

# LNG CANADA EXPORT TERMINAL PROJECT

## ASSESSMENT REPORT

With respect to:

the Application by LNG Canada Development Inc.

for an Environmental Assessment Certificate

pursuant to the *Environmental Assessment Act*, S.B.C. 2002, c.43

and

the *Canadian Environmental Assessment Act, 2012*, S.C. 2012 c. 19,

as a substituted environmental assessment

Prepared by:

Environmental Assessment Office

May 6, 2015



## Preface

The Environmental Assessment Office (EAO) manages the assessment of proposed major projects in British Columbia, as required by the *Environmental Assessment Act* (Act). The process includes:

- Opportunities for the involvement of all interested parties;
- Consultations with Aboriginal Groups;
- Technical studies to identify and examine potential significant adverse effects;
- Strategies to prevent or reduce adverse effects; and
- Comprehensive reports summarizing input and findings.

At the conclusion of each Environmental Assessment (EA), EAO provides a comprehensive assessment report (Assessment Report), and makes recommendations to the Minister of Environment and, for natural gas proposals, to the Minister of Natural Gas Development. The Ministers may decide to certify a project, decline to certify a project, or require further assessment. As the EA of this project is also required under the *Canada Environmental Assessment Act 2012* (CEAA 2012), EAO has conducted a substituted EA and will also provide this Assessment Report to the federal Minister of the Environment to support decision-making under CEAA 2012.

This Assessment Report considers the potential for the LNG Canada Export Terminal Project (proposed Project) to cause significant adverse environmental, economic, social, heritage and health effects. It identifies measures to prevent or reduce adverse effects and sets out EAO's analysis and conclusions. It also documents the work undertaken by EAO to consult and accommodate Aboriginal Groups, in keeping with the Supreme Court of Canada's direction in *Haida v. Minister of Forests* and related case law. The Report also includes the results of procedural aspects of consultation with Aboriginal Groups and Métis Nation BC on behalf of the Canadian Environmental Assessment Agency.

Information and records relating to environmental assessments are available on the EAO website at [www.eao.gov.bc.ca](http://www.eao.gov.bc.ca). Questions or comments can be directed to:

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## Acronyms Used in the Assessment Report

AAQO	ambient air quality objectives	ePIC	EAO electronic Project Information Centre
Act	<i>Environmental Assessment Act</i>	ERP	Emergency Response Plan
Adawx	First Nation oral history	FLNR	Ministry of Forests, Lands and Natural Resource Operations
Agency	Canadian Environmental Assessment Agency	GBPU	Grizzly Bear Population Units
AIA	Archaeological Impact Assessment	GDP	Gross Domestic Product
AIR	Application Information Requirements	GHG	greenhouse gas
BMP	best management practices	ha	hectare
BSA	basin study areas	H <sub>2</sub> S	hydrogen sulphide
CAAQS	Canadian Ambient Air Quality Standards	HCA	<i>Heritage Conservation Act</i>
CAC	criteria air contaminants	HFC	hydro-fluorocarbons
C&E	Compliance and Enforcement (Program)	HHRA	human health risk assessment
CCME	Canadian Council of Ministers of the Environment	IPCC	Intergovernmental Panel on Climate Change
CDC	Conservation Data Centre	IR	Indian Reserve
CEAA 2012	<i>Canadian Environmental Assessment Act, 2012</i>	ISO	International Organization for Standardization
CEPA	<i>Canadian Environmental Protection Act</i>	JAG	Ministry of Justice
CFHOP	Conceptual Fish Habitat Offsetting Plan	KLNG	Kitimat LNG
CH <sub>4</sub>	methane	kV	kilovolt
CMP	Compliance Management Plan	LFN	low frequency noise
CMT	culturally modified trees	LHA	Local Health Area
CO	carbon monoxide	LNG	liquefied natural gas
CO <sub>2</sub>	carbon dioxide	LSA	local study area
CO <sub>2</sub> e	carbon dioxide equivalents	MARPOL	International Convention for the Prevention of Pollution from Ships
COPC	contaminants of potential concern	MCTS	Marine Communication and Traffic System
COSEWIC	Committee on the Status of Endangered Wildlife in Canada	MEM	Ministry of Energy and Mines
CPD	Certified Project Description	MNBC	Métis Nation British Columbia
CRA	commercial, recreational and Aboriginal	MNGD	Ministry of Natural Gas Development
CWS	Canadian Wildlife Service	MNL	mitigated noise level
DAS	Disposal at sea	MOE	Ministry of Environment
dB	decibel	MOF	materials offloading facility
DFO	Fisheries and Oceans Canada	MOH	Ministry of Health
EA	environmental assessment	MOTI	BC Ministry of Transportation and Infrastructure
EAC	Environmental Assessment Certificate	MOU	Memorandum of Understanding
EAO	Environmental Assessment Office	MTPA	million tonnes per annum
EC	Environment Canada	NAAQS	National Ambient Air Quality Standards
EMA	<i>Environmental Management Act</i>	N <sub>2</sub> O	nitrous oxide
EMP	environmental management plan	NPA	<i>Navigation Protection Act</i>
EOF	Early offloading facility	NRCan	Natural Resources Canada
		NWHSDA	Northwest Health Services Delivery Area

NO <sub>2</sub>	nitrogen dioxide
O <sub>3</sub>	ozone
OCP	Official Community Plan
OGAA	<i>Oil and Gas Activities Act</i>
OGC	Oil and Gas Commission
OGWR	Oil and Gas Waste Regulation
OLM	Ozone Limiting Method
PAH	polycyclic aromatic hydrocarbons
PCDD/F	polychlorinated dibenzo-p-dioxin and polychlorinated dibenzofuran
PEL	probable effects levels
PFC	perfluorocarbons
PM	particulate material
PNW LNG	Pacific NorthWest LNG
Proponent	LNG Canada Development Inc.
PSL	permissible sound levels
PY	person years
RAA	Regional Assessment Area
RDKS	Regional District of Kitimat-Stikine
ROW	right of way
RSA	regional study area
RTA	Rio Tinto Alcan
RTA STAR	Rio Tinto Alcan Sulphur Dioxide Technical Assessment Report
SARA	<i>Species at Risk Act</i>
SF <sub>6</sub>	sulphur hexafluoride
SIA	socio-economic impact assessment
SO <sub>2</sub>	sulphur dioxide
SQCRD	Skeena Queen Charlotte Regional District
STI	sexually transmitted infections
TC	Transport Canada
TERMPOL	Technical Review Process of Marine Terminal Systems and Transshipment Sites
TK	traditional knowledge
TOC	Table of Conditions
TSS	total suspended solids
US EPA	US Environmental Protection Agency
VC	valued component
VOC	volatile organic compounds
WCSB	Western Canadian Sedimentary Basin
WHO	World Health Organization
WQG	water quality guidelines

## Executive Summary

### Overview

LNG Canada Development Inc. (the Proponent) is proposing the construction, operation, and decommissioning of the LNG Canada Export Terminal Project (proposed Project), located in northwest British Columbia (BC) in the District of Kitimat. The proposed Project would include a facility with liquefied natural gas (LNG) storage, power generation, a marine terminal and any incidental physical activities, as well as shipping of LNG in LNG carriers during operations. The proposed Project would be operational for a minimum of 25 years, and would produce an estimated 26 million tonnes of LNG per year at full build out. The Proponent is a joint venture comprised of Shell Canada Energy (Shell), Diamond LNG Canada Ltd. (an affiliate of Mitsubishi Corporation), KOGAS Canada LNG Ltd. (an affiliate of Korea Gas Corporation), and Brion Kitimat LNG Partnership (an affiliate of PetroChina Investment [Hong Kong] Ltd).

The proposed Project is subject to an environmental assessment under BC's *Environmental Assessment Act* by the BC Environmental Assessment Office (EAO), and the *Canadian Environmental Assessment Act, 2012* (CEAA 2012) by the Canadian Environmental Assessment Agency (the Agency). On May 21, 2013 the federal Minister of the Environment approved the substitution of the federal environmental assessment process under CEAA 2012 with the process conducted under BC's *Environmental Assessment Act*. The substitution decision was granted in consideration of the approach set out in the *Memorandum of Understanding between the Canadian Environmental Assessment Agency and BC's Environmental Assessment Office on the Substitution of Environmental Assessments, 2013*.

EAO prepared an Assessment Report in consultation with an Advisory Working Group, made up of federal, provincial and local government representatives with the mandates and skill sets relevant to the review of the proposed Project, as well as representatives of potentially affected Aboriginal groups listed on Schedules B and C of the Section 11 Order. The Agency also provided advice to EAO in relation to fulfilling the requirements of CEAA 2012.

EAO undertook public consultation activities during the course of the environmental assessment, including holding two public comment periods. All public comments, and the Proponent's responses to these comments, were considered in completing the environmental assessment.

In conducting this environmental assessment, EAO considered the potential environmental, economic, social, heritage and health effects, including cumulative effects of other projects or activities, of the proposed Project for the provincial environmental assessment. For the purposes of meeting the CEAA 2012 substitution requirements, EAO considered effects that the proposed Project may have on

environmental effects described in subsections 5(1) and 5(2) of CEAA 2012, as well as the *Species at Risk Act*, subsection 79(2).

## **Assessment of Effects**

EAO uses valued components as an organizing framework for the assessment of the potential effects of proposed projects. Valued components are components of the natural and human environment that are considered by the Proponent, public, Aboriginal Groups, scientists and other technical specialists, and government agencies involved in the assessment process to have scientific, ecological, economic, social, cultural, archaeological, historical or other importance.

The environmental assessment focused on the valued components related to air quality, greenhouse gas emissions, acoustics, water quality, fish and fish habitat, marine resources, vegetation and wetlands, wildlife and birds, economics, infrastructure and services, community health and well-being, marine transportation and use, visual quality, archaeological and heritage resources, and human health.

EAO assessed the potential for the proposed Project to have significant adverse effects on the valued components and on the requirements of CEAA 2012. The assessment also considered how accidents and malfunctions and changes to the environment could affect the valued components. These assessments were based on the Application provided by the Proponent and informed by comments received from the Advisory Working Group, Aboriginal Group consultation, and the public.

The Proponent proposed mitigation measures to avoid or minimize the adverse effects of the proposed Project. In consideration of the Proponent's proposed mitigation measures and the comments received during the review of the Application, EAO is proposing 22 conditions, each of which includes measures to mitigate the effects of the proposed Project. If provincial Ministers issue an Environmental Assessment Certificate, they may establish these conditions as legally binding requirements. Additional mitigation conditions may be proposed by the Agency for consideration by the federal Minister of the Environment as legally binding conditions in a CEAA 2012 decision statement should the Project proceed.

The following are some of the key mitigation measures and follow-up programs that are included in the conditions EAO proposes to provincial ministers, some of which may also be incorporated in a decision statement under CEAA 2012:

- Air quality management and monitoring, which includes design measures to reduce nitrogen oxide (NO<sub>x</sub>) emissions and participation in regional airshed monitoring activities;
- Monitoring of air emissions impacts to air, soil, water, and/or vegetation;
- Development of a greenhouse gas emissions management plan, which includes use of aero-derivative gas turbines and measures to meet provincial regulatory requirements;
- Marine mammal monitoring and mitigation during construction and operations;

- Management and monitoring of marine water quality and the availability of contaminated sediments during and after construction dredging, to ensure protection of the health of marine life and humans;
- Seek to maintain at least a 30 metre vegetation buffer between the Kitimat River and the project area to minimize impacts to vegetation, old forest and visual quality;
- Offsetting impacts to ecologically important wetlands;
- Development of a wildlife management plan to minimize impacts to wildlife, including timing of flaring events to reduce risks to birds, reducing human-wildlife conflicts, and maintaining wildlife movement through the estuary;
- Development of a socio-economic effects management plan to coordinate with government agencies to minimize impacts to community infrastructure and services;
- Development of a health and medical services plan to manage workforce health;
- Development of a traffic management plan to minimize construction disruption on transportation infrastructure;
- Communication of marine activities during construction and operations with impacted stakeholders and Aboriginal groups;
- Development of a marine activities plan that monitors and mitigates impacts to marine users;
- Monitoring to verify the assessment of the wake effects from LNG carriers, particularly in relation to potential safety hazards to marine and shoreline users, and, including adaptive management measures;
- Development of an emergency response plan to address both land and marine based emergencies, including accidents and malfunctions; and
- Ongoing consultation with the public and Aboriginal groups throughout all phases of the proposed Project.

Other mitigation measures that would be requirements of subsequent regulatory processes, if an Environmental Assessment Certificate is issued, include:

- A waste discharge permit under the *Environmental Management Act*, which would establish the allowable criteria air contaminant emission levels and detailed mitigation requirements;
- Fish habitat offsetting, as required under authorization contemplated under paragraph 35(2)(b) of the federal the *Fisheries Act*;
- Provincial laws related to greenhouse gas emissions, including payment of the carbon tax and requirements associated with the intensity benchmark for LNG facilities of 0.16 tonnes of CO<sub>2</sub>e per tonne of LNG produced;
- A disposal at sea permit, contemplated under the *Canadian Environmental Protection Act*, 1999, which would require that dredge material is suitable for disposal at sea and establish specific disposal locations and methods; and
- Maintenance and preservation of marine access under the *Navigation Protection Act*.

In consideration of the mitigation measures that would be required of the proposed Project, either in the Environmental Assessment Certificate, if approved, or in subsequent regulatory processes, EAO concludes that the proposed Project would result in key residual adverse effects that include:

- Increase in emission of air contaminants, particularly from the facility operations, which would contribute to the potential acidification of some lakes and streams;
- Greenhouse gas emissions, particularly from the facility operations;
- Increase in ambient sound levels during construction and operations;
- The removal and alteration of freshwater, estuarine and marine fish habitat, including marine plants, as well as the potential for physical injury or mortality to fish from habitat isolation during construction;
- Change in human health risk from ingestion of contaminated marine country foods resulting from construction dredging;
- Potential harm to fish or marine mammals due to underwater noise or pressure waves during construction;
- Potential avoidance behaviour of marine mammals due to underwater noise from shipping during operations;
- A loss of habitat for two BC Conservation Data Centre listed plant species, 12 listed wetland and floodplain ecological communities, 51 hectares of old forest, and 25 species of traditional use plants;
- A loss or change in terrestrial wildlife and bird habitat, sensory disturbance or behavioral alteration to wildlife and birds, and increased risk of injury or mortality to wildlife and birds, including migratory birds as defined under the *Migratory Birds Convention Act*;
- Negative social effects largely resulting from the temporary and permanent change in population, including on community health and wellbeing, and community infrastructure and services;
- Increase in traffic and pressure on transportation infrastructure, including air and road corridors, during construction;
- Interference with marine navigation and marine and shoreline activities due to shipping; and
- A change in visual quality due to the establishment of the facility and ongoing shipping activity.

For the purposes of the assessment required under CEAA 2012, EAO concludes that the proposed Project would result in key residual adverse effects that, in addition to those above, include:

- Increase in emission air contaminants, particularly from the facility operations, on federal lands;
- Increase in ambient sound levels during construction and operations on federal lands;
- Impacts to Aboriginal peoples due to decreased air quality and increased availability of marine contaminants;
- Increase in ambient sound levels during construction and operations for Aboriginal peoples;



- Change in visual quality for Aboriginal peoples at terrestrial and marine viewpoints; and
- Impacts to the harvesting and consumption of traditional marine and non-marine foods by Aboriginal peoples.

### **Aboriginal Consultation**

EAO and the Agency worked together to identify which Aboriginal groups could potentially be impacted by the Project based on the following factors:

- Strength of the case for the claimed Aboriginal rights and title (Aboriginal Interests) that may be adversely affected; and
- Seriousness of the proposed Project's potential to adversely impact these Aboriginal Interests.

EAO consulted these groups throughout the EA and assessed the potential adverse effects of the proposed Project on Aboriginal Interests.

Potential direct effects from the proposed facility would occur in the asserted traditional territory of Haisla Nation. Potential effects along the shipping route would occur in the asserted traditional territories of Haisla Nation, Gitga'at First Nation, Gitxaala Nation, Metlakatla First Nation, Lax Kw'alaams Band, Kitsumkalum First Nation, and Kitselas First Nation. EAO consulted with these Aboriginal groups throughout the environmental assessment process, including the Métis Nation British Columbia on behalf of the federal government.

The proposed Project has the potential to impact Aboriginal rights related to hunting, fishing, trapping, gathering, trails and travelways, and archaeological and heritage resources and sites. The proposed Project also has the potential to impact Aboriginal title at the facility location. The key mitigation measures and proposed conditions would accommodate the assessed potential effects to Aboriginal Interests. In the context of potential impacts on Aboriginal Interests EAO also considered: the importance of the proposed Project to the local, regional, and provincial economy; the resources or values that may no longer be available for future generations; and the benefits of the proposed Project to Aboriginal groups.

### **Conclusion**

EAO concludes that, considering the analysis and implementation of the proposed conditions, the proposed Project would not result in significant adverse effects, with the exception of a significant residual adverse effect related to greenhouse gas emissions.

## **PART A – INTRODUCTION AND BACKGROUND**

### **1 Purpose of the Report**

The purpose of this Assessment Report is to summarize the procedures and findings of the EA conducted on the Application by the Proponent for an EA Certificate for the proposed Project, submitted November 7, 2014.

EAO is required to prepare this Assessment Report for provincial Ministers who are responsible for making a decision on the proposed Project under section 17 of the Act. For liquefied natural gas (LNG) facility projects, the deciding Ministers are the Minister of the Environment and the Minister of Natural Gas Development.

On May 21, 2013 the federal Minister of the Environment approved the substitution of the BC EA process for the federal process. The substituted process must meet the EA requirements of the *Canadian Environmental Assessment Act 2012* (CEAA 2012).

The approval was granted with the understanding that the EA would be conducted by EAO in accordance with the *Memorandum of Understanding on Substitution of Environmental Assessments* (2013) entered into by the Agency and EAO. The essence of the memorandum of understanding (MOU) on substitution is that EAO would consider the factors as set out in subsection 19(1) of CEAA 2012 when conducting the EA and would provide an EA report to the Agency that includes the findings and conclusions of the EA with respect to those factors. Ultimately, substitution results in one EA process designed to support both a provincial and federal decision.

The Assessment Report will be submitted to the federal Minister of the Environment to inform decision-making under CEAA 2012. Consistent with paragraph 34(1)(e) of CEAA 2012, the Assessment Report will be made available to the public following the provincial Ministers' decision.

This Assessment Report:

- Describes the proposed Project, substituted EA process, and consultations undertaken during the EA;
- Documents work undertaken by EAO to consult and accommodate Aboriginal Groups in keeping with the Supreme Court of Canada's direction in *Haida v. Minister of Forests* and related case law;
- Documents procedural aspects of consultation with Aboriginal Groups and Métis Nations on behalf of the federal Agency in keeping with the MOU on Substitution;
- Identifies the potential environmental, economic, social, heritage and health effects of the proposed Project and how the Proponent proposes to mitigate effects;
- Identifies the residual effects after mitigation;

- Identifies the conditions proposed by EAO; and
- Sets out conclusions based on the proposed Project's potential for significant adverse residual effects with respect to both the Act and CEAA 2012.

In keeping with the Act, the EA is focused on specific environment, economic, social, health and heritage Valued Components (VCs) considered important to assess in order to understand the potential for significant adverse effects of the proposed Project.

This Assessment Report does not replicate the content presented in the Application. In the preparation of this Assessment Report, the following information has been considered:

- The Application and supplemental information provided by the Proponent; and
- Comments provided on the Application and supplemental information by the Working Group, Aboriginal Groups and the public.

This information has been posted to EAO's electronic Project Information Centre (ePIC).

## **2 Project Overview**

### **2.1 Proponent Description**

The Project would be owned and operated by LNG Canada Development Inc., an operating entity established by Shell Canada Energy (Shell), Diamond LNG Canada Ltd. (an affiliate of Mitsubishi Corporation), KOGAS Canada LNG Ltd. (an affiliate of Korea Gas Corporation), and Brion Kitimat LNG Partnership (an affiliate of PetroChina Investment [Hong Kong] Ltd).

If approved, the Environmental Assessment Certificate (EAC) and operational permits for the proposed Project would be held by LNG Canada Development Inc., a Canadian corporation based in Vancouver, BC.

On February 28, 2013 the Proponent received, a Licence to Export LNG from the National Energy Board pursuant to section 117 of the *National Energy Board Act*.

### **2.2 Project Description and Scope**

#### **2.2.1 Project Description and Location**

The proposed Project would be located in northwest BC in the District of Kitimat, approximately 4 km from the Kitimat service centre. The proposed Project's site is in the asserted traditional territory of Haisla Nation and the proposed Project's shipping route is in the asserted traditional territories of Haisla Nation, Kitsumkalum First Nation, Gitga'at First Nation, Gitxaala First Nation, Lax Kw'alaams Band, Metlakatla First Nation and the asserted harvesting area of Kitselas First Nation.

The proposed Project site is on a 412 ha site that is held fee simple and most of which is zoned for industrial use. Approximately 10% of the proposed Project site was previously developed for methanol production, storage and transshipment and for condensate transshipment (see Figure 2-1). A LNG loading and circulation system would connect the LNG processing and storage site with the marine terminal located in the private port of Kitimat. Construction of the marine terminal would involve modification of an existing wharf to accommodate two LNG carriers and a materials offloading facility (MOF).

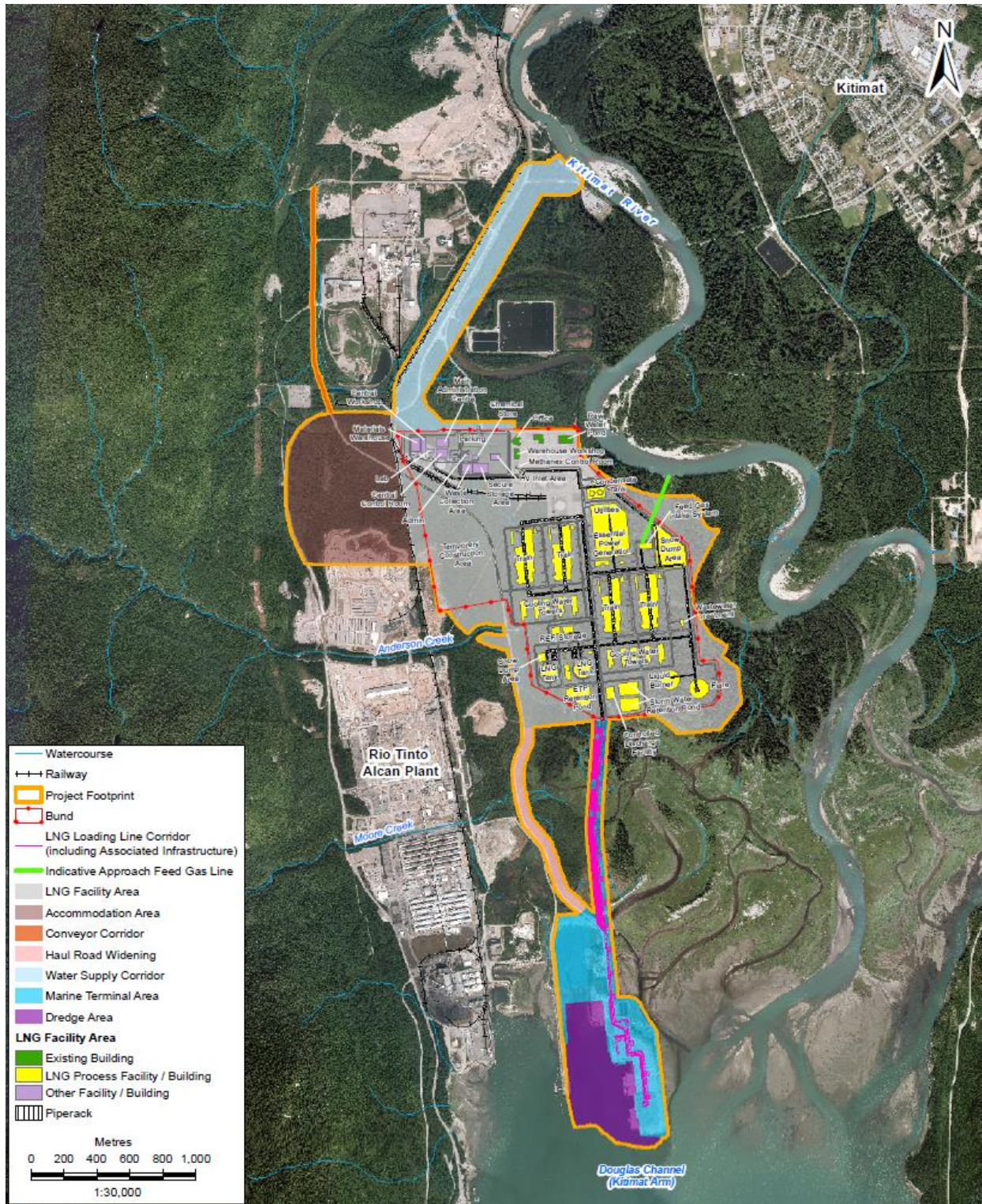
The proposed marine access route to the port of Kitimat would start near the Triple Island Pilotage Station where BC Coast Pilots would board the LNG carriers, and would continue south through Principe Channel, and then angle east and northeast into Douglas Channel to Kitimat Arm.

A temporary workforce accommodation centre would house construction staff on former Rio Tinto Alcan (RTA) lands (approximately 64 ha) immediately adjacent to the LNG processing and storage site.

The main processing or production units of an LNG facility, where natural gas is converted to liquid, are referred to as “trains”. The Proponent anticipates that the proposed Project would be constructed in phases, with the first phase consisting of two trains and a further two trains to be added in subsequent phase(s). If an EAC is issued, and other regulatory approvals are received, construction of the proposed Project would start in 2015. Construction of the first phase would be completed in approximately four to five years following issuance of permits, with the subsequent phase(s) being developed as required by market demand. The proposed Project would be expected to be commissioned by 2019 or 2020.

The proposed Project would be supplied with natural gas from the Coastal GasLink Pipeline Project, owned and operated by Coastal GasLink Ltd. Coastal GasLink Pipeline Project has been issued an EAC (Certificate #E14-03).





**Figure 2-1: Detailed Project Site Plan**

## 2.2.2 Project Component

The proposed Project would include the following components, described in further detail below:

- LNG facility and supporting infrastructure;
- Temporary construction-related infrastructure and facilities; and
- Shipping activities.

### *LNG Facility and Supporting Infrastructure*

Natural gas received at the facility would be processed in natural gas liquefaction trains, where natural gas liquids (condensate) and impurities (e.g., water) are removed and the remaining natural gas is converted into LNG through liquefaction and transferred into storage tanks. The components related to the LNG processing and storage include:

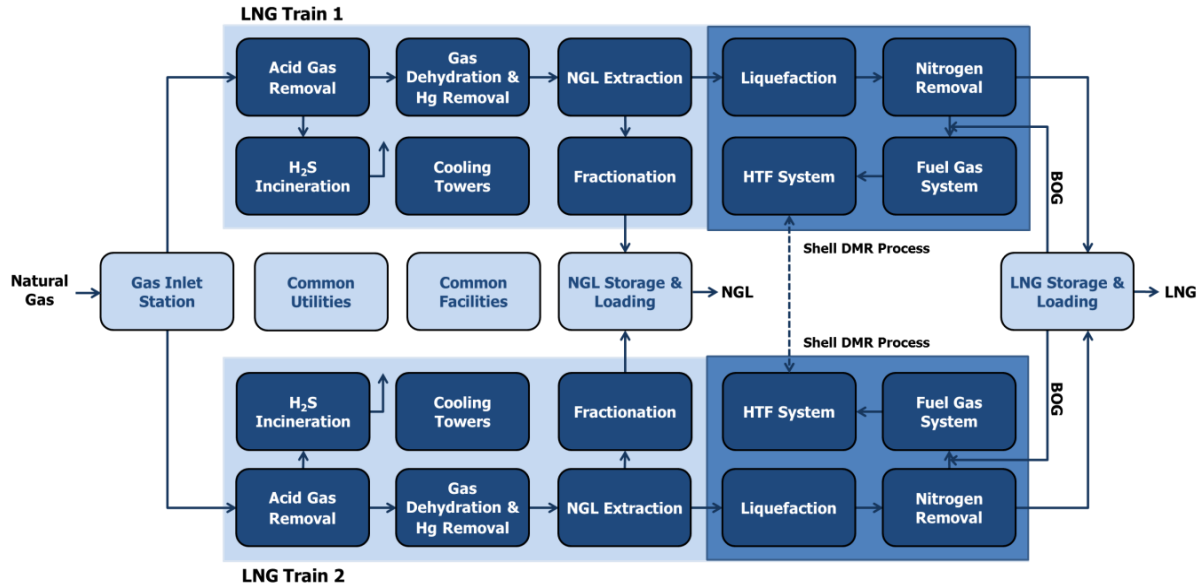
- Natural gas inlet station;
- Up to four natural gas liquefaction trains (processing units), comprised of gas treatment and liquefaction facilities with a maximum total combined production of LNG that does not exceed the volume authorized in the Licence to Export LNG pursuant to section 117 of the *National Energy Board Act*;
- Up to two containment storage LNG tanks with a net capacity of up to approximately 250,000 m<sup>3</sup> each;
- Up to two condensate storage tanks with a total net capacity of up to 25,000 m<sup>3</sup>;
- Water cooling towers with water sourced from the Kitimat River;
- Water and wastewater facilities; and
- Flare systems, with a flare derrick of no greater than 135 m in height.

The components of the phase one LNG facility (two trains) are shown in Figure 2-2.

The pressure relief and liquid disposal system (flare system) is an important component of the LNG facility's safety system. The purpose of the flare system is to collect and dispose of hydrocarbon containing streams in a controlled manner. The flare system would consist of the flare derrick and the liquid burner derrick. The flare derrick would have an approximate height of 135 m, and width of 10 m. Each flare stack would have a diameter of approximately 1.6 m. There would be a continuously operational flare pilot. Controlled flaring is expected to have a flare height of between 10 m to 30 m and the maximum flare height is anticipated to be approximately 60 m during a major plant upset condition. The liquid burner derrick would have a height of approximately 60 m.

The natural gas liquefaction trains would use natural gas powered direct-drive turbines. The remainder of the LNG facility and terminal's electrical power would be sourced from BC Hydro.





**Figure 2-2: Block Diagram of LNG Facility with Two Trains**

The LNG loading and circulation system would continue south from the LNG processing and storage site to the marine terminal. LNG would travel to the marine terminal through two parallel loading lines and would be loaded into the carrier by marine loading arms. Vapour from the LNG carrier would be transported back to the facility through a vapour return line. The line would allow for wildlife passage and freshwater and tidal flows underneath the loading line.

The marine terminal would include two LNG carrier berths, each able to accommodate one LNG carrier up to 345 m long, and a MOF.

Construction of the marine terminal would involve modifying and enhancing the existing RTA Wharf “B”, and portions of the existing Methanex jetty to accommodate temporary and permanent material offloading areas. Dredging would be required at the LNG vessel basin for both berths, as well as for the entrance to the material offloading facility for heavy lift ships. During operations occasional maintenance dredging may occur.

Supporting permanent infrastructure within the facility area would include:

- Upgrades to existing roads;
- Modifications to and possible extension of existing railway tracks;
- Replacement of the existing water intake infrastructure on Kitimat River and a water pipeline to the LNG facility site, designed with backwash facilities;
- Replacement of the existing wastewater pipeline to Kitimat harbour;
- Infrastructure for the import of power to the LNG facility site and marine terminals, including electrical transmission lines from Minette substation to north of the proposed site;
- Construction offices;

- Cooling water supply, treatment and return;
- Fire water system;
- Waste solids collection and disposal;
- Wastewater collection and treatment; and
- Storm water management and discharge facilities.

### *Temporary Infrastructure and Facilities*

The proposed Project would include the following construction-related temporary infrastructure and facilities:

- Concrete batch plant(s);
- Overland conveyor;
- Temporary buildings to house administration offices, subcontractor offices, temporary medical facilities, sanitary facilities and shipping and receiving warehouse;
- Temporary construction roads;
- Laydown areas to stage or store construction materials;
- Early offloading facility; and
- Temporary utilities to support construction, including water, power, gas and sewage.

The temporary workforce accommodation centre would be located on 64 ha adjacent to the LNG processing and storage site (as described in an addendum filed March 27, 2015). The centre would have bedrooms, eating areas, recreational facilities, health facilities, offices and sewage treatment to support between 4,500 and 7,500 workers.

### *Shipping Activities*

During operations, the proposed facility would receive between 170 and 350 LNG carrier visits per year, depending on carrier size. BC Coast Pilots would board the LNG carriers near the Triple Island Pilotage Station and pilot the ships through Principe Sound and Douglas Channel to Kitimat Arm, as shown in Figure 2-3. The LNG carriers would be accompanied by one or two escort tugs while in transit from Triple Island to the marine terminal. Up to four harbour tugboats would be available for berthing operations at the marine terminal.





**Figure 2-3: Proposed Shipping Route**

### 2.2.3 Project Activities

#### **Construction**

The Proponent anticipates that the first phase of construction and commissioning (e.g., start-up tests and inspections) would be completed in approximately four to five years. The construction activities would include:

- Site preparation (land-based);
- Onshore construction;
- Dredging, including disposal;
- Marine construction;
- Waste management;
- Vehicle and rail traffic; and
- Commissioning and start-up (including processing units, common utilities, loading and shipping facilities).

Construction would also include shipping construction materials by barge and other vessels.

#### **Operations**

Once the first phase of construction and commissioning is complete, the operations phase would begin. The life of the proposed Project is estimated to be a minimum of 25 years. Operational activities would include:

- Natural gas treatment and natural gas liquids extraction;
- LNG production;
- LNG loading;
- Waste management;
- LNG shipping; and
- Natural gas liquids (condensate) loading and transport via rail.

Major maintenance activities would occur during planned maintenance outages (turnarounds), which are anticipated to occur once every three years, per train.

#### **Decommissioning and Abandonment**

At the end of the life of the proposed Project (estimated to be in excess of 25 years) the facility would be decommissioned, and would likely include:

- Dismantling of land-based and marine infrastructure;
- Remediation and reclamation of the site;
- Waste management; and
- Post-closure monitoring and follow-up.

## 2.2.4 Alternative Means of Undertaking the Proposed Project

The Application includes a comparative evaluation of alternative practical means of implementing and carrying out various aspects of the proposed Project, consistent with paragraph 19(1)(g) and paragraph 34(1)(a) of CEEA 2012.

The specific alternative means that were evaluated included the following:

- Facility sites;
- Marine access routes;
- Location for the marine terminal;
- Power supply options;
- Disposal options for dredge material; and
- Sites for the temporary workforce accommodation centre.

The evaluation of alternatives means was conducted using the following general criteria:

- Technical requirements to construct and operate the facility and its related infrastructure, including consideration of the distance between the LNG processing and storage site and the marine terminal, and the layout for the LNG loading and circulation system;
- Economic feasibility of the alternative for construction and operation of the LNG facility and the associated infrastructure land-use zoning based on the zoning in the Kitimat Municipal Code and future land use goals, objectives and policies reflected in the District of Kitimat's Official Community Plan;
- Ability to acquire land or to gain rights-of-way over private land;
- Industry safety standards (including marine safety); and
- Environmental and heritage resources and the potential effects of the Project, including the environmental effects as identified in section 5 of CEEA 2012.

Appendix 1 provides a detailed summary of the evaluation of the various alternative means considered in the Application.

## 2.2.5 Project Design as a Result of the Environmental Assessment

During pre-Application and Application Review the Proponent selected amongst several Project design alternatives and made several changes to the Project to minimize or avoid potential adverse effects. These design changes were made as a result of feedback from Aboriginal Groups, communities, stakeholders and federal and provincial agencies, as well as more detailed design and engineering work. These were incorporated into the proposed Project as described in the Proponent's Application and in an addendum that was filed during Application Review, on March 27, 2014. A summary (as identified by the Proponent) of some of the Project design changes that resulted from the EA process is provided in Table 2-1.

**Table 2-1: Project Design Resulting from the EA Process**

<b>Project Feature</b>	<b>Project Changes</b>	<b>Benefits of Change</b>
Disposal at sea	<ul style="list-style-type: none"> <li>Removed two of five sites DSA2 and DSA3 based on input from Haisla Nation (see Appendix I)</li> </ul>	<ul style="list-style-type: none"> <li>Reduced potential for impacts to Haisla Nation Aboriginal Interests</li> </ul>
Fish habitat	<ul style="list-style-type: none"> <li>Beaver Creek realignment</li> <li>Increased offsetting options in close proximity to Project effects</li> </ul>	<ul style="list-style-type: none"> <li>Decreased upstream habitat loss in Beaver Creek.</li> <li>Reduction in localized effects to fish in the Kitimat estuary</li> </ul>
LNG loading line	<ul style="list-style-type: none"> <li>Removing proposed bunds, safety fencing along the loading line right of way that crosses Kitimat River estuary</li> </ul>	<ul style="list-style-type: none"> <li>Facilitates continued wildlife passage through the estuary and tidal flows</li> </ul>
Marine Access Route	<ul style="list-style-type: none"> <li>The location of the marine access route was revised such that as it travels between Browning Entrance and Triple Island it moves further offshore than as presented in the Application</li> </ul>	<ul style="list-style-type: none"> <li>Reduces impacts of pilot vessels in the vicinity of Triple Island</li> </ul>
Pilot boarding	<ul style="list-style-type: none"> <li>Ongoing discussion with BC Coast Pilots about pilot boarding, including use of helicopters</li> <li>Proposed location of pilot boarding is well offshore of Triple Island</li> </ul>	<ul style="list-style-type: none"> <li>Decreased potential for adverse effects to Aboriginal Interests around Triple Island</li> </ul>
Power source	<ul style="list-style-type: none"> <li>Selected a hybrid approach to power requirements: gas turbine compressor drivers for the liquefaction process trains, and import power from the BC Hydro grid for electricity</li> <li>Other options included sourcing all electricity from BC Hydro grid or generating all power onsite (see Appendix I)</li> </ul>	<ul style="list-style-type: none"> <li>Reduction of potential GHG air emissions</li> </ul>
Shipping	<ul style="list-style-type: none"> <li>Limited vessel speeds</li> </ul>	<ul style="list-style-type: none"> <li>Reduced potential effects from wake from LNG carriers</li> <li>Reduced risk to marine mammals</li> </ul>
Vehicle traffic	<ul style="list-style-type: none"> <li>Traffic management plan, including use of busses, commitments to transportation planning</li> </ul>	<ul style="list-style-type: none"> <li>Managing potential Project contribution to cumulative effects on traffic volume and infrastructure, including the Haisla Bridge</li> </ul>

### 2.3 Project Benefits and Purpose

This section summarizes the Project purpose and estimated benefits during construction and operations, as reported in the Proponent's Application.

### 2.3.1 Purpose of the Project

The purpose of the proposed Project is to convert natural gas into LNG and develop the LNG export industry in BC. LNG exported from the proposed Project would connect the 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 and North American gas supply now exceeds forecasted long-term North American demand. Increased gas production from new gas fields in the US has substantially reduced the share of the continental gas market served by the WCSB. Additionally, the development of a LNG sector in BC is a major economic goal for the Province and for the Canadian natural gas industry.

### 2.3.2 Economic Benefits of the Project

Table 2-2 summarizes the economic benefits that would be generated from proposed Project construction in BC and Canada. To reflect the uncertainty of cost estimates and timing of construction, the Application contains low- and high-cost scenarios. Construction would be conducted in a phased approach. The estimated cost of construction of Phase 1, consisting of LNG trains 1 and 2, the marine terminal and port works, is between \$12.9 billion and \$20.6 billion over approximately five years. The timing of the subsequent two trains would be market-driven. The Proponent expects the total construction cost of full build-out of all four LNG trains would be between \$22.6 billion and \$36 billion.<sup>1</sup> This is expected to include between \$10.4 and \$16.6 billion of direct capital expenditures in Canada, representing 46% of total capital costs, of which, up to \$7.1 billion would be spent in BC.

**Table 2-2: Summary of Economic Benefits from Project Construction**

<b>Construction Spending</b>				
	<b>Trains 1 and 2</b>		<b>Trains 1, 2, 3 and 4</b>	
	<b>Low Cost (\$ millions)</b>	<b>High Cost (\$ million)</b>	<b>Low Cost (\$ millions)</b>	<b>High Cost (\$ million)</b>
Spending in BC	2,500	4,100	4,400	7,100
Spending in Canada	5,900	9,500	10,400	16,600
Foreign spending	7,000	11,100	12,200	19,500
<b>Total</b>	<b>12,900</b>	<b>20,600</b>	<b>22,600</b>	<b>36,100</b>
<b>Types of Construction Spending within Canada</b>				
	<b>Trains 1 and 2</b>		<b>Trains 1, 2, 3 and 4</b>	
	<b>Low Cost (\$ millions)</b>	<b>High Cost (\$ million)</b>	<b>Low Cost (\$ millions)</b>	<b>High Cost (\$ million)</b>
Direct Labour	1,170	1,820	5,040	3,180
Services	1,870	2,980	3,280	5,220
Goods	1,650	2,650	2,880	4,640

<sup>1</sup> All dollar values expressed in 2015 Canadian dollars unless otherwise specified.

Other Expenditures	630	1,030	1,110	1,800
Overhead	650	1,040	1,130	1,820
<b>Total</b>	<b>5,970</b>	<b>9,520</b>	<b>10,440</b>	<b>16,660</b>
<b>Estimated Contribution of Project Construction to BC Gross Domestic Product (GDP)*</b>				
	<b>Trains 1 and 2</b>		<b>Trains 1, 2, 3 and 4</b>	
	<b>Low Cost (\$ millions)</b>	<b>High Cost (\$ million)</b>	<b>Low Cost (\$ millions)</b>	<b>High Cost (\$ million)</b>
Direct	1,100	1,820	1,926	3,177
Indirect	500	800	873	1,404
Induced	510	830	900	1,458
<b>Total</b>	<b>2,110</b>	<b>3,450</b>	<b>3,699</b>	<b>6,039</b>
<b>Effects of Project Construction on Government Revenues</b>				
	<b>Trains 1 and 2</b>		<b>Trains 1, 2, 3 and 4</b>	
	<b>Low Cost (\$ millions)</b>	<b>High Cost (\$ million)</b>	<b>Low Cost (\$ millions)</b>	<b>High Cost (\$ million)</b>
Municipal/Regional**	35	35	83	83
Provincial (BC)*	200	320	347	563
Federal*	710	1,130	1,238	1,980

\* Based on SCIPIOM, includes direct, indirect and induced spending

\*\* Based on LNG Canada estimate

The Proponent estimates that construction to full build out would directly create 29,200 person years (PYs) of employment in Canada, including 10,950 PYs of work for residents of BC (Table 2-3). An estimated, 10% of the direct construction workforce would be hired locally, 20% from other parts of BC, 50% from other parts of Canada and 20% from abroad.

**Table 2-3: BC and Canada Employment Estimates during Construction**

<b>Trains 1 and 2</b>						
	<b>BC</b>		<b>Other Canada</b>		<b>Total Canada</b>	
	<b>Low Cost (PYs)</b>	<b>High Cost (PYs)</b>	<b>Low Cost (PYs)</b>	<b>High Cost (PYs)</b>	<b>Low Cost (PYs)</b>	<b>High Cost (PYs)</b>
<b>Direct*</b>	6257		10,429		16,686	
<b>Other Direct**</b>	5,117	9,951	3,883	8,254	9,000	18,206
<b>Indirect</b>	5,451	8,794	13,320	21,137	18,771	29,931
<b>Induced</b>	4,783	7,714	9,154	14,554	13,937	22,269
<b>Total Employment</b>	<b>21,608</b>	<b>32,716</b>	<b>36,786</b>	<b>54,374</b>	<b>58,394</b>	<b>87,092</b>
<b>Trains 1, 2, 3 and 4</b>						
	<b>BC</b>		<b>Other Canada</b>		<b>Total Canada</b>	
	<b>Low Cost (PYs)</b>	<b>High Cost (PYs)</b>	<b>Low Cost (PYs)</b>	<b>High Cost (PYs)</b>	<b>Low Cost (PYs)</b>	<b>High Cost (PYs)</b>
<b>Direct*</b>	10,950		18,250		29,200	
<b>Other Direct**</b>	8,955	17,415	6,795	14,445	15,750	31,860
<b>Indirect</b>	9,540	15,390	23,310	36,990	32,850	52,380
<b>Induced</b>	8,370	13,500	16,020	25,470	24,390	38,970
<b>Total Employment</b>	<b>37,815</b>	<b>57,255</b>	<b>64,375</b>	<b>95,155</b>	<b>102,190</b>	<b>152,410</b>

\*Proponent estimate

\*\*Other direct employment is based on SCIPOM estimated of workers involved in supply of goods and services directly to the Project less the direct workforce estimate.

### *Economic Benefits from Project Operations*

The LNG facility is expected to operate for more than 25 years starting in 2021. During operations the Proponent estimates that the BC workforce would be between 450 and 800 people (see Table 2-4). The table summarizes the estimated direct, indirect and induced employment that would occur in BC and other Canadian provinces, from the proposed Project during operations.

**Table 2-4: BC and Canada Estimated Employment during Operation**

Trains 1 and 2						
	BC		Other Canada		Total	
	Low Estimate (FTE jobs)	High Estimate (FTE jobs)	Low Estimate (FTE jobs)	High Estimate (FTE jobs)	Low Estimate (FTE jobs)	High Estimate (FTE jobs)
Direct	350	550			350	550
Other Direct	0	39	64	116	64	155
Indirect	5,402	7,631	4,194	5,965	9,596	13,596
Induced	1,779	2,557	2,034	2,866	3,813	5,384
<b>Total</b>	<b>7,531</b>	<b>10,777</b>	<b>6,292</b>	<b>8,947</b>	<b>13,823</b>	<b>19,685</b>
Trains 1, 2, 3 and 4						
	BC		Other Canada		Total	
	Low Estimate (FTE jobs)	High Estimate (FTE jobs)	Low Estimate (FTE jobs)	High Estimate (FTE jobs)	Low Estimate (FTE jobs)	High Estimate (FTE jobs)
Direct	450	800			450	800
Other Direct	64	310	127	232	191	542
Indirect	10,804	15,262	8,389	11,931	19,192	27,193
Induced	3,559	5,113	4,067	5,733	7,626	10,769
<b>Total</b>	<b>14,427</b>	<b>20,685</b>	<b>12,583</b>	<b>17,896</b>	<b>27,009</b>	<b>38,504</b>

\*Proponent estimate

\*\*Other direct employment is based on SCIPOM estimated of workers involved in supply of goods and services directly to the Project less the direct workforce estimate

\*\*\*Includes employment associated with natural gas development and extraction

The Proponent estimates that at full build-out, the proposed Project would generate between \$126 million and \$175 million per year in carbon taxes and between \$57 million and \$77 million in Provincial Sales Tax. At full build out, annual municipal and regional government revenues are estimated at \$15 million. Table 2-5 provides a breakdown of the economic benefits from the proposed Project during operation.

**Table 2-5: Summary of Annual Project Benefits from Project Operations**

Summary of Annual Operations Spending within Canada				
	Trains 1 and 2		Trains 1, 2, 3 and 4	
	Low Cost (\$ millions)	High Cost (\$ million)	Low Cost (\$ millions)	High Cost (\$ million)
Labour	63	92	126	183
Natural gas	2,979	4,216	5,959	8,432
Goods and services	211	304	422	608
<b>Total</b>	<b>3,254</b>	<b>4,611</b>	<b>6,507</b>	<b>9,222</b>
Summary Annual Contributions of Project Operations to Government*				
	Trains 1 and 2		Trains 1, 2, 3 and 4	
	Low Cost (\$ millions)	High Cost (\$ million)	Low Cost (\$ millions)	High Cost (\$ million)
<b>Municipal Regional**</b>	<b>12</b>	<b>12</b>	<b>15</b>	<b>15</b>
Provincial (BC)				
PST	28	38	57	77
Carbon Tax	63	88	126	175
Other***	15	20	30	40
<b>Total Provincial</b>	<b>102</b>	<b>146</b>	<b>205</b>	<b>292</b>
<b>Federal</b>	<b>17</b>	<b>28</b>	<b>35</b>	<b>56</b>

\*Excludes effects on government revenue for indirect and induced activities as these primarily result from the extraction and transmission of natural gas

\*\*Assumes municipal/regional taxes for trains 1 and 2 only is 80% of full-build out

\*\*\*Includes personal income taxes paid by direct employees and miscellaneous other taxes; excludes corporate income taxes

### *Project Contributions to Business Development*

The proposed Project is expected to create procurement opportunities for businesses. At full build-out, spending on goods and services during construction in Canada is projected to range from \$6.2 billion to \$9.9 billion (see Table 2-6). In BC, spending on construction goods and services is projected to range from \$2.5 billion to \$3.9 billion. Additionally, BC companies would be commissioned to provide professional engineering services, transportation and camp services.

**Table 2-6: Summary of Types of Construction Spending in Canada**

Types of Construction Spending within Canada				
	Trains 1 and 2		Trains 1, 2, 3 and 4	
	Low Cost (\$ millions)	High Cost (\$ million)	Low Cost (\$ millions)	High Cost (\$ million)
Direct Labour	1,170	1,820	2,040	3,180
Services	1,870	2,980	3,280	5,220
Goods	1,650	2,650	2,880	4,640



<b>Types of Construction Spending within Canada</b>				
Other Expenditures	630	1,030	1,110	1,800
Overhead	650	1,040	1,130	1,820
<b>Total</b>	<b>5,970</b>	<b>9,520</b>	<b>10,440</b>	<b>16,660</b>

During operation, annual spending on labour, goods and services (other than natural gas) is expected range from \$548 million to \$791 million, of which approximately 80% would be spent in BC. Purchased utilities and repair and maintenance are the two largest costs associated with operation.

### 2.3.3 Community and Social Benefits of Proposed Project

Social and economic benefits are expected for local and Aboriginal communities, such as training and education and employment opportunities for unemployed and underemployed individuals, and increased availability of funds for government programs. Socio-economic benefits for Aboriginal Groups are discussed in greater detail in Part C of this Report.

## 2.4 Applicable Permits

In addition to provincial and federal EA approvals, the proposed Project would need various permits and authorizations from federal, provincial, and local governments.

### 2.4.1 Federal Regulatory Environment

The Proponent anticipates that the following key federal permits, approvals and authorizations would be required:

- Authorization to carry on a proposed work, undertaking or activity causing serious harm to fish under subsection 35(2)(b) of the *Fisheries Act*;
- Permit for disposal at sea under subsection 127(1) of the *Canadian Environmental Protection Act, 1999*;
- Approval under subsection 5(1) of the *Navigation Protection Act* for works in and about navigable water;
- Export licence under section 117 of the *National Energy Board Act*, which was issued on February 28, 2013;
- Potential approved Facility Security Plan under the Marine Transportation Security Regulations;
- Obstruction Clearance Permit(s) under the Canadian Aviation Regulations of the *Aeronautics Act* for any flare towers or construction equipment that may require marking and/or lighting during construction or operation of the facility; and
- Notice of Railway Works under the *Railway Safety Act* for trackage construction that falls under federal jurisdiction.

## 2.4.2 Provincial Permits

The primary regulator for construction and operation of an LNG facility in BC is the Oil and Gas Commission (OGC), pursuant to the *Oil and Gas Activities Act* (OGAA) and the LNG Facility Regulation. The OGC is an independent, single-window regulatory agency responsible for overseeing oil and gas operations in BC. Regulatory responsibility is delegated to OGC through the OGAA and includes specified enactments under the *Forest Act*, *Heritage Conservation Act*, *Land Act*, *Environmental Management Act*, and *Water Act*.

Provincial permits, approvals, and authorizations that would be required include the following:

- Permit for construction and operation of the LNG facility under OGAA;
- 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*;
- 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*, and
- Permit with regard to activities that may cause health hazards under section 19 of the *Public Health Act*.

The Proponent is pursuing a synchronous permitting process for provincial permits and approvals, as per the MOU between EAO and OGC, signed in October 2013. Synchronous permitting is a flexible approach that provides proponents with the opportunity have both EA and permitting processes proceed in tandem.

## 2.4.3 Municipal Permits and Approvals

The Application stated that the Proponent would also adhere to the District of Kitimat Official Community Plan (OCP) and zoning amendment applications, building permits and inspections, and the application of provincial Building Code and Municipal Inspection Services.

### 3 Assessment Process

#### 3.1 Overview and Scope of the Environmental Assessment

EAO determined that the proposed Project was reviewable pursuant to Part 4 (Electricity Projects), Part 4 (Petroleum and Natural Gas Projects) and Part 8 (Marine Port Facilities – other than Ferry Terminals) of the Reviewable Projects Regulation because the proposed Project would:

- Generate at least 50 MW of electrical power;
- Have the capability to store energy resources in a quantity that can yield by combustion  $\geq 3$  PJ of energy;
- Have the design capacity to process natural gas at rate greater than 5.634 million m<sup>3</sup>/day; and
- Consist of a new marine port facility, the construction of which entails dredging, filling or other direct physical disturbance of  $\geq 2$  ha of foreshore or submerged land, or a combination of foreshore and submerged land, below the natural boundary of a marine coastline or marine estuary.

The federal Minister of the Environment announced on May 21, 2013 that an EA would be required for the proposed Project. On the same date, the federal Minister of the Environment approved EAO's application to substitute the provincial EA process for the federal process in accordance with the *Memorandum of Understanding on Substitution of Environmental Assessments* (2013). Through an Order issued under section 11 of the *Act*, the scope of the assessment was required take into account the factors identified under subsection 19(1) of CEAA 2012, including, but not limited to, any environmental effects as defined by section 5 of that Act.

This Report and EAO's Aboriginal Consultation Report (in Part C of this Report) were provided to the responsible provincial Ministers for consideration in their decision of whether or not to issue an EA Certificate for the proposed Project, and submitted to the Agency for the purposes of informing the federal Minister of the Environment's decisions under CEAA 2012.

#### 3.2 Major Milestones of the Environmental Assessment

**April 2, 2013:** CEAA invited public comment on the proposed Project, its potential effects on the environment, and the BC Government's request that the BC EA process be a substitute for the CEAA 2012 (if it was determined that a federal EA was required). <http://www.ceaa-acee.gc.ca/050/document-eng.cfm?document=87568>

**April 3, 2013:** EAO issued an Order under section 10 of the *Act* to start the provincial EA. [http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic\\_document\\_398\\_35482.html](http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_document_398_35482.html)

**May 21, 2013:** The federal Minister of the Environment granted substitution of the proposed Project. <http://www.ceaa-acee.gc.ca/050/document-eng.cfm?document=89389>

**May 21, 2013:** CEAA posted the Notice of Commencement of an Environmental Assessment and Substitution Determination <http://www.ceaa-acee.gc.ca/050/document-eng.cfm?document=89388>

**June 6, 2013:** EAO issued an Order under section 11 of the Act, which set the scope, procedures and methods of the EA. [http://a100.gov.bc.ca/appsdata/epic/documents/p398/1370559526777\\_767d528233a72dec820ee92e2b7fd0fb1faab5c81b80925e9b745df1d09cf1df.pdf](http://a100.gov.bc.ca/appsdata/epic/documents/p398/1370559526777_767d528233a72dec820ee92e2b7fd0fb1faab5c81b80925e9b745df1d09cf1df.pdf)

**August 7, 2013:** EAO issued an Order under section 13, which clarified that consultation activities with Métis groups listed on Schedule D of the Section 11 Order. [http://a100.gov.bc.ca/appsdata/epic/documents/p398/1375912604609\\_c9885dcc6170b17d07bd12bad8cad5674ab8769634e9dba5e68114bdcf4cb768.pdf](http://a100.gov.bc.ca/appsdata/epic/documents/p398/1375912604609_c9885dcc6170b17d07bd12bad8cad5674ab8769634e9dba5e68114bdcf4cb768.pdf)

**November 13, 2013:** EAO initiated a 30-day public comment period on the draft Application Information Requirements (AIR). [http://a100.gov.bc.ca/appsdata/epic/documents/p398/1383767982180\\_28030e3d0504421e11ded2d3aa665b6ea15db31892e06b093c4d4dbfaa5efabb.pdf](http://a100.gov.bc.ca/appsdata/epic/documents/p398/1383767982180_28030e3d0504421e11ded2d3aa665b6ea15db31892e06b093c4d4dbfaa5efabb.pdf)

**February 24, 2014:** EAO issued the final AIR. [http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic\\_document\\_398\\_37266.html](http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_document_398_37266.html)

**September 18, 2014:** The Proponent submitted an Application for an EA Certificate for the proposed Project. From September 18, 2014 to October 20, 2014, EAO evaluated the Application against the AIR, and determined that the Application met the AIR. [http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic\\_document\\_398\\_38056.html](http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_document_398_38056.html)

**November 7, 2014:** The Proponent submitted the copies of the Application and the 180-day Application Review period began. [http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic\\_project\\_doc\\_list\\_398\\_r\\_app.html](http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_project_doc_list_398_r_app.html)

**November 7, 2014:** EAO initiated a 45-day comment period on the Application. [http://a100.gov.bc.ca/appsdata/epic/documents/p398/1414697205537\\_NL0IJSQbPG8fSkBL6LF6GI2P6qqdn0nhd5XpCBLLYt1GTtTFQKsN!-351597226!1414696987807.pdf](http://a100.gov.bc.ca/appsdata/epic/documents/p398/1414697205537_NL0IJSQbPG8fSkBL6LF6GI2P6qqdn0nhd5XpCBLLYt1GTtTFQKsN!-351597226!1414696987807.pdf)

**May 6, 2015:** EAO referred the proposed Project to provincial Ministers for decision and provided the referral package to the Agency for the federal decision.

### 3.3 Role of the Advisory Working Group

The advisory Working Group was established by EAO, made up of federal, provincial and local government staff with the mandates and skill sets relevant to the review of the

proposed Project, as well as representatives of potentially affected Aboriginal Groups listed on Schedules B and C of the Section 11 Order. See list of Working Group members in Appendix 2.

EAO sought and considered advice from the Working Group in order to understand and assess the potential adverse effects associated with the proposed Project. Working Group members were responsible for providing timely advice to EAO on:

- Key EA documents, including, but not limited to, the selection of VCs, AIR, Application and EAO's Assessment Report;
- Government policy direction and/or gaps that could affect the conduct of the EA;
- Potential conflicts with the legislation and/or regulations of their organizations;
- EA Information requirements as compared with permitting design and information requirements; and
- Technical issues raised by the public during the public consultation process.

The following federal departments with specialist information or expert knowledge relevant to the Project participated in the evaluation and the review of the Proponent's Application:

- The Agency provided guidance and information directly to EAO regarding the substituted process and federal EA requirements under CEAA 2012, but did not participate in the Working Group;
- Environment Canada (EC) provided comments and information related to their regulatory and statutory responsibilities within the themes of vegetation resources, wildlife resources, surface water quality, disposal at sea, marine resources, human health, cumulative effects, air quality, greenhouse gas (GHG) management, accidents and malfunctions and Aboriginal interests;
- Fisheries and Oceans Canada (DFO) provided comments and information related to their regulatory and statutory responsibilities within the themes of freshwater and estuarine fish and fish habitat, marine resources and disposal at sea;
- Health Canada (HC) provided advice and information related to their regulatory and statutory responsibilities in regard to human health;
- Natural Resources Canada (NRCan) provided advice and information related to their expertise in seismicity, marine geohazards, and sediment dispersion modelling; and
- Transport Canada (TC) provided comments and information related to their regulatory and statutory responsibilities within the themes of marine transportation and use, accidents and malfunctions, Aboriginal Interests, cumulative effects and disposal at sea.

EAO reviewed the adequacy of the Proponent's responses to all comments received from Working Group members,<sup>2</sup> and held various meetings with Working Group members to discuss outstanding issues and concerns. In development of its Assessment Report and recommended conditions, EAO considered all comments and issues raised during the EA.

### 3.4 Aboriginal Group Consultation

On June 6, 2013 EAO issued a Section 11 Order that specified the consultation activities that both EAO and the Proponent would undertake with all Aboriginal Groups potentially affected by the proposed Project. In accordance with the *Memorandum of Understanding on Substitution of Environmental Assessments* (2013), EAO also ensured that consultation was carried out in a manner consistent with Canada's determination of the scope and content of consultation.

Aboriginal Groups on Schedule B and C of the Order were provided the following opportunities:

- Participate as members of the Working Group;
- Discuss their Aboriginal Interests in relation to the proposed Project and measures to avoid, mitigate, or otherwise manage potential adverse impacts on Aboriginal Interests, as appropriate;
- Identify their respective Aboriginal Interests that may be adversely affected by the proposed Project;
- Review and comment on key documents, including draft AIR, the Proponent's Application for an EAC, and EAO's draft proposed conditions and Assessment Report, including Aboriginal Consultation Report;
- Determine the adequacy of the Proponent's responses to the comments received from such Aboriginal Groups; and
- Submit a document outlining their views on the Assessment Report to be included in the package of materials sent to Ministers when the proposed Project is referred for decision.

The following Aboriginal Groups are identified on Schedules B and C of the Section 11 Order for the proposed Project:

- Haisla Nation
- Gitga'at First Nation
- Kitselas First Nation
- Kistumkalum First Nation
- Gitxaala Nation

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<sup>2</sup> dAIR tracking table: [http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic\\_document\\_398\\_37268.html](http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_document_398_37268.html);

Application tracking table:

[http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic\\_document\\_398\\_38982.html](http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_document_398_38982.html)

- Lax Kw'alaams Band
- Metlakatla First Nation

In accordance with the *Memorandum of Understanding on Substitution of Environmental Assessments (2013)*, the Section 13 Order issued August 7, 2013, required that the Métis be included on Schedule D and consulted on behalf of the Government of Canada. As described in the Section 11 Order for Aboriginal Groups, the Métis were provided the following:

- Notification about key milestones of the proposed Project, including, but not limited to, the issuance of the AIR, the acceptance of the Application to EAO for review, the timing of public comment periods, including open houses, referral of the final Assessment Report to Ministers, and the decision of the Ministers;
- Offers to meet and consider information regarding Aboriginal Interests in the proposed Project area; and
- A draft of the Assessment Report with an opportunity to provide comments within established timelines.

Further detail regarding consultation with Aboriginal Groups is provided in Part C of this Report.

#### 3.4.1 Ensuring the Crown's Duties to Consult and Accommodate Aboriginal Groups

EAO is required to ensure that the honour of the Crown is discharged by ensuring appropriate consultation and accommodation of potential impacts of the proposed Project on the exercise of Treaty rights, proven Aboriginal rights, and asserted Aboriginal rights and title (Aboriginal Interests) in respect of the decision by Ministers as to whether to issue an EAC. In accordance with the *Memorandum of Understanding on Substitution of Environmental Assessments (2013)*, on substituted projects, EAO is also required to ensure that consultation is carried out in a manner consistent with Canada's determination of the scope and content of consultation. Aboriginal Groups' comments and interests in terms of consultation and specific consideration of the Crown's duty to consult and accommodate Aboriginal Interests are specifically factored into the analysis in Part C of this Report.

There is often considerable overlap between the interests of Aboriginal Groups and the assessment of environmental, economic, social, heritage and health effects. Aboriginal Group's comments and interests that directly relate to the environmental, economic, social, heritage and health assessments are discussed in Part B of this Report.

#### 3.4.2 Funds Distributed by EAO to Assist Aboriginal Participation and Consultation

EAO distributed provincial funding to assist Aboriginal Groups to participate in the EAO process. Additionally, under the *Memorandum of Understanding on Substitution of Environmental Assessments (2013)*, CEAA provided funding to support potentially affected Aboriginal Groups' participation in the substituted EA. Refer to Part C of this Report for additional details regarding funding.

### 3.5 Public Consultation

Public consultation requirements are set out in the Section 11 Order, and are intended to provide multiple opportunities for the public to provide input. Shortly after the issuance of the Section 11 Order, the Proponent was required to prepare a Public Consultation Plan. The plan laid out the Proponent's consultation objectives and activities. Through the course of the EA, the Proponent submitted multiple Public Consultation Reports to EAO. The first Public Consultation Report was submitted during the Pre-Application stage, the second was submitted with the Application, and the third was submitted near the end of Application Review. The Public Consultation Plan and all public consultation reports are posted on EAO's project website.<sup>3</sup>

#### 3.5.1 Summary of Proponent Activities

Following is a summary of the public consultation activities carried out by the Proponent during the EA process:

- Opened a Community Information Centre and employed a Community Liaison Officer in Kitimat;
- Launched a Project website;
- Distributed newsletters by email and door-to-door;
- Placed multiple newspaper advertisements and issued news releases at key phases during project development and the assessment process;
- Developed Project fact sheets with a focus on jobs and skills training;
- Produced Project-related informational videos;
- Held 121 stakeholder meetings with representatives of environmental, economic and community-based organizations;
- Collaboratively established a Community Commitment, a document that addresses how LNG Canada intends to operate in and contribute to the local community;
- Provided representatives from communities and Aboriginal Groups an opportunity to tour an operational LNG processing facility in Oman, Jordan;
- Established a Community Advisory Group;
- Participated in multiple community events and meetings; and
- Engaged with three local governments, 22 community organizations and service providers, three economic development organizations, seven educational stakeholders, 10 environmental stakeholders, six first responders, one heritage and cultural stakeholder, eight marine users groups, and four recreation groups.

Through public engagement during the course of the EA, the Proponent has demonstrated to EAO a good understanding of and responsiveness to public interests.

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<sup>3</sup> [http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic\\_project\\_home\\_398.html](http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_project_home_398.html)



### 3.5.2 Summary of EAO Activities

EAO hosted the following two public comment periods and four open houses over the span of the EA:

- The 30-day public comment period on the draft AIR was held from November 13, 2013 to December 13, 2013 and 41 public comment submissions were made. Public open houses were held in Kitimat on November 27, 2013 and in Terrace on November 28, 2013. In total, approximately 110 people attended these open houses.
- The 45-day public comment period on the Proponent's Application was held from November 7, 2014 to December 22, 2014 and 52 public comment submissions were made. Public open houses were held in Kitimat on November 25, 2014 and in Terrace on November 26, 2014. In total, approximately 110 people attended.

The key issues raised by the public through the submitted public comments included the following:

- **Marine resources, including marine mammals** – Questions regarding the potential change in behaviour of fish and marine mammals due to underwater noise, and request for further studies and information on critical marine mammal habitat. Questions regarding monitoring of mitigations such as vessel speeds and interaction with marine mammals as well as the safety zones.
- **Marine transportation and use** – Questions regarding the use of tug escorts and marine pilots for safe navigation through the Douglas Channel, including training and availability of marine pilots. Questions and concerns regarding plans for marine communications, shipping schedules, wake effects and effects of poor weather on vessel speeds.
- **LNG production and export** – Questions and comments regarding the liquefaction process, electricity requirements and selection, storage and export of by-products, and financial viability of the LNG industry in BC, potential environmental impacts of upstream gas production and associated pipelines
- **Air quality and greenhouse gas emissions** – Concerns about emissions from the proposed Project and potential effects on the local airshed, human health, and climate change. Requests for additional information about mitigation measures and long-term monitoring and consideration for use of alternative/ low emission vehicles and consideration for use of alternative power.
- **Community Wellbeing** – Concerns related to the potential impacts to community health and well-being and the population influx and increased pressure on community infrastructure and services
- **Local benefits** – Interest regarding jobs, skills training and procurement opportunities, noting the importance of ensuring procedures for maximizing local involvement in benefits
- **Emergency response** – Questions and comments regarding the procedures in the event of an accident or malfunction, particularly in the marine environment
- **Public access** – Concerns regarding access to waterfront for emergency response, recreational activities and fishing

- **Environmental and social management plans** – Comments noting desire for additional information on scope and timing of development of certain plans.
- **Water usage and management** – Comments regarding the extraction of water from the Kitimat River and the potential effects on freshwater species, the estuary, variation in Kitimat River water flow, and discharge of waste water into the marine environment.

These comments were addressed in the Application, and through the Application Review period. Public comments from both public comment periods and the Proponent's responses are posted on the EAO's website.<sup>4</sup>

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<sup>4</sup> Public comments on the draft AIR and the Proponent's responses:  
[http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic\\_document\\_398\\_37269.html](http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_document_398_37269.html)  
Public comments on the Application and the Proponent's responses:  
[http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic\\_document\\_398\\_38813.html](http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_document_398_38813.html)

## PART B – ASSESSMENT OF POTENTIAL ADVERSE EFFECTS

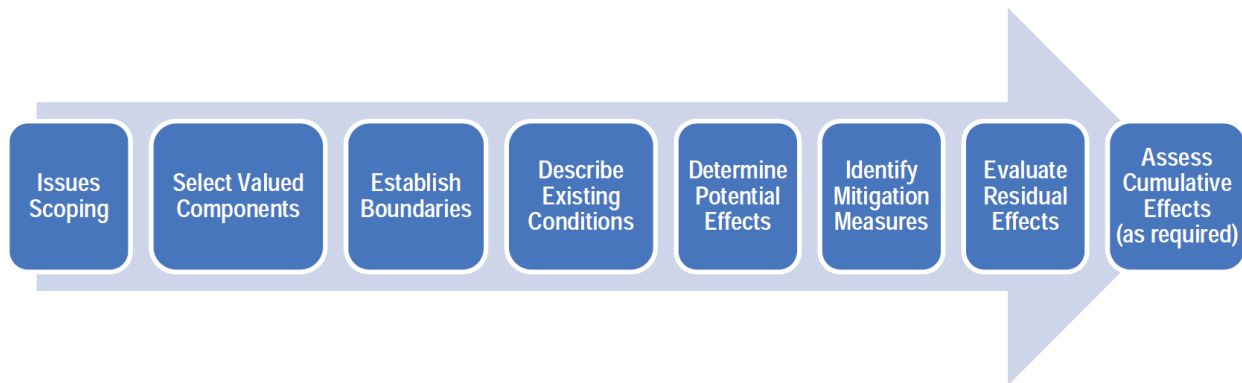
### 4 Assessment Methodology and Overview of Potential Effects

#### 4.1 General

##### 4.1.1 Environmental Assessment Methods

In this Report, EAO assesses whether the proposed Project is likely to have significant adverse environmental, economic, social, heritage and health effects, including cumulative effects, having regard for the mitigation measures proposed in the Application or otherwise developed through the provincial and federal EA processes, in addition to conditions proposed by EAO.

To conduct this assessment, EAO followed the methods outlined in its *Guideline for the Assessment of Valued Components and Assessment of Potential Effects* (2013). This section provides a brief summary of the methodology followed.<sup>5</sup> The general steps in EAO's EA process are shown in Figure 4-1.



**Figure 4-1: EAO's Environmental Assessment Methods**

EA in BC uses a values-based framework to promote a comprehensive, yet focused, understandable, and accessible assessment of the potential effects of proposed projects. This framework relies on the use of VCs as a foundation for the assessment. VCs are components of the natural and human environment that are considered by the Proponent, public, Aboriginal Groups, scientists and other technical specialists, and government agencies involved in the assessment process to have scientific, ecological, economic, social, cultural, archaeological, historical or other importance.

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<sup>5</sup> The *Guideline for the Assessment of Valued Components and Assessment of Potential Effects* is available at [http://www.eao.gov.bc.ca/pdf/EAO\\_Valued\\_Components\\_Guideline\\_2013\\_09\\_09.pdf](http://www.eao.gov.bc.ca/pdf/EAO_Valued_Components_Guideline_2013_09_09.pdf).

Appropriate VCs are identified and selected during the Pre-Application phase of the EA. Ultimately, the VCs required to be in the Application are established by EAO upon issuance of the AIR. Much of the early part of the Pre-Application phase is focused on consultation on the VCs, key indicators, study area boundaries and technical requirements with Working Group members, including Aboriginal Groups and the public.

#### 4.1.2 Study Boundaries

Assessment boundaries serve to define the scope or limits of the assessment. They encompass the areas within and times during which the Project is expected to interact with the VCs (spatial and temporal boundaries). These boundaries are discussed in the Application for each VC.

Spatial boundaries encompass the areas within which the proposed Project is expected to have potential effects on the selected VCs. The study areas generally include the:

- Project footprint – the area directly disturbed by the proposed Project’s physical works and activities;
- Local Study Area (LSA) – varies by VC, and is based on the zone of influence within which the VC is most likely to be affected by the proposed Project construction and operations; and
- Regional Study Area (RSA) – provides context for the assessment of potential project effects, and is typically based on a natural transition (e.g., watershed boundary, ecological zone) or on an artificial delineation (e.g., political or economic district or zone) that is relevant to the VC. The RSA is often, but not always, used as the spatial boundary for the assessment of potential cumulative effects.

Temporal boundaries encompass the periods during which the Project is expected to have potential effects on the selected VCs. The temporal phases discussed under each VC are construction and operation, and the duration of effect is assessed as the length of time it would persist.

#### 4.1.3 Assessment of Valued Components

For each selected VC, the Application describes the existing conditions within the study area in sufficient detail to enable potential Project-VC interactions to be identified, understood and assessed. The description of existing conditions includes, as relevant, natural and/or human-caused trends that may alter the environmental or socio-economic setting irrespective of the changes that may be caused by the proposed Project or other projects and activities in the local area.

The assessment then considers the potential interactions of the proposed Project with the VC, and the potential effects that could arise. These potential effects are identified and described, and an analysis is presented of the potential adverse effects resulting from the proposed Project.

The assessment then describes the mitigation measures that would be incorporated into the Project, including site and route selection, project scheduling, project design, and construction and operation procedures and practices. Consistent with the Ministry of Environment's (MOE) Environmental Mitigation Policy and Procedures, EAO considers mitigation to be any practical means or measures taken to avoid, minimize, restore on-site, compensate or offset potential adverse effects. Also described are standard mitigation, best management practices (BMP), environmental management plans (EMP), contingency plans, emergency response plans (ERP), and other practices proposed to be implemented.

The residual effects on each VC are then identified. Residual effects are those effects remaining after the implementation of all mitigation measures, and are, therefore, the expected consequences of the proposed Project for the selected VCs. To inform the determination of the significance of a residual (adverse) effect, it is necessary to characterize the residual effect.

Residual effects are usually described using standard criteria: context, magnitude, extent, duration, reversibility and frequency. These criteria, as well as likelihood, are summarized in the following box.

#### ***Summary of Criteria for Characterizing Residual Effects***

**Context** refers primarily to the current and future sensitivity and resilience of the VCs to change caused by the Project. Consideration of context draws heavily on the description of existing conditions of the VC, which reflect cumulative effects of other projects, and activities that have been carried out, and especially information about the impact of natural and human-caused trends in the condition of the VC.

**Magnitude** refers to the expected size or severity of the residual effect. When evaluating magnitude of residual effects, consider the proportion of the VC affected within the spatial boundaries and the relative effect (e.g., relative to natural annual variation in the magnitude of the VC or other relevant characteristic).

**Extent** refers to the spatial scale over which the residual effect is expected to occur.

**Duration** refers to the length of time the residual effect persists (which may be longer than the duration of the physical work or activity that gave rise to the residual effect).

**Reversibility** pertains to whether or not the residual effect on the VC can be reversed once the physical work or activity causing the disturbance ceases.

**Frequency** refers to how often the residual effect occurs and is usually closely related to the frequency of the physical work or activity causing the residual effect.

**Likelihood** refers to whether or not a residual effect is likely to occur. It may be influenced by a variety of factors, such as the likelihood of a causal disturbance, occurring or the likelihood of mitigation being successful. Generally speaking, the residual effects described in the assessment comprise the best prediction of what is likely to occur as a result of a proposed Project, assuming a suite of proposed mitigation is implemented.

The identification of significant adverse residual effects is a requirement of the Act. When determining significance for each VC, consideration should be given to how each of the criteria for characterizing residual effects informs the determination of significance. Significance may be determined based on a quantitative or qualitative threshold that describes the point beyond which a residual effect would be considered significant. In some instances, thresholds established for some VCs by legislation, regulation, or regulatory standard are used.

Once the residual effect prediction has been described in terms of significance and likelihood, it is important to explain the level of confidence in each prediction. The level of confidence, typically based on expert judgement, characterizes the level of uncertainty associated with both the significance and likelihood determinations. Specifying the level of confidence associated with these determinations allows the decision-maker to better evaluate the risk associated with the proposed Project. The assessment of confidence also informs the need for and scope of monitoring or other follow-up programs, including adaptive management.

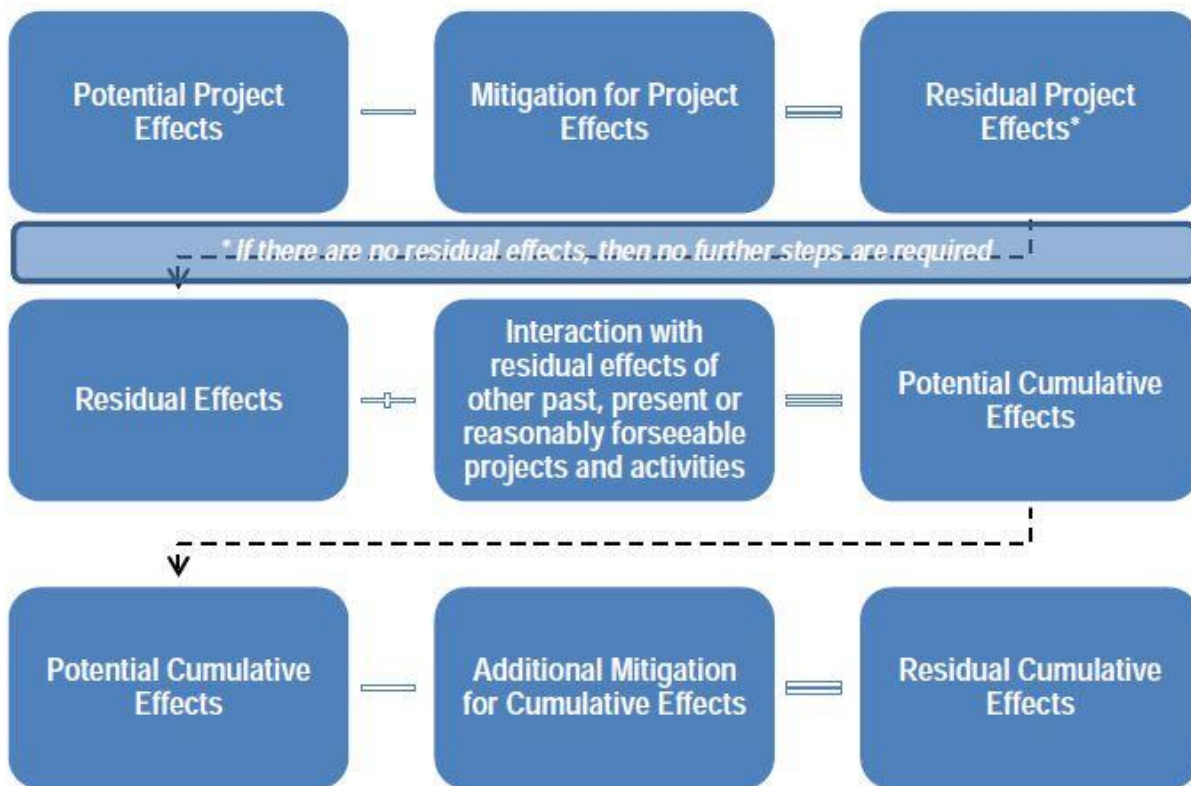
Significance is usually determined for both the residual effects of the proposed Project and the cumulative effects. This is critical for making an informed decision about the proposed Project. It is important to understand the characteristics and significance of the potential project-specific residual effects in order to also understand the relative contribution of the proposed Project to cumulative effects. The cumulative effects assessment is discussed further below.

#### 4.1.4 Cumulative Effects Assessment

If the proposed Project is expected to result in any residual adverse effects on the selected VC, the need for a cumulative effects assessment must be considered. It is important to note that this consideration must be made for all residual adverse effects, not only for those predicted to be significant.

Where there is a residual adverse effect, the assessment of cumulative effects for reviewable projects should consider other past, present and reasonably foreseeable projects and activities, which were identified in the AIR. Any cumulative effects that are likely to result from the proposed Project in combination with other physical activities that have been or will be carried out were considered as part of the assessment, consistent with paragraph 19(1)(a) of CEAA 2012.

The general steps for a cumulative effects assessment are shown in Figure 4-2. The likelihood of a cumulative interaction with other projects and activities, and the proposed Project's contribution to the overall cumulative effect, should together inform the cumulative effects assessment undertaken.



**Figure 4-2: Steps to Determine Residual Effects and Cumulative Effects**

EAO evaluates cumulative effects by considering how the proposed Project’s residual effects interact with the residual effects of other past, present and reasonably foreseeable projects and/or activities included in the Proponent’s cumulative effects assessment, as described in Application Table 4.5-1. These projects and activities are discussed where relevant under the cumulative effects section for each VC in this report.

#### 4.1.5 Environmental Assessment Certificate Documentation

If an EAC is issued, it would include a Certified Project Description (CPD) and Table of Conditions (TOC).

The CPD describes what is certified by an EAC. It consists primarily of a description of the infrastructure of the proposed Project, and describes all essential elements of the Project proposed by the Proponent, taking into account any changes to the proposed Project that occurred during the EA. If an EAC is issued for the proposed Project and the Proponent subsequently proposes to vary from the CPD, an amendment to the EAC would be required.

If the Ministers decide to issue an EAC, they may attach legally binding conditions to it under section 17(3)(c)(i) of the Act. A condition is a legally binding requirement set by

Ministers to which a holder of an EAC must adhere. A set of proposed conditions is provided to Ministers as part of the referral package. As part of their decision regarding whether or not to grant an EAC, Ministers determine which conditions would be attached to the EAC.

If the federal Minister of the Environment determines that the proposed Project is not likely to cause significance adverse environmental effects or the Governor in Council decides that the significant adverse effects are justified in the circumstances, the Minister of the Environment must establish conditions, including mitigation measures and follow-up program requirements, in relation to the environmental effects referred to in subsections 5(1) and 5(2) of CEAA 2012 with which the Proponent must comply, consistent with section 53 of CEAA 2012.

#### 4.1.6 Compliance and Enforcement

EAO has a Compliance and Enforcement Program (C&E Program), whose primary responsibility is compliance oversight and enforcement of EAC conditions on all projects subject to the Act in BC.

The C&E Program builds on the expertise and resources of other agencies, including the Compliance and Enforcement Branch of the Ministry of Forests, Lands and Natural Resource Operations (FLNR), Ministry of Energy and Mines (MEM), OGC, Conservation Officer Service, and the Environmental Protection Division of MOE.

EAO conducts extensive planning to ensure effective, risk-based compliance oversight. The two key plans prepared by EAO compliance staff are:

- Compliance Management Plans (CMPs) – After a project has been certified, EAO compliance staff prepare a CMP in collaboration with partner agencies. The CMP outlines the general approach to compliance oversight for the Project and clarifies inter-agency responsibilities for inspecting and enforcing the EAC conditions. This plan is updated as the Project progresses.
- Annual Inspection Plans – Each fiscal year, EAO plans its administrative (e.g., desk-based) and field-based inspections for the year in keeping with risk-based criteria developed by EAO and the targets specified in MOE's Service Plan. Unplanned inspections are also conducted in response to new information received by EAO, public and Aboriginal Group complaints or in follow-up to previous inspections.

When information from an inspection, EAC holder self-report, public or Aboriginal Group complaint or partner agency indicates that a certificate requirement may have been breached, EAO compliance staff conduct an investigation to collect the evidence necessary to determine if enforcement action is warranted. Investigations vary in effort and length of time depending on the nature and complexity of the non-compliance. Often, partner agencies are involved in the investigations.



Throughout the life of a project, EAO and compliance partners collaborate to ensure the Project is constructed and operated according to the EAC. The Agency would be responsible for compliance and enforcement activities with respect to a decision statement issued under CEAA 2012.

## **5 Assessment of Environmental Effects**

### **5.1 Air Quality**

#### **5.1.1 Background**

Air quality was selected as a VC because it is inherently important to the health and well-being of humans, wildlife and vegetation. The atmosphere is a major pathway by which contaminants can be transported to receptors in the terrestrial, aquatic and human environments.

The assessment considered the potential effects of the proposed Project on air quality in the Kitimat airshed, and focussed on the following measureable parameters:

- Sulphur dioxide (SO<sub>2</sub>);
- Nitrogen oxides (NO<sub>x</sub>);
- Carbon monoxide (CO);
- Respirable particulate matter (PM<sub>2.5</sub>);
- Hydrogen sulphide (H<sub>2</sub>S); and
- Volatile organic compounds (VOCs).

Nitrogen oxides (NO<sub>x</sub>) are produced in most combustion processes and consist almost entirely of nitrogen dioxide (NO<sub>2</sub>) and nitric oxide (NO). SO<sub>2</sub> is produced during combustion by the oxidation of sulphur-containing compounds and can have adverse effects on plant and animal health, particularly on respiratory systems. SO<sub>2</sub> can also further oxidize and combine with water to form the sulphuric acid component of acid rain. Acid rain can have acidification effects on freshwater and soils and can adversely affect vegetation.

Ozone (O<sub>3</sub>) was originally identified as a potential concern. The proposed Project is not expected to produce ozone directly, but it would generate emissions of precursor substances such as NO<sub>2</sub> and VOCs that could contribute to the formation of photochemical ozone in the presence of sunlight. In 2013, the Proponent completed an analysis and concluded that the incremental addition of precursor emissions from the proposed Project is unlikely to cause enhanced ozone production in the Kitimat region. Therefore, further analysis of ozone was not warranted.

The above listed parameters (with the exception of VOCs<sup>6</sup>) are considered criteria air contaminants (CACs), and have the following applicable criteria:

- BC Ambient Air Quality Objectives (BC AAQO);
- National Ambient Air Quality Objectives (NAAQO); and
- Canadian Ambient Air Quality Standards (CAAQS).

The assessment compared the most stringent of these criteria to the ground-level concentrations of CACs predicted from dispersion modelling. The Application used guidance from the US Environmental Protection Agency (US EPA) and the World Health Organization (WHO) for NO<sub>2</sub> and SO<sub>2</sub>, as requested by MOE, since the existing provincial objectives were being revised at the time of Application preparation. On October 24, 2014, after the Proponent submitted its Application to EAO, MOE released Interim AAQO for SO<sub>2</sub> and NO<sub>2</sub>, which are similar but not equivalent to the US EPA and WHO guidance.

The facility LSA for the air quality assessment is 40 km x 40 km centred on the facility footprint. The LSA for shipping is a 4 km band centred on the marine access route, which extends approximately 295 km in length, from the port of Kitimat to Triple Island. The RSA for the facility is 78 km x 78 km centered on the facility footprint. The RSA for shipping is a 10 km band centred on the marine access route. For the assessment of potential effects from the deposition of air contaminants, an area measuring 125 km x 40 km situated on the LNG facility was used for the modelling.

The Proponent prepared a detailed air quality dispersion modelling plan which was approved by the MOE in February 2014. Dispersion modelling of air contaminants from the proposed facility was completed using the CALPUFF air quality modelling system with input from the CALMET meteorological model. For shipping emissions, dispersion modelling was completed using the SCREEN3 model.

The results of the air quality assessment were used to inform the assessment of other VCs in the Assessment Report:

- Surface Water Quality (section 5.4) and Vegetation and Wetland Resources (section 5.7) examine the potential effects of acidification and eutrophication on freshwater and vegetation resources;
- Human Health (section 9.1) examines the potential human health effects of predicted ground-level CAC concentrations; and
- Accidents and Malfunctions (section 10) examines effects related to fogging and icing.

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<sup>6</sup> There are no national or BC provincial criteria for VOCs. To assess the potential effects of VOC emissions from the proposed Project, the Proponent used Alberta's AAQOs for benzene. The proposed Project would emit very small quantities of benzene (approximately 0.5% of the total VOC emissions).

The proposed Project would require a waste discharge permit under the *Environmental Management Act* to authorize emissions of CACs. Provincial and federal AAQOs guide permit development and provide the framework for evaluating observed or predicted air contaminant concentrations.

#### 5.1.2 Potential Project Effects and Proposed Mitigation Described in the Application

The construction, operation and decommissioning of the proposed Project have the potential to generate air emissions. Construction activities with the potential to generate air emissions include site preparation, onshore construction, dredging, marine terminal construction, vehicle and rail traffic, shipping, and commissioning of the facility.

Operational activities with the potential to generate air emissions include: the treatment of natural gas, extraction and storage of condensate, LNG storage, loading and shipping.

Dispersion modelling was used to predict ground-level concentrations of CACs and VOCs emitted from the facility and from shipping activities during operations. The Application states that the inputs and assumptions used in the modelling are conservative and, therefore, the results are understood to be generally over-estimated.

The analysis focussed on predicted effects at gridded receptor points in the LSA and RSA, which included five human health focus areas (Kitamaat Village, lower Kitimat, upper Kitimat, north Kitimat and the service area) as well as 29 other sensitive receptors such as schools, daycares, seniors' care facilities, health care facilities and recreational areas.

#### *Baseline Conditions*

The proposed Project is located at the head of Kitimat Arm and is bounded by steep terrain to the east and west, with the narrow Kitimat River valley extending to the north. The area receives high amounts of precipitation and the winds are strongly influenced by topography. Through the Kitimat River Valley, the predominant wind direction is from the north. In Kitimat Arm and Douglas Channel, prevailing winds are from the northeast.

Kitimat has a long history of air quality monitoring, owing to the industrial activities that have occurred in the area since the 1950s. The historic air monitoring network in Kitimat consisted of five continuous air quality monitoring stations, four of which operate today. The air monitoring data includes measurements of NO, NO<sub>2</sub>, PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub>, CO, O<sub>3</sub> and H<sub>2</sub>S concentrations. The monitoring data suggest that air quality in the Kitimat airshed is generally "good" (i.e., clean, clear, unpolluted air, as defined by MOE).

The primary sources of existing air emissions in the Kitimat area include the RTA facility located adjacent to the proposed Project and the Kitimat LNG (KLNG) export terminal at Bish Cove on Douglas Channel. Other sources of emissions include domestic heating, as well as transportation emissions from motor vehicles and marine vessels.

Several major air quality studies have recently been completed for the Kitimat region:

- Enbridge Northern Gateway Environmental Assessment (Enbridge, 2010);
- Rio Tinto Alcan Sulphur Dioxide Technical Assessment Report (RTA STAR) (RTA, 2013); and
- 2014 MOE Kitimat Airshed Emissions Effects Assessment (ESSA Technologies Ltd., 2014).

The RTA STAR described how the Kitimat Modernization Project would affect emissions of SO<sub>2</sub> given the planned 48% increase in production capacity at the smelter. While SO<sub>2</sub> emissions would increase by 56%, the near-field effects would not change substantially from present day emissions as a result of improved dispersion at the facility. However, the far-field (off-site) effects are expected to exceed air quality objectives in some areas, and potentially cause acidification effects that are greater than previously experienced farther north up the Kitimat River valley.

The 2014 MOE Kitimat Airshed study assessed NO<sub>2</sub> and SO<sub>2</sub> concentrations in the Kitimat Airshed using twelve different scenarios with varying levels of emissions treatments.

The results from both the RTA STAR and the MOE Kitimat Airshed study predict generally higher SO<sub>2</sub> concentrations in the far-field and lower concentrations in the near-field, in comparison to LNG Canada's assessment. The differences are discussed further in section 5.1.3 below.

#### *Emissions from the Facility*

Concentrations of the substances of interest were predicted using the CALPUFF dispersion model. There are four scenarios: Base case, Project-alone case, Application case, and Cumulative case. Note that the Base case includes the RTA Modernization Project and the KLNG Project, although these projects are not yet in operation.

Under all scenarios, ground-level concentrations of NO<sub>2</sub>, CO and PM<sub>2.5</sub>, were well below the most stringent applicable objectives and MOE's interim guidance. Predicted concentrations of VOCs were also well below any level of concern. Concentrations of H<sub>2</sub>S were modelled for the Project-alone case only and were well below the most stringent applicable objective.

The Base case and Application case for ground-level concentrations of SO<sub>2</sub> (the maximum predicted 1-hour, 3-hour, 24-hour, and annual average) were well above the applicable objectives and MOE's interim guidance. However, the proposed Project on its own did not exceed any objectives or guidance.

The area with the most SO<sub>2</sub> exceedances in the Application case was directly west of the RTA facility, and mostly attributable to the Base case emissions. Isopleth maps show the maximum predicted SO<sub>2</sub> concentrations located near the facility and on a hillside above and to the west of the facility for the Application case.

Additional modelling for Project emissions was conducted to determine the maximum predicted ground-level concentrations for three additional facility scenarios: high inlet total sulphur; non-routine flaring; and, cooling tower-related fogging and icing. The high inlet total sulphur scenario resulted in SO<sub>2</sub> concentrations that exceeded the most stringent applicable objectives for the 1-hour and 3-hour averaging times. However, this situation is based on worst-case meteorological conditions and is not expected to persist for more than a few hours to days. For non-routine flaring, ground-level SO<sub>2</sub> and H<sub>2</sub>S concentrations were well below applicable objectives and the MOE interim guidance. The potential frequency and extent of fogging and icing attributable to the cooling tower emissions of water vapour was estimated using the CALPUFF model. Instances of fogging and icing were predicted to be infrequent.

### *Emissions from Shipping*

Plume dispersion modelling was used to estimate the marine-based emissions from shipping activities. All predicted concentrations for SO<sub>2</sub>, NO<sub>2</sub>, CO, and PM<sub>2.5</sub> at receptors along the shipping route were found to be well below the most stringent applicable objectives, including the MOE interim guidance for SO<sub>2</sub> and NO<sub>2</sub>. Predicted VOC concentrations were also well below any level of concern.

### *Mitigation Measures*

The Application proposes the following key measures to mitigate the proposed Projects key air quality effects:

- Managing NO<sub>x</sub> emissions from gas turbines and incinerators through engineering design and operational control measures; and
- Developing and implementing an air quality management plan.

Additional key mitigation measures were proposed to limit effects to air quality during construction and shipping:

- Conducting regular maintenance on all machinery and equipment;
- Controlling fugitive road dust by installing speed limits on Project-controlled gravel roads and using water for dust suppression as needed;
- Prohibiting the open burning of waste materials from the workforce accommodation centre(s);
- Using low-sulfur fuel for diesel-fired equipment and marine vessels, including construction vessels, supporting tugs, LNG carriers and assist tugs. Additionally, marine vessels will comply with Canada's Vessel Pollution and Dangerous Chemicals Regulations, which require vessels to use a 0.1% low sulphur diesel fuel within the North American Emissions Control Area.

### 5.1.3 Potential Project Effects and Proposed Mitigation Identified During Application Review

The following key issues or concerns were raised during Application Review by members of the Working Group and the public.

#### *Predicted NO<sub>2</sub> Concentrations and the Ozone Limiting Method*

MOE raised concerns regarding the Proponent's treatment of NO, NO<sub>2</sub> and NO<sub>x</sub> in the dispersion model and the predicted NO<sub>2</sub> concentrations from the NO<sub>x</sub> results. The Proponent used the Ozone Limiting Method (OLM) with hourly ozone measurements from Smithers to model hourly NO<sub>2</sub> concentrations over a 3 year period. MOE questioned the Proponent's use of the OLM, as well as the selected reference site (Smithers) and suggested that using this method could result in under predicting NO<sub>2</sub> concentrations in the airshed.

The Proponent conducted additional analysis and applied two alternate NO to NO<sub>2</sub> conversion methods (OLM driven by an assumed ambient ozone concentration of 69 ppb (the highest measured value from the Smithers monitoring station) and results as NO<sub>x</sub> (100% conversion), and found that the resulting concentrations were still within the provincial air quality objectives (see memo *Maximum Predicted Nitrogen Dioxide Ground-Level Concentrations Associated with the Assessment Scenarios: Alternate NO to NO<sub>2</sub> Conversion Output*, November 17, 2014).

Following additional discussion with MOE, Ministry of Health (MOH), OGC and EAO, the Proponent completed additional modelling of NO<sub>2</sub> using the OLM with different background reference values for ozone and produced isopleths of the NO<sub>2</sub> concentrations for each choice of reference value for both the Application case and the Cumulative case for the 1-hour and annual NO<sub>2</sub> concentrations (see *Revised NO<sub>2</sub> Isopleths Assuming OLM @ 69 ppb Ozone*). This analysis demonstrated that there was very little meaningful difference in the geographic distribution of the predicted maximum NO<sub>2</sub> concentrations in the near field to the far field compared to the original modelling results.

Section 9.1 of this Report (Human Health) includes further discussion of these results as they relate to human health.

#### *Temporal and Spatial Distribution of Exceedances*

Members of the Working Group, including MOE, MOH, Kitsumkalum First Nation, as well as the public raised concerns regarding the potential effects of SO<sub>2</sub> on the receiving environment and the proposed Project's contribution to NO<sub>2</sub> emissions. MOE and MOH expressed concern that the spatial and temporal distribution of NO<sub>2</sub> and SO<sub>2</sub> exceedances were not adequately assessed in the Application and that the weighted-average concentrations were based only on the grid point where the maximum

concentration was identified. The concern was that the approach did not consider data from other grid points.

The Proponent provided exceedances for NO<sub>2</sub> and SO<sub>2</sub> concentrations, and Concentration Ratios at the 29 special receptor locations (see memo *Human Health Project Specific Concentration Ratios; Isopleth Figures*, December 2, 2014).

Following discussions at the Working Group meetings, the Proponent undertook additional detailed analyses of the spatial and temporal distribution of SO<sub>2</sub> and NO<sub>2</sub> concentrations, including producing additional isopleths and conducting a sensitivity analysis using the NO to NO<sub>2</sub> conversion method recommended by MOE. The results of these additional analyses were consistent with the conclusions presented in the Application (see memos *Revised NO<sub>2</sub> Isopleths Assuming OLM @ 69 ppb Ozone* and *Isopleth Technical Memo*).

#### *Consistency with RTA STAR Report*

A number of Working Group members, including MOE, OGC, HC, and Kitsumkalum First Nation, questioned the dispersion modelling results in the Application, noting that they were different than those presented in the RTA STAR and the Kitimat Airshed Study.

The Proponent provided additional explanation of the sources of the differences (see memo *LNG Canada Dispersion Modelling Consistency with RTA STAR Report*, dated November 26, 2014). This identified 10 modelling aspects that contributed to the inconsistencies, in particular the meso-meteorological data that was used to develop the CALMET input data files that drive the CALPUFF model. The data set used to develop the *RTA STAR Report* was not available to LNG Canada, and, therefore, LNG Canada developed a new meso-meteorological dataset. The Proponent indicated that despite the differences between modelling assessments, the resulting outputs are within expected uncertainties.

#### *Marine Vessels – Assumptions for Emission Estimates*

EC noted that the 96% reduction in SO<sub>2</sub> emissions from marine vessels stated in the Application represents a best case scenario and assumes 100% compliance with low sulphur fuel regulations, which is contingent on the availability of low-sulphur fuel. Where low sulphur fuel is difficult to obtain, ships are allowed compliance exemptions and the resulting SO<sub>2</sub> emissions could be higher.

The Proponent re-affirmed their commitment to use low-sulphur fuels in accordance with the Sulphur in Diesel Fuel Regulations, but agreed that marine vessels could be exempted from these requirements when low-sulphur fuel is difficult to obtain. However, the exemption authorizations would likely require

shipboard emission control systems to mitigate SO<sub>2</sub> emissions to the same extent as if the ships were burning low-sulphur fuels.

EC noted that the use of low-sulphur fuel does not mitigate NO<sub>x</sub> emissions from ships and also questioned what mitigation measures were being proposed to control marine VOC emissions.

The Proponent indicated that NO<sub>x</sub> emissions would be mitigated by improved engine design and adherence to Tier III marine engine standards for new marine engines deployed after January 1, 2016. Tier II compliant vessels would continue to be used, however, these vessels would slowly be decommissioned by attrition and replaced by Tier III compliant vessels.

The Proponent also indicated that the International Convention for the Prevention of Pollution from Ships (MARPOL) Regulation 15 deals specifically with vapour emission control systems that could be a requirement for all marine vessels visiting the Port of Kitimat.

#### *Follow-up Monitoring*

A number of Working Group members, including MOE and Metlakatla First Nation, as well as the public, questioned what follow-up air quality programs or actions the Proponent would undertake.

The Proponent responded that air monitoring and compliance reporting would be undertaken during the facility operation phase. MOE and OGC also indicated that air monitoring could potentially form part of the permit requirements, and that this would likely include participation in the existing regional monitoring initiative led by RTA.

EAO is proposing a condition that would require the Proponent to develop and implement an air quality and deposition monitoring program in consultation with MOE and OGC. The Proponent would also be required to participate in the Kitimat regional air quality monitoring.

#### 5.1.4 Characterization of Residual Project Effects

After considering all relevant proposed mitigation measures, EAO concludes that the proposed Project would result in the following residual adverse effects:

- Change in air quality resulting from emissions of CACs during facility operations; and
- Change in air quality resulting from emissions of CACs from shipping activities.

EAO's characterization of the residual effects of the proposed Project is summarized below, as well as EAO's level of confidence in the effects determination (including their likelihood and significance).



Criteria	Assessment Rating	Rationale
Context	<p><b>Facility:</b> Moderate sensitivity</p> <p><b>Shipping:</b> Low sensitivity</p>	<p>Environmental sensitivity and resilience are considered implicit in the applicable AAQO.</p> <p><b>Facility:</b> Existing ambient air quality data indicates that the air quality in Kitimat airshed is generally good. Emissions of CACs, particularly SO<sub>2</sub> arising from industrial sources that will be in operation near the proposed facility are expected to impact the sensitivity of atmospheric conditions.</p> <p><b>Shipping:</b> The atmospheric environment along the shipping route has a high degree of resilience, and low sensitivity to changes in air quality.</p>
Magnitude	<p><b>Facility:</b> Moderate to High</p> <p><b>Shipping:</b> Negligible</p>	<p><b>Facility:</b> The proposed Project's contributed increase in CACs would result in a generally moderate residual effect to air quality within the Kitimat airshed. However, there are expected to be some localized instances of exceedances of the AAQOs, which would be a high magnitude residual effect.</p> <p><b>Shipping:</b> Residual effects would be within the normal variability of baseline conditions.</p>
Extent	Local	The geographic extent of the effects would be generally localized near the LNG facility and on elevated terrain to the west of the facility. Areas further away such as the city of Kitimat, would be less affected. Shipping emissions would be localized.
Duration	Long-term	The duration of the effects of the proposed Project on air quality would be the life of the proposed Project (approximately 25 years).
Reversibility	Reversible	Residual effects would cease when operations cease.
Frequency	<p><b>Facility:</b> Continuous</p> <p><b>Shipping:</b> Intermittent</p>	<p><b>Facility:</b> Residual effects from CAC emissions from the facility would occur continuously throughout the operations phase, although the actual periods of high predicted concentrations are expected to occur sporadically.</p> <p><b>Shipping:</b> Multiple regular residual effects would occur along the shipping route with the transiting of LNG marine vessels throughout the operations phase. Actual periods of high predicted concentrations are expected to be sporadic in nature.</p>
Likelihood	The likelihood is high that the construction and operation of the proposed Project would result in emissions of CACs and a residual effect on air quality.	
Significance Determination	Considering the above analysis and having regard to the conditions identified in the TOC (which would become legally binding as a condition of an EAC), EAO is satisfied that the proposed Project would not have significant adverse residual effects on air quality.	
Confidence	There is a moderate level of confidence in the significance and likelihood determination based on the emissions data provided and the analytical techniques used to support the assessment.	

Criteria	Assessment Rating	Rationale
		Although there is some uncertainty with the modelling predictions, EAO proposes a condition that would require the Proponent to develop and implement an air quality and deposition monitoring program that would include air, soil and water monitoring, mitigation measures and reporting requirements. The Proponent would also be required to participate in a regional air quality monitoring program if established by MOE.

### 5.1.5 Cumulative Effects Assessment

There are a number of existing and reasonably foreseeable projects and activities that have the potential to act cumulatively with the proposed Project. Existing and approved facilities within the RSA include the RTA Facility, including the RTA Kitimat Modernization Project, and the KLNG Project. The greatest potential for cumulative effects are from the RTA facility/Kitimat Modernization Project due to its proximity to the proposed Project and its substantial SO<sub>2</sub> emissions. There is notably less potential for overlapping effects from the KLNG Project due to its distance (approximately 10 km) from the proposed Project.

Other potential interactions noted in the Application include cruise ships and BC Ferry activities, as well as planned and announced projects, including Douglas Channel LNG Terminal, Enbridge Northern Gateway, and Kitimat Clean. The potential for cumulative effects from these projects and activities is considered low due to their distance from the proposed Project and/or their small quantities of emissions. The Application stated that while these projects all have a marine transportation component, the separation of the marine vessels (both spatially and temporally), combined with the mobile nature of these sources precludes the possibility of meaningful cumulative effects.

The Application presents dispersion modelling results for the cumulative case. The cumulative case considers emissions from planned and announced projects, as well as proposed Project emissions. All predicted concentrations of NO<sub>2</sub>, CO and PM<sub>2.5</sub> for the cumulative case were well below the most stringent applicable objectives. Predicted concentrations of VOCs were also well below any level of concern. Concentrations of SO<sub>2</sub> in some locations and at some periods were well above the applicable objectives. The geographic extent of the predicted exceedances for the cumulative case is located near the facility and on isolated hillsides above and to the west of the facility.

EAO is proposing a condition that requires the Proponent to develop and implement an air quality and deposition monitoring program, which may include air, soil, and water monitoring and to participate in the Kitimat regional air quality monitoring program, if established by MOE. It is anticipated that future projects would have a similar requirement to participate in a regional monitoring and mitigation program.

EAO concludes that significant cumulative effects to air quality are not expected as a result of the effects of the proposed Project interacting with effects of other past, present and reasonably foreseeable future projects and activities.

#### 5.1.6 Conclusions

Considering the above analysis and the air quality Condition in the TOC (which would become legally binding under an EAC) requiring the Proponent to develop and implement an air quality and deposition monitoring program, EAO is satisfied that the proposed Project would not have significant adverse effects on air quality.

## 5.2 Greenhouse Gas Emissions

### 5.2.1 Background

GHG emissions was selected as a VC because of its effects on the global climate. GHGs would be released during the construction, operation and decommissioning of the proposed Project.

There are four major gases or groups of gases that are influenced by human activities that are of interest with respect to GHG emissions: carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O) and, synthetic (not naturally occurring) fluorinated gases (i.e., sulphur hexafluoride (SF<sub>6</sub>), hydro-fluorocarbons (HFCs) and perfluorocarbons (PFCs). Total GHG emissions are aggregated into carbon dioxide equivalents (CO<sub>2</sub>e), which represents an equivalent amount of carbon dioxide (CO<sub>2</sub>) that would cause the same amount of global warming as the aggregated gases.

The Intergovernmental Panel on Climate Change (IPCC) is an international scientific body under the United Nations whose role it is to assess available scientific information related to climate change. The IPCC's scientific consensus is that anthropogenic sources of GHG emissions are altering the global climate, and that concentrations above 450 parts per million (ppm) of CO<sub>2</sub> in the atmosphere would result in a 50% chance of increasing average global temperatures by 2°C over the pre-industrial average.<sup>7</sup> The IPCC has developed scenarios (called Representative Concentration Pathways) to support the development of global policy, mitigation and adaptation measures in response to a changing climate. All scenarios would result in atmospheric concentrations exceeding 450 ppm, although one scenario would only result in a modest, short term exceedance.

Both the federal and provincial governments have indicated a desire to address GHG emissions and have created strategic-level plans. The Government of Canada has set a target of reducing Canada's total GHG emissions by 17% from 2005 levels by 2020. At present, with respect to GHG emissions reporting, EC requires that any facility emitting more than 50 kt CO<sub>2</sub>e report their annual GHG emissions online.

In 2007, the BC Government passed the *Greenhouse Gas Reduction Act*, legislating provincial GHG reduction targets of 33% below 2007 emission levels by 2020 and 80% below by 2050. Interim reduction targets of 6% by 2012 and 18% by 2016 have been set in policy to guide and measure progress. In the Province's most recent Greenhouse Gas Inventory Report, BC's 2012 CO<sub>2</sub>e emission levels were reported at 61,500 kt, 4.4% below 2007 levels.

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<sup>7</sup> Intergovernmental Panel on Climate Change (IPCC). 2013. Working Group I Contribution to the IPP 5th Assessment Report. *Climate Change 2013: The Physical Science Basis*. IPCC. Geneva, Switzerland.

In order to achieve the legislated GHG reduction goals, BC has designed and implemented a suite of policy, regulatory, and legislative measures to reduce emissions across the province. These measures include:

- A provincial carbon tax, introduced in 2008 through the *Carbon Tax Act*;
- A carbon-neutrality mandate for all public sector operations (Carbon Neutral Government Regulation), largely achieved through the sourcing of province-based offsets; and
- Mandatory GHG reporting program for industrial facilities (Reporting Regulation).

In November 2014, BC passed the *GHG Industrial Reporting and Control Act* that puts in place a GHG emissions intensity benchmark for LNG facilities of 0.16 tonnes of CO<sub>2</sub>e per tonne of LNG produced (t CO<sub>2</sub>e/t LNG). LNG facilities can use offsets and a technology fund to reach the benchmark, and facilities below the benchmark can receive a credit that they can sell.

EAO recognizes that the impacts of GHG emissions must be addressed globally, and that it is not possible to estimate the impacts of an individual project's emissions on global climate change. However, EAO also recognizes that BC's GHG reduction targets were established in the context of the best science about the necessary reductions to global GHG emissions to address impacts on global climate change, and that it is BC's responsibility to contribute to the global reduction. As such, individual projects are considered in relation to their contribution to provincial, national and international GHG emissions, as well as with the industry average of GHG intensity.

In the Application, GHG management considers Project emissions in terms of CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O. The Application stated the proposed Project activities would not contribute emissions of HFCs and PFCs. The Application stated that the proposed Project may use SF<sub>6</sub> insulated breakers that would contain SF<sub>6</sub> in sealed systems designed not to leak, and therefore, would have negligible fugitive emissions.

To establish a baseline, the Proponent compared the carbon footprint of a number of international LNG facilities, which are either already in operation or are currently under construction. The average GHG intensity for the facilities used as comparison is 0.35 t CO<sub>2</sub>e/t LNG. The average of the lowest three emission intensities is 0.25 t CO<sub>2</sub>e/t LNG, and the best-in-class facility at the time of the comparison was Snohvit LNG at 0.22 t CO<sub>2</sub>e/t LNG.

#### 5.2.2 Potential Project Effects and Proposed Mitigation Described in the Application

During construction, GHG emissions would be generated primarily from land clearing, the combustion of fuel in vehicles and heavy equipment, and marine activities. About 255,742 t CO<sub>2</sub>e would be released during the five-year construction period.

The Application stated that during operations at full build-out, about 3,957,728 t CO<sub>2</sub>e would be released annually from the combustion of fossil fuels, flaring, domestic

shipping activities and fugitive sources (Table 5-1). This would increase BC's emissions total by 6.6% and Canada's emissions total by 0.57% over 2011 levels.

**Table 5-1: Estimated GHG emissions during operations**

Operation Activity	GHG Emissions (t/y)			
	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub> e
Gas turbine power generation	3,054,358	63	56	3,072,570
Incinerators	704,917	345	208	775,636
Flares	78,810	5.2	1.5	79,398
Fugitive Sources	0.89	1,002	-	25,056
Domestic Shipping Activities	5,008	0.65	0.15	5,067
<b>Total GHG Emissions (excluding international shipping activities)</b>	<b>3,843,094</b>	<b>1,415</b>	<b>266</b>	<b>3,957,728</b>
International Shipping Activities	83,396	0.59	4.8	84,827

The Proponent determined that when the proposed Project is operating at full capacity of 26 million tonnes per annum (MTPA) of LNG production, the GHG intensity of the proposed Project would be a ratio of 0.15 t CO<sub>2</sub>e/t LNG.

The key mitigation measures in the Application regarding GHG emissions include:

- Use of efficient aero-derivative gas turbine technology to drive the refrigeration compressors in the liquefaction process;
- Use of BC Hydro power for the LNG facility auxiliary electricity supply;
- Recovery of boil off gas during storage and loading processes, and re-inject the recovered gas into the fuel/feed gas system;
- Implementation of a fugitive emissions survey program with the aim to measure, control and manage fugitive emissions, and
- Development and adherence to a GHG management plan that would consider best achievable technology and best industry practices.

### 5.2.3 Potential Project Effects and Proposed Mitigation Identified During Application Review

EC wanted to know if the facility would be able to adapt to increased utilization of grid power in the case that additional grid capacity becomes available in the future.

The Proponent responded that the only items not planned to use grid power are the main refrigerant compressors, emergency generators and emergency air compressors, and that to change these components to run on grid power would require considerable engineering design re-work resulting in a cost and time impact to the proposed Project.

EAO proposes a condition that would require the Proponent to develop a GHG management plan that sets out the means by which the GHG management mitigation measures related to operations would be achieved.

#### 5.2.4 Characterization of Residual Project Effects

After considering all relevant proposed mitigation measures, EAO concludes that the proposed Project would result in the following residual adverse effect:

- GHG emissions during construction and operations.

Summarized below is EAO's characterization of the expected residual effects of the proposed Project on the environment from GHG emissions, as well as EAO's level of confidence in the effects determination (including their likelihood and significance).

Criteria	Assessment Rating	Rationale
Context	Moderate to high sensitivity	The IPCC has confirmed that GHG emissions are at levels that are impacting the global climate.
Magnitude	High	Emissions from the proposed Project at full build-out are estimated to be 4 Mt CO <sub>2</sub> e/year and are anticipated to increase BC's provincial GHG emissions by 6.6%. The proposed Project would increase national GHG emissions by 0.57%, and contribute to global GHG emissions.
Extent	Global	The geographic impact of GHG emissions from the proposed Project is cumulative globally.
Duration	Long-term	CO <sub>2</sub> constitutes the majority of the proposed Project's GHG emissions. CO <sub>2</sub> remains in the atmosphere for 100 years or more.
Reversibility	Irreversible	Given current technology and the persistence of CO <sub>2</sub> in the atmosphere, the effects of the GHG emissions are effectively irreversible.
Frequency	Continuous	GHG emissions would be continuous for the life of the proposed Project.
Likelihood	It is certain that the proposed Project would emit GHGs. However, GHG emissions may be reduced over time due to changes in technology and/or regulatory requirements.	
Significance Determination	After considering all relevant mitigation measures identified in the Application, EAO has determined that the proposed Project would have significant residual adverse effects on GHG emissions, particularly considering the magnitude of the proposed Project's GHG emissions in relation to BC's reduction targets.	
Confidence	EAO has a high level of confidence in the significance and likelihood determinations, as the estimates presented in the Application is a reasonably conservative estimate of potential GHG emissions during construction and operations, and the technical approach for estimating GHG emissions has a high level of confidence.	

#### 5.2.5 Cumulative Effects Assessment

EAO did not require the Proponent's Application to include a cumulative effects assessment for GHG emissions.

GHG emissions are a global issue, and the IPCC has produced several scenarios forecasting global GHG emissions and the potential impacts associated with these emissions levels. These factors are already considered in the above assessment.

#### 5.2.6 Conclusions

Considering the above assessment and having regard to the conditions identified in the TOC (which would become legally binding as a condition of an EAC), EAO concludes that there would be a significant residual adverse effect of the proposed Project related to GHG emissions. The effect is considered significant because of the existing context of global greenhouse gas emissions and the magnitude of the proposed Project's emissions, which would have a notable impact on BC's emissions reduction targets.



## 5.3 Acoustics

### 5.3.1 Background

Acoustics was selected as a VC because activities during construction, operation, and decommissioning would generate noise that has the potential to affect the health and well-being of humans. The Application assessed the potential effects on human receptors from noise generated through construction and operation activities of the proposed Project. Noise effects on wildlife are assessed under the Terrestrial Wildlife and Marine Birds section 5.8 of this Report; potential effects of noise on marine species are assessed in the Marine Resources section 5.6 of this Report.

The facility LSA for the noise assessment includes the facility footprint, safety zones and a 3.5 km buffer. The shipping LSA is a 4 km band centered on (e.g., extending 2 km to either side of) the marine access route. The facility RSA is an area that includes the facility footprint, safety zones and a 5 km buffer. The shipping RSA is a 10 km band centered on the marine access route.

A total of 29 noise sensitive receptors were selected for the noise assessment. Five of these receptors are located along the marine access route outside of the shipping RSA, but are still included in the assessment because of their importance to Aboriginal Groups. Table 5.4-2 in the Application lists the noise sensitive receptors and Figure 5.4-3 shows the receptor locations.

The regulatory framework for the noise assessment consists of provincial and federal guidance from OGC and HC, respectively. The OGC *British Columbia Noise Control Best Practices Guideline* is applicable to the operations phase and is a receptor-based guideline that specifies daytime and nighttime permissible sound levels (PSLs) at dwelling units (residential receptors) located at 1.5 km from the Project fence line. The noise from the operation of the proposed Project must be assessed cumulatively with other approved operating OGC regulated facilities in the assessment area. OGC also provides guidance on low frequency noise (LFN) effects by assessing the difference between the overall C-weighted and the overall A-weighted sound levels. Noise guidelines from HC are based on international standards and technical publications and are used to inform noise management in all proposed Project phases. Health Canada's guidance employs an adjusted day-night sound level ( $L_{dn}$ ) and a percentage highly annoyed (%HA) parameter. Potential noise effects during the construction phase are compared to HC's guidelines for mitigated noise level (MNL) for  $L_{dn}$  and the change in %HA.

The existing ambient acoustic conditions in the RSA are characterized by a combination of sounds from the natural environment and anthropogenic sources, including local businesses, industry and transportation. The Proponent assessed ambient sound levels (ASLs) at the 29 noise sensitive receptors using the OGC guidelines. Expected contributions from the Douglas Channel LNG Project were added to the ambient sound levels to determine the combined noise effect (baseline sound levels) for comparison to

the OGC PSLs. Using the HC guidelines, the Proponent conducted baseline noise monitoring at six locations within the LSA between June 2013 and February 2014 and determined the baseline  $L_{dn}$  levels for use in the %HA calculations.

Acoustic modeling was conducted as per International Organization for Standardization (ISO) standards, using worst-case meteorological conditions in order to achieve conservative results. Detailed information on the acoustic modeling, including assumptions, methods and results, are provided in the Application.

### 5.3.2 Potential Project Effects and Proposed Mitigation Described in the Application

The Application stated that activities such as site preparation, onshore construction, dredging, marine construction, and vehicle and rail traffic are all expected to generate noise during the construction phase. The dismantling of the LNG facility during the decommissioning phase would also generate noise; however, it is expected to be less than during construction. In the operations phase, activities with the potential to generate noise include the production of LNG, vehicle and rail traffic, shipping, docking and idling of LNG carriers.

For the construction and operations phases, acoustic modeling was undertaken to determine the change in %HA at each noise sensitive receptor. Adjustments for tonality and impulse were made to account for high pitch back-up alarms and the impulsive nature of piling activities during construction. The calculated change in %HA at each receptor was found to be less than the HC guideline of 6.5%.

Low frequency noise effects were also assessed. For the construction phase, the difference between the C-weighted and A-weighted sound levels were found to exceed the OGC cautionary limit of 20 dB at three receptors. At these receptors, low frequency tonality is not expected and the overall C-weighted sound levels were below the ANSI 12.9 standard of 65 dBC, except for one location: R10 (the nearest proposed workforce accommodation centre). However, since the predicted linear sound levels at receptor R10 are below the 65 dB threshold recommended by the ANSI 12.9 standard at the octave band frequencies of 31.5 Hz and 63 Hz, low frequency noise effects are not expected during construction. For the operations phase, 12 of the 15 receptors exceeded the cautionary limit; however, since low frequency tonality is not expected and the overall C-weighted sound levels were below 65 dBC at all receptor locations, LFN issues are not expected during operations either.

Compliance with the OGC *Noise Control Best Practice Guideline* was assessed for the operations phase of the proposed Project. The modelled combined sound levels for the four residential receptors (R01, R02, R05 and R11) were compared against the OGC PSLs. The modelled sound levels at these residential receptors were within the OGC noise control guidelines.

During operation, the LNG carriers are expected to generate noise while travelling along the marine access route between Kitimat and Triple Island. The Application does not specify Project-specific mitigation measures for noise related to shipping, but indicates

that the marine vessels are assumed to be equipped with standard silencers on their exhaust stacks.

The modelled acoustic results for shipping activities indicated that the combined sound levels (daytime and nighttime) at all residential receptors in the shipping RSA were within the OGC noise control guidelines. An assessment of the change in %HA was also completed for shipping activities and found that the change in %HA at all receptors was below the Health Canada limit of 6.5%.

Mitigation measures discussed in the Application to reduce noise effects during construction and operation include the following:

- Adhering to the OGC *British Columbia Noise Control Best Practices Guideline*;
- Undertaking most construction activities during daytime hours (7:00 am to 10:00 pm);
- Using vibro-hammer piling equipment as conditions permit;
- Development and implementation of:
  - A traffic management plan;
  - A noise management plan;
  - A notification protocol to provide advance notice to nearby residents of planned activities with the potential to generate substantial noise; and
  - A process to address noise complaints in a timely manner.

### 5.3.3 Potential Project Effects and Proposed Mitigation Identified During Application Review

During their review of the Application, members of the Working Group and the public raised key issues on the potential effects to the acoustic environment.

Gitxaala Nation raised the concern that baseline sound levels were not measured at several locations along the proposed shipping route that are considered important by the Nation and that the Application instead used baseline acoustic information from other sites with similar characteristics. Gitxaala Nation had recommended eight additional noise sensitive receptors to be included in the Application.

The Proponent confirmed that all eight additional noise receptors suggested by Gitxaala Nation were included in the assessment of potential acoustic effects. Baseline sound level measurements were taken at only one location suggested by Gitxaala Nation: McCauley Island (R22). This location is considered representative of other receptors along the Principe Channel section of the proposed shipping route. The measured baseline level at McCauley Island was 45 dBA daytime and 44 dBA nighttime. These levels were compared to the OGC Noise Guideline recommended sound level for a quiet rural environment, 45 dBA daytime and 35 dBA nighttime. The lower levels recommended by the OGC were used in the assessment of the locations of importance identified by the Gitxaala Nation, which represents a conservative approach.

Members of the public raised specific questions about the nature and level of noise to be expected from the construction and operation of the proposed Project, particularly the continuous, intermittent and low frequency noises. Concerns were raised regarding the proximity of the proposed facility to residential areas (for example, the Kildala neighbourhood) and the potential effects on sensitive populations in these areas. Questions were also raised regarding the noise monitoring proposed for the construction and operations phase and the specific actions that the Proponent would undertake to keep the public informed and to adjust mitigation if required.

The Proponent responded that the highest continuous noise from the facility would be from air processing equipment such as ventilation fans, aerial coolers, or industrial blowers during the operation phase. Impulsive or impact noise is not anticipated for the operation phase. For the construction phase, the Application considered the sound levels of various types of equipment.

The closest residential receptor to the proposed Project is R02, with the noise level at this location predicted to be 33.6 dBA during the daytime and nighttime period. To manage noise levels, equipment would be enclosed within buildings, where appropriate, and would be regularly maintained to ensure efficient operation. The Proponent clarified that the OGC PSLs for a rural community are (in equivalent sound level, Leq) 50 dBA daytime and 40 dBA nighttime, and for smaller communities such as Kildala, they are 53 dBA daytime and 43 dBA nighttime. The Proponent confirmed that low frequency noise effects from the Project alone are not expected.

The Proponent committed to notifying the local community in advance of planned substantial noise-causing activities at the proposed facility. A noise management plan would also be developed and implemented for the project and would include an approach for monitoring noise. If the noise monitoring indicated that the actual Project-related noise levels were in excess of the thresholds established by regulatory requirements, additional mitigation measures would be considered to reduce Project noise. These additional measures would be developed following an investigation of the issue.

EAO is proposing a condition that would require the Proponent to develop and implement a noise management plan that would demonstrate adherence to the proposed mitigation measures, as well as the noise guidelines.

#### 5.3.4 Characterization of Residual Project Effects

After considering all relevant proposed mitigation measures, EAO concludes that the proposed Project would result in the following residual adverse effects on the acoustic environment:

- Increase in ambient noise levels.

EAO's characterization of the expected residual effects of the proposed Project on the acoustic environment is summarized below, as well as EAO's level of confidence in the effects determination (including their likelihood and significance).

Criteria	Assessment Rating	Rationale
Context	Moderate sensitivity	The acoustic environment is considered moderately sensitive due to the existing conditions in the receiving environment which include both natural and anthropogenic sounds. However, some human receptors, especially in relatively undisturbed areas, may be sensitive to additional noise disturbance.
Magnitude	Low to moderate	<p>The magnitude of potential adverse effects is generally predicted to be low, based on a comparison of the predicted sound levels (including LFN from the facility) to applicable criteria at the noise sensitive receptors. However, during construction and decommissioning, the magnitude of effects at some receptors would be moderate.</p> <p>Noise during construction and operations is predicted to be within HC's MNL guideline and the <i>OGC Noise Control Best Practices Guideline</i>.</p>
Extent	Local	The extent of the noise effects would be local and within the LSAs for both the facility and shipping.
Duration	Long-term	The duration of the effects of the proposed Project on the acoustic environment would be the life of the proposed Project (approximately 25 years).
Reversibility	Reversible	The potential adverse effects would be fully reversible upon cessation of construction or operational activity.
Frequency	<p>Construction: Semi-continuous</p> <p>Operations: Continuous (facility), Semi-continuous (shipping)</p>	<p>Potential adverse effects are expected to be semi-continuous during construction.</p> <p>For operations, adverse effects to the acoustic environment are expected to be continuous at the facility and semi-continuous for receptors along the shipping routes.</p>
Likelihood	The likelihood of residual effects to the acoustic environment is high.	
Significance	EAO is satisfied that the proposed Project would not have significant residual adverse noise effects, as adverse effects would be highly localized, and the effects assessments predict compliance with the OGC's <i>Noise Control Best Practices Guideline</i> and the HC guidance.	
Confidence	EAO acknowledges that there are uncertainties associated with the noise prediction modelling, but considers that the Application used a conservative approach. Given the modelling approach and the proposed mitigation, EAO has moderate to high confidence in the significance and likelihood conclusions.	

### 5.3.5 Cumulative Effects Assessment

The Application determined that past and present regulated projects and activities within the RSA would not overlap with the proposed Project in such a way that the changes in ambient sound levels would exceed regulatory thresholds on a persistent basis. The Application did not include reasonably foreseeable non-regulated projects or activities in the assessment, as these are difficult to quantify due to a lack of public information and there is an absence of quantitative noise limits applicable to such activities. However, the Application assessed the potential residual effects of other reasonably foreseeable OGC regulated projects and activities in the facility RSA, in combination with those of the proposed Project, and concluded that noise levels are expected to comply with regulatory guidelines. Cumulative effects were, therefore, assessed as not significant.

Considering the Proponent's assessment of the interaction with past, present and reasonably foreseeable future regulated projects, the mitigation proposed, and the requirement for other projects and activities to comply with regulatory standards, EAO is satisfied that cumulative effects on the acoustic environment would not be significant.

### 5.3.6 Conclusions

Considering the above analysis and having regard to the OGC regulatory requirements that the Proponent would have to meet, EAO is satisfied that the proposed Project would not have significant adverse effects on the acoustic environment.

## 5.4 Surface Water Quality

### 5.4.1 Background

Surface water quality was selected as a VC because water quality is important to maintain aquatic life and for human consumption. Key indicators that were assessed in the Application include the indirect effects of nitrogen and acid deposition from air emissions.

The water quality LSA encompassed the area where the modelled concentrations were above the combined sulphate (SO<sub>4</sub>) and nitrogen screening threshold (15 meq/m<sup>2</sup>/y), as well as sensitive freshwater systems identified as acidic or highly acid sensitive at baseline but not necessarily located in the screening threshold area. The LSA was approximately 79,830 ha, extending 35 km north and 13 km southwest of the LNG facility.

The RSA was approximately 377,950 ha, and it provided a regional context in order to gauge natural conditions. The boundary for the RSA was defined by the area anticipated to receive measurable nitrogen and SO<sub>4</sub> deposition below the MOE screening thresholds.

The *Environmental Management Act* (EMA) regulates industrial and municipal waste discharge, pollution, hazardous waste and contaminated site remediation. The Oil and Gas Waste Regulation (OGWR) allows authorization to discharge specific wastes to the environment from specific oil and gas operations, including CACs emissions.

### 5.4.2 Project Issues and Effects and Proposed Mitigation Identified in the Application

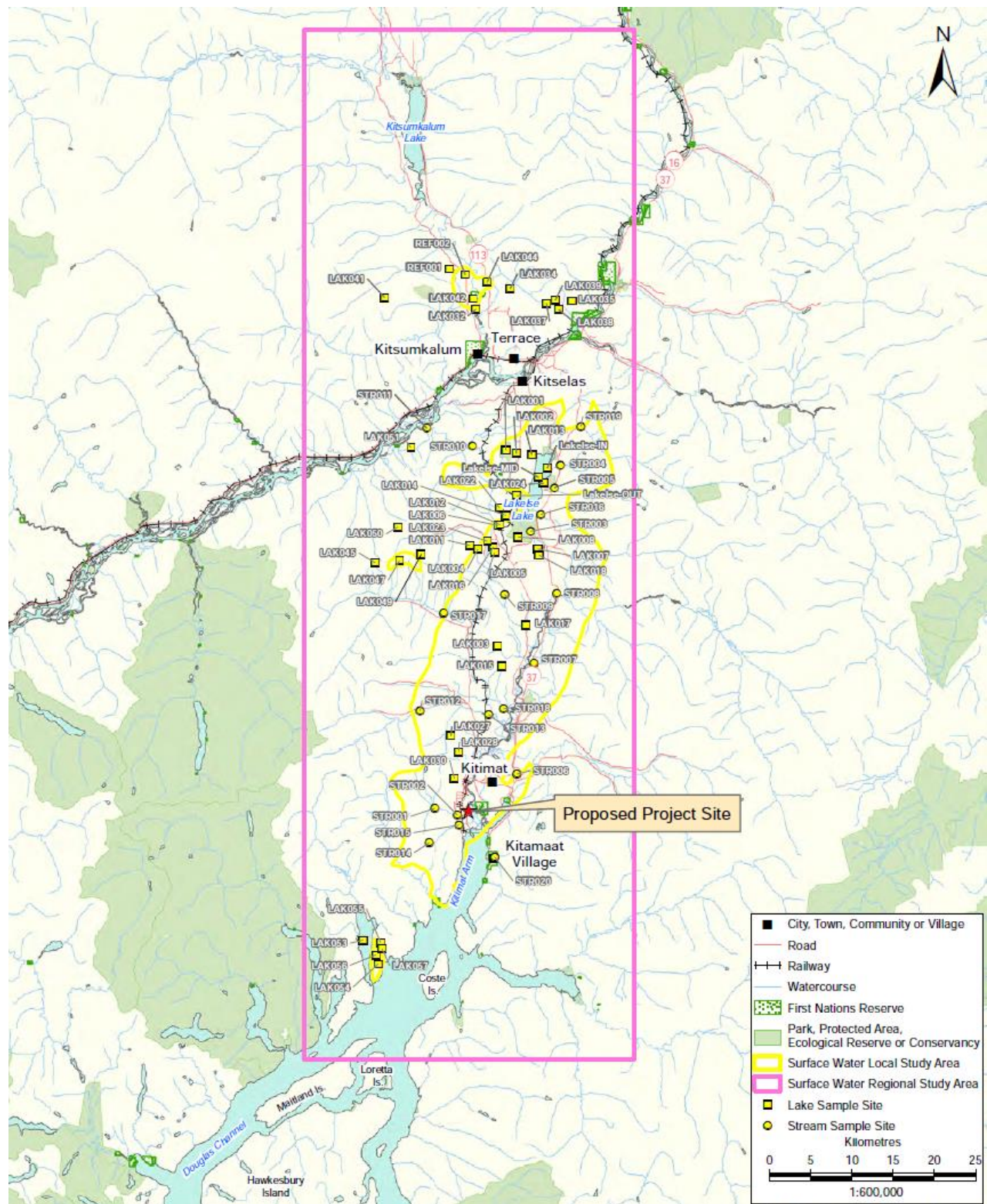
The Application stated that air emissions from LNG production during the operation phase would result in the deposition of NO<sub>x</sub> and SO<sub>2</sub> that could cause acidification and eutrophication of freshwater systems and affect the health of freshwater ecosystems. The assessment of air quality in section 5.1 was used to inform the assessment of surface water quality. These compounds have the potential to cause acid deposition by reacting with water and oxygen in the atmosphere and precipitating as SO<sub>4</sub> and NO<sub>x</sub>. Over time, acidic deposition can lead to the acidification (both SO<sub>4</sub> and NO<sub>x</sub>) and eutrophication (NO<sub>x</sub> only) of lakes and streams which can adversely affect fish and other aquatic biota. Eutrophication of water bodies promotes algal growth that leads to low oxygen levels.

#### *Baseline*

The Application stated that lake and stream water within the study areas 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 the release of SO<sub>x</sub> and NO<sub>x</sub> in air emissions from the RTA facility since the early 1950s. Lakes and streams were selected to reflect a range of conditions encountered in the study areas, including

watershed size, elevation, proximity to Kitimat and the proposed LNG facility (Figure 5-1).





**Figure 5-1: Surface Water Quality Sampling Sites**

According to the Application, most lakes (61%) were identified as having low to very low baseline acid sensitivity, two lakes were identified as acidic, and nine lakes were identified as having high acid sensitivity, with pH ranging from 4.98 to 6.51. Most sampled streams (90%) were identified as having very low acid sensitivity. One stream was classified as moderate acid sensitivity and one as low acid sensitivity. Results indicated that generally streams had a high buffering capacity (Table 5-2).

**Table 5-2: Baseline Acid Sensitivity for Lakes and Streams in the RSA**

Acid Sensitivity	# of Lake Sites	# of Stream Sites
Acidic	2	0
High	9	0
Sensitive	2	0
Moderate	5	1
Low	8	1
Very Low	20	18
<b>Total Sampled Sites</b>	<b>46</b>	<b>20</b>

The Application stated that 10 of the 12 lakes and all eight streams sampled in 2013 were classified as either oligotrophic (low algal growth) or mesotrophic (moderate algal growth). Two lakes were classified as eutrophic (high algal growth) and were also in the acid sensitivity classes.

#### *Effects and Mitigation*

Eight lakes had critical load exceedances for acidification modelled for the base case, with an increase in acidification modelled with the addition of proposed Project contributions. The Application stated that the lakes with critical load exceedances are acidic or highly acid sensitive lakes, and that these lakes have observed or inferred fish habitat despite the low pH conditions. The Project-alone case had critical load exceedances in the same lakes as in the base case, but the values in the base case were about 4.6 times higher than those of the Project-alone case. With proposed Project contributions, it was modelled that one additional lake (End Lake) would have critical load exceedances. For all other lakes and streams, there were no changes in the number of lakes with critical load exceedances. In the base case, eighty percent of the total deposition in water bodies where there were exceedances was related to existing conditions, including emissions from RTA and KLNG, with the proposed Project acidification contributions being less than 20%.

The Application also stated that air emissions from operations would result in the deposition of substances that could cause eutrophication, which has the potential of changing trophic states. The Proponent anticipated that no freshwater systems would change trophic status, and that the two lakes that are currently considered eutrophic would have negligible changes in nitrogen loading.

Key mitigation measures proposed in the Application include the following:

- Diesel fired equipment would be powered by low sulphur fuel; and
- Managing the continuous NO<sub>x</sub> emissions associated with the gas turbine exhaust to meet regulatory requirements, which would be set in permitting.

#### 5.4.3 Potential Project Effects and Proposed Mitigation Identified During Application Review

Key issues of concern raised during stakeholder and Aboriginal engagement were acidifying emissions and their potential effects on lakes and streams, and effluent water discharge.

##### *Lakes that are exceeding critical loads*

During Application Review, MOE requested additional information to better understand the effects of critical load exceedances and associated changes in lake chemistry on fish populations and aquatic health. They noted the possibility of biological impacts to the most sensitive water bodies.

In response, the Proponent conducted additional analysis and concluded that there would be a low concern for acidification in the targeted lakes and streams, although two lakes had critical load exceedances and had a pH change close to the biological threshold. The Proponent committed to working collaboratively with the RTA monitoring program before the beginning of operations to monitor accessible lakes within the Project area in order to validate the modelling results and to ensure acidification and eutrophication are monitored.

EAO proposes a condition requiring the development and implementation of an air quality management plan which specifies the mitigation measures to reduce air emissions during construction and operations. The condition would also require development of an air quality and deposition monitoring program to determine the appropriate level of air monitoring, as well as to establish soil and water sampling and reporting requirements to ensure that potential effects from air emissions are monitored. As part of this condition, the Proponent would also be required to participate in the Kitimat regional air quality monitoring program.

##### *Impacts of acidification on fish*

MOE had concerns that emissions impacts to surface waters may impact fish and aquatic health. One of the lakes at the headwater of Goose Creek, which is an important stream for cutthroat trout, is close to thresholds for effects for acidification. MOE recommended that validation of predictions is required through monitoring of the receiving environment.

The Proponent committed to participate in regional environmental effects monitoring for permitted waste discharges, commencing prior to the start of operations.

EAO proposes a condition requiring the development (with MOE and OGC) and implementation of an air quality and deposition monitoring program to determine the appropriate level of air monitoring, as well as to establish soil and water sampling and reporting requirements to ensure potential effects from air emissions are monitored.

#### 5.4.4 Characterization of Residual Project Effects

After considering all relevant proposed mitigation measures, EAO concludes that the proposed Project would result in the following residual adverse effects on surface water quality:

- Potential increase in acidification of lakes in the RAA during operations.

Summarized below is EAO's characterization of the expected residual effects of the proposed Project on freshwater aquatic resources, as well as EAO's level of confidence in the effects determination (including their likelihood and significance).

Criteria	Assessment Rating	Rationale
Context	Low resilience	Of 46 lakes sampled, two lakes were acidic and nine lakes had high acid sensitivity. Eight of these sampled lakes had critical load exceedances for acidification.
Magnitude	Low to moderate	A low measurable effect on lakes and streams is expected to occur over the operations of the proposed Project due to changes from baseline conditions from the deposition of air emissions resulting in potential acidification. The eight lakes with existing critical load exceedances would have an increase in their exceedances, and one additional lake would have a critical load exceedance. In total, 86% of the lakes and streams have a low magnitude effect with no critical load exceedances, and 14% have a moderate magnitude effect with exceedances. For streams, no exceedance to the critical load occurs for any of the sampled sites.
Extent	Local	Residual effects would extend beyond the activity area with respect to acidification.
Duration	Long term	The effects of acidification would continue for the duration of the proposed Project while air contaminants are being emitted, and would persist following decommissioning.
Reversibility	Irreversible	While the lake chemistry may be reversible, and would begin to reverse once the proposed Project operations cease, the lake biota are unlikely to recover to the pre-acidified aquatic community.
Frequency	Continuous	The effects of acidification would occur continuously during the operations phase of the proposed Project.

Criteria	Assessment Rating	Rationale
Likelihood		The likelihood of residual effects is moderate for residual effects of acidification on surface water quality due to the apparent sensitivity of some water bodies.
Significance		Taking into consideration the magnitude of the residual effect, as well as having regard to the conditions identified in the TOC, EAO concludes that the residual effects of the proposed Project on surface water quality would not be significant.
Confidence		The significance determination and likelihood rating for residual effects of acidification and eutrophication are determined with moderate to high confidence. Based on the proposed mitigation measures, the analysis used to support the assessment from the modelling methodology applied by the Proponent, and compliance with the EAC conditions, there is moderate to high confidence that the residual effects would not be significant.

#### 5.4.5 Cumulative Effects Assessment

The Application stated that the residual effects spatially and temporally overlap with the effects of the following present and future projects: RTA Facility and Kitimat Modernization Project, KLNG, Douglas Channel LNG Terminal, Enbridge Northern Gateway, and Kitimat Clean.

With the proposed Project, it is modelled that nine lakes would have critical load exceedances. The Application stated that with the addition of future projects, the number of lakes with critical exceedances is not expected to increase the number of lakes with critical load exceedances. The emissions from past, present, and reasonably foreseeable projects are expected to contribute more than 80% of total acid deposition.

The Application stated that nitrogen loads in the modelled cumulative effects scenario would increase, with the largest increase being 3.8% in one stream. It is predicted that the magnitude of change is expected to be low because the increase of total nitrogen is not anticipated to change the trophic status of any of the studied watercourses.

EAO has proposed a condition requiring the Proponent to develop and implement an air quality and deposition monitoring plan, and participate in any regional airshed monitoring programs established in the area.

EAO concludes that no significant cumulative effects to surface water quality are expected as a result of the effects of the proposed Project interacting with effects of other past, present and reasonably foreseeable future projects and activities.

#### 5.4.6 Conclusions

Considering the above analysis, and having regard to the conditions identified in the TOC (which would become legally binding as a condition of the EAC), EAO is satisfied that the proposed Project would not have significant adverse effects on surface water quality.

## 5.5 Freshwater and Estuarine Fish and Fish Habitat

### 5.5.1 Background

Freshwater and estuarine fish and fish habitat was selected as a VC because fish are an important component of local commercial, recreational and Aboriginal (CRA) fisheries (including food, social and ceremonial purposes). Freshwater and estuarine fish and fish habitat include anadromous and non-anadromous fishes, shellfish, crustaceans, and their respective habitats.

The freshwater and estuarine fish and fish habitat section of the Application reported on three potential project effects, each with its own set of measureable parameters:

- Changes in fish habitat (e.g., 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 (e.g., harm to fish by way of physical injury or mortality to freshwater or estuarine species); and
- Change in fish health.

Key effects to freshwater aquatic resources are direct effects to freshwater fish, such as the removal of habitat, and indirect effects that change abiotic conditions, such as nitrogen or acid deposition from air emissions.

The spatial boundaries for the VC include:

- The Project footprint includes the physical area to be cleared for the proposed LNG facility and all Project works and related infrastructure;
- The LSA for the freshwater and aquatic riparian habitat is a portion of the Kitimat River mainstem channel from the marine environment upstream to the location of the existing Methanex water intake, its side channels downstream of the intake, and streams affected by the LNG facility. It also includes estuarine habitat in the tidally influenced channels west of the Kitimat River mainstem that have the potential to be affected by Project development activities, including the LNG facility, LNG loading line, and workforce accommodation centre; and
- The RSA includes the Kitimat River mainstem and side channels, direct tributaries to Kitimat Arm, and estuarine habitats, including in Minette Bay.

The federal *Fisheries Act*, administered by DFO, is the main statute related to the conservation and protection of freshwater fish and fish habitat. Fish and fish habitat protection measures include a prohibition, if unauthorized, against serious harm to fish that are part of a CRA fishery, or to fish that support such a fishery (subsection 35[1]); and a prohibition against the deposit of deleterious substances in water frequented by fish (subsection 36[3]).

DFO is responsible for administering all aspects of the *Species at Risk Act* (SARA) related to aquatic species at risk. SARA contains specific requirements for when project reviews are being undertaken under CEAA 2012. It requires assessment of the adverse

effects of a proposed project on any species listed in Schedule 1 of SARA for measures to be taken to avoid or lessen those effects, and requires those measures to be monitored. All measures must be consistent with any recovery strategies or action plans in place for SARA listed species.

The *Water Act* regulates the allocation and management of surface water. Diversion of water from the Kitimat River during construction (hydrostatic testing of pipelines and vessels) and operation (cooling for the liquefaction processes) would require an approval and/or a water licence under the *Act*. The *Water Act* also regulates and allows for changes in and about a stream in accordance with regulations under the *Water Act*, and sets out specific conditions under which changes in and about a stream may be carried out. This includes scheduling activities within timing windows of least risk for instream activities (also known as “instream work windows” or “reduced risk timing windows”), prohibitions on entry of substances into a stream that may have potential adverse effects on the stream, and measures to protect fish, wildlife and habitat.

The Environmental Protection and Management Regulation (EPMR) under OGAA include requirements related to the protection and management of fish habitat and riparian values on crown land.

#### 5.5.2 Potential Project Effects and Proposed Mitigation Described in the Application

##### *Baseline and Context*

Four streams constitute the primary freshwater habitat in the LSA: the Kitimat River, Moore Creek, Anderson Creek, and Beaver Creek. These streams provide access to extensive off-channel and upstream habitat for numerous fishes of ecological, cultural, and commercial significance.

The Kitimat River estuary provides high value habitat to support multiple important CRA fisheries, including: all five species of Pacific salmon; steelhead, rainbow and cutthroat trout; Dolly Varden char; and eulachon. Other species that support these fish are three-spine stickleback, sculpins, lamprey, and starry flounder. Overall, coho salmon are the most abundant and widely distributed species relevant to CRA fisheries.

The aquatic ecosystem in the LSA has been modified over the years as a result of direct efforts to stabilize natural hydrology, including stream channelization through industrial sites, protective dikes, and large industrial footprints. Three types of habitat were assessed for fish, freshwater mainstem habitat, freshwater off-channel habitat, and estuarine habitat in the LSA. Freshwater habitat is characterized by limited spawning capacity, but seasonally important rearing and overwintering capacity in Kitimat River and Moore, Anderson and Beaver Creeks. Off-channel areas include undercut banks, vegetative cover and large woody debris that provide suitable rearing and overwintering habitat, particularly suitable for juvenile coho salmon.



### *Effects and Mitigation – Fish Habitat*

The Application stated that development activities during construction would result in the potential alteration or destruction of freshwater and estuarine habitat as outlined in Table 5-3. During construction, Beaver Creek would be realigned around the Project footprint since Beaver Creek currently runs through the Project footprint. Anderson Creek would be realigned to remove a bend in the creek to eliminate the need for future dredging in the area to maintain channel conveyance. A side channel of the Kitimat River would be realigned around the Project footprint because of overlap with the Project footprint.

Residual serious harm resulting in a localized effect that cannot be avoided or fully mitigated would require authorization under subsection 35(2) of the *Fisheries Act*. This authorization would involve mandatory habitat offsetting measures that must uphold the guiding principle of no net loss of productivity, including both spatial losses, and temporal. For the EA, the Proponent provided a Conceptual Fish Habitat Offsetting Plan (CFHOP) for review that provided the site specific mitigation and avoidance measures to reduce or avoid serious harm to fish and fish habitat.

The Application stated that Beaver Creek channel realignments would be designed to support habitat structures that would maintain productivity while providing fish access to upstream spawning habitat and downstream estuary channels. Anderson Creek channel realignments would include a gravel-cobble bed to encourage coho and chum salmon spawning. Realignment of a Kitimat River side channel would be designed to provide sufficient flow and dissolved oxygen levels to support CRA fisheries, and would improve potential eulachon recovery.

Grading of the site would result in exposed mineral soils that have the potential to create sediment-laden water during rainfall events. The removal of aquatic habitat in the LSA could directly affect salmonid species through reduced access to spawning, rearing, and overwintering habitats. Temporary instream works could also reduce the abundance of benthic invertebrates and adversely affect food availability for salmonids.

Other key mitigation measures that would be incorporated to reduce changes to fish habitat caused by Project activities are as follows:

- Design of the LNG loading line corridor would consider and incorporate ways to maintain tidal flow and wildlife passage; and
- To minimize potential sedimentation of watercourses, disturbed riparian areas would be reclaimed with appropriate vegetation cover, as soon as practicable after construction.

### *Effects and Mitigation – Physical Injury or Mortality to Fish*

During construction, the greatest potential for injury or mortality to fish is associated with dewatering and infilling of aquatic habitats. Water withdrawal from Kitimat River during construction and operations could potentially lead to entrainment and impingement of



juvenile fish, especially eulachon larvae and juvenile Pacific salmon from the incurrent force of water being drawn in at the intake, thereby causing physical injury or mortality.

Key mitigation measures that would be incorporated to reduce physical injury or mortality to fish caused by Project activities are as follows:

- If isolating freshwater habitats during instream works occurs, fish would be salvaged and relocated to unaffected habitats;
- Timing windows would be identified and followed, unless otherwise authorized, to avoid critical fish life stages, such as spawning or incubation;
- Freshwater habitats to be affected by construction activities would be isolated from adjacent fish-bearing aquatic habitats; and
- Water intake location and design would minimize the risk of injury and mortality to fish, and would take into consideration the risk of entrainment of eulachon larvae during seaward migrations.

If a new water licence is required under the *Water Act*, it would require the development of an Operational Water Management Plan, which requires a procedure for safely adjusting flow rates in consideration of downstream fish. The Application stated that during the lowest flows, which would be expected to occur 6.7% of the time, water withdrawals would not be permitted under a water licence.

### 5.5.3 Potential Project Effects and Proposed Mitigation Identified During Application Review

#### *Species Utilization*

During Application Review, DFO required more information on species utilization and dependency of habitat so as to understand the effectiveness of proposed offsetting.

The Proponent provided more information in the CFHOP on how species use the habitat that was reported to be permanently altered or destroyed, and linked the proposed habitat offsetting to the function of the lost fish habitat. DFO was able to use this additional information to assess if the conceptual habitat offsets were consistent with DFO policy on offsetting requirements.

#### *Offsetting Ratios*

DFO determined that the Application and the initial CFHOP did not demonstrate that the Project impacts could be offset, and did not provide suitable offsets to counterbalance the Project residual effects to freshwater and estuarine fish and fish habitat.

The Proponent worked with DFO during Application Review to determine the types and amount of habitat offsetting that would potentially meet DFO's requirements. In a revised version of the CFHOP, the Proponent outlined how they would reduce the amount of habitat that would be lost, as well as increased the amount of habitat that would be gained through offsetting from 41,331 m<sup>2</sup> to 129,690 m<sup>2</sup>, thereby

increasing the offsetting ratio to a level that DFO was satisfied with to counterbalance the residual serious harm to fish. Table 5-3 provides a summary of habitat changes.

**Table 5-3: Areas of Habitat Loss**

Habitat Type	Application (m <sup>2</sup> )	Updated (m <sup>2</sup> )
Aquatic Habitat Lost	125,000	74,509
Freshwater Riparian Habitat Lost	1,060,000	721,654
Estuarine Riparian Habitat Lost	29,000	33,486

DFO stated that they were comfortable with the completeness of the conceptual information provided to inform an EA project review, and that they would provide additional comments on the Fish Habitat Offsetting Plan directly to the Proponent during regulatory review of the proposed Project.

EAO proposes a condition requiring the Proponent to offset any serious harm to fish and to develop a fish habitat offsetting plan or plans to the satisfaction of DFO. The Proponent must also identify the reduced risk work windows and any work that would occur outside of the reduced risk work windows.

*Temporal Harm to Fish Habitat*

DFO was of the opinion that constructed aquatic habitats would require planting to establish functioning vegetation, and that this would result in a time lag before the planted trees re-established to riparian habitat with the equivalent functional value as the existing habitat.

The Proponent responded that they are committed to the construction of aquatic habitat offsets that have fully functional riparian area, either by planting of unvegetated or disturbed streamside areas, or via the creation of stream channels through existing forested areas, or both.

*Eulachon*

Haisla Nation requested more information on effects to eulachon habitat, since there were historical eulachon observations in the lower Kitimat River. Haisla expressed their interest in seeing an improvement of eulachon habitat in the lower Kitimat River reach.

The Proponent has focused the habitat enhancement in the Kitimat River side channel on eulachon habitat enhancement. The Proponent also proposed a long-term stock assessment of salmon and eulachon populations in the Kitimat River system, as well as a research program to investigate the feasibility of eulachon propagation to support the recovery of the Kitimat River eulachon population in conjunction with DFO and Haisla.

EAO has proposed a condition requiring the Proponent to consider the Kitimat River eulachon population in the proposal of habitat offsetting measures.

*Water Withdrawals from the Kitimat River*

Gitga’at and Kitselas First Nations raised concerns regarding water withdrawals from the Kitimat River during low flow periods, and the potential effects of impairment of fish to access potential habitat, as well as reducing fresh water input into the estuary habitat.

The Proponent determined the ecosystem base flow thresholds for the Kitimat River, which is the minimum instream flow required to maintain aquatic health. The Proponent determined that removing freshwater from Kitimat River water withdrawals would unlikely adversely affect species that use the brackish water for life history strategies. The Proponent stated that the proposed Project would operate within the boundaries of the permitted water licence allocation and water level/flow would be regularly monitored. If the water level/flow dropped (which is a gradual phenomenon), the LNG production would be reduced over time and, if required, the LNG train(s) would be shut down in an orderly manner. EAO explored this issue further in discussions with DFO, OGC, Haisla Nation, and the Proponent, and is satisfied that the proposed Project’s water withdrawals from the Kitimat River would not result in residual adverse effects to fish or fish habitat.

5.5.4 Characterization of Residual Project Effects

After considering all relevant proposed mitigation measures, EAO concludes that the proposed Project would result in the following residual adverse effects on freshwater aquatic resources:

- Alteration or removal of freshwater and estuarine habitat;
- Potential physical injury or mortality to fish from habitat isolation during construction; and
- Potential physical injury or mortality to fish from water intake during operations.

Summarized below is EAO’s characterization of the expected residual effects of the proposed Project on freshwater aquatic resources, as well as EAO’s level of confidence in the effects determination (including their likelihood and significance).

<b>Criteria</b>	<b>Assessment Rating</b>	<b>Rationale</b>
Context	Moderate resilience	Estuary and tributaries at the head of Kitimat Arm are important rearing habitat for numerous fish of CRA importance. Much of the aquatic ecosystem in the LSA has been previously modified. CRA fish can be sensitive to disturbance and interference at critical life history stages. Off-channel areas provide rearing and overwintering habitat, especially for coho salmon.

Criteria	Assessment Rating	Rationale
Magnitude	<p><b>Fish Habitat:</b> Low</p> <p><b>Fish Injury or Mortality:</b> Low</p>	<p><b>Fish Habitat:</b> Construction would result in permanent alteration and destruction of fish habitat. With implementation of the Fish Habitat Offsetting Plan it would be of low magnitude because there would be a maintenance or enhancement of the ongoing productivity and sustainability of commercial, recreational and Aboriginal fisheries.</p> <p><b>Fish Injury or Mortality:</b> During construction, the magnitude of effects would be low with implementation of fish salvage and other mitigation. During operations, the magnitude of effects would be low with appropriate water intake design.</p>
Extent	Local	<p><b>Fish Habitat:</b> Effects would occur on the Kitimat River mainstem and side channels, and Anderson Creek, Beaver Creek, and Moore Creek. It would also include estuarine habitat in the tidally influenced channels west of the Kitimat River mainstem.</p> <p><b>Fish Injury or Mortality:</b> Effects would occur in the Project footprint during construction and at the area of water intake on the Kitimat River during operations.</p>
Duration	<p><b>Fish Habitat:</b> Short-term</p> <p><b>Fish Injury or Mortality:</b> Short-term to Long-term</p>	<p><b>Freshwater fish:</b> Infilling would occur during construction, but effects would be short-term because of habitat offsetting.</p> <p><b>Fish Injury or Mortality:</b> Short-term during construction when affected habitat is isolated, for the life of Project operations due to continuous water withdrawals.</p>
Reversibility	<p><b>Fish Habitat:</b> Reversible</p> <p><b>Fish Injury or Mortality:</b> Reversible</p>	<p><b>Fish Habitat:</b> Reversible following the establishment of offset habitat.</p> <p><b>Fish Injury or Mortality:</b> Reversible following the cessation of operations, as the effect would not cause a measurable change in the population.</p>
Frequency	<p><b>Fish Habitat:</b> Multiple events</p> <p><b>Fish Injury or Mortality:</b> Multiple events to Continuous</p>	<p><b>Freshwater fish:</b> The residual effect on freshwater fish habitat would occur over phases during construction.</p> <p><b>Fish Injury or Mortality:</b> Multiple events when fish in different areas are isolated during construction, with mitigation, injury or mortality of fish would be low. Continuous during operations due to ongoing water withdrawals.</p>
Likelihood	<p><b>Fish Habitat:</b> While there is a high likelihood of short-term residual effects to freshwater fish habitat, implementing the Fish Habitat Offsetting Plan would result in a low likelihood of residual effects to freshwater fish overall.</p> <p><b>Fish Injury or Mortality:</b> The likelihood of residual effects for fish injury or mortality is low. Predicted numbers of dead or moribund fish as a result of Project activities are very low, such that there would be no measureable effects to species at a population level.</p>	

Criteria	Assessment Rating	Rationale
Significance		Considering the above analysis, and having regard to the conditions identified in the TOC (which would become legally binding as a condition of an EAC, EAO is satisfied that the proposed Project would not have significant adverse residual effects on freshwater aquatic resources.
Confidence		The significance determination and likelihood rating for residual effects are determined with a moderate level of confidence, based on the proposed mitigation and offsetting measures, particularly existing federal and provincial regulatory requirements, as well as well-developed industry best management practices and compliance with the proposed EAC conditions. There is some uncertainty because the mitigation of habitat effects depends on the effectiveness of the Fish Habitat Offsetting Plan implementation.

### 5.5.5 Cumulative Effects Assessment

Previous industrial development has affected known Kitimat River eulachon spawning habitat, with river bank armouring in the direct vicinity of the most suitable spawning habitat for the Kitimat River. Alcan constructed a dike in the 1950s that blocked side channels that were also used by eulachon for spawning. The Application stated that the Project would displace 3,578 m<sup>2</sup> of side channel habitat on the Kitimat River, but that the existing side channel does not support suitable habitat for eulachon spawning in its present state. More suitable eulachon spawning habitat would be provided in the realigned channel as part of Project offsetting.

The Application stated that the Kitimat River has had previous declines in coho and chinook salmon escapement, which may be due to a combination of factors, including forestry activities, industrial development by Eurocan and RTA, and commercial and recreational fishing. Channelization of Moore and Anderson Creeks through the RTA facility also reduced coho spawning, resulted in the loss of mainstem rearing and off-channel habitat, and decreased riparian habitat function.

There is a potential cumulative effects interaction with coho salmon juvenile rearing habitat due to the destruction of freshwater aquatic habitat during Project construction. Construction of several pipeline projects (Coastal GasLink Pipeline, Enbridge Northern Gateway, Pacific Northern Gas Pipeline, and Pacific Trail Pipeline) would include crossings of the Kitimat River, as well as Beaver, Anderson, and Moore Creeks. After successful habitat offsetting, the proposed Project would not contribute to the cumulative effects that may occur from other projects or activities.

There is a potential for increased physical injury or mortality to fish related to instream work activities and associated effects. As a result of permitting, these projects would be required to undertake appropriate standard best management practices to mitigate the risk of injury or mortality to fish so that cumulative effects would be negligible.

EAO concludes that no significant cumulative effects to freshwater and estuarine fish and fish habitat are expected as a result of effects of the proposed Project interacting with effects of other past, present and reasonably foreseeable future projects and activities.

### 5.5.6 **Conclusions**

Considering the above analysis, and having regard to the conditions identified in the TOC (which would become legally binding as a condition of an EAC), EAO is satisfied that the proposed Project would not have significant adverse effects on freshwater and estuarine fish and fish habitat.

## 5.6 Marine Resources

### 5.6.1 Background

Marine resources was identified as a VC because of its ecological importance, importance to local fisheries and communities, and importance to Aboriginal Groups whose cultures and traditional resource harvesting activities are deeply connected to the marine environment. The marine waters surrounding Kitimat provide diverse habitats supporting many species that contribute to the ecological, cultural and economic well-being of the region.

The Marine Resources VC assessment focused on potential effects on marine species with the Application reporting on four potential project effects:

- Change in fish habitat;
- Harm to fish and marine mammals;
- Change in fish health as a result of toxicity; and
- Change in behaviour of fish and marine mammals due to underwater noise or pressure waves.

Key issues of concern raised during stakeholder and Aboriginal engagement were issues related to CRA fisheries, marine species mortality and effects on habitat, and alteration of fish and mammal behaviour. Key issues of concern raised by the public were the effects of construction on whales and fish, and the effects of shipping on whales and whale habitat.

Separate spatial boundaries were identified for the facility, shipping, and disposal at sea (DAS) sites. The facility LSA (Figure 5-2) and RSA encompasses marine waters from the head of Kitimat Arm south to the northern tip of Coste Island. The shipping LSA and RSA encompasses the extent of shipping activities and surrounding waters within the confined channels (e.g., Kitimat Arm, Douglas Channel, Squally Channel, Principe Channel), Whale Channel, Caamaño Sound, and marine waters along the marine access route out to the Triple Island Pilot Boarding Station in the north (Figure 5-3). Where the marine access route is not confined by geography, a buffer of 10 km was used on either side around the route. The DAS study areas includes spatial areas considerably larger than the expected disposal footprint because they represent investigative areas and not physical receiving sites, and are captured as DAS basin study areas (BSAs) (Figure 5-4).

#### *Regulatory Context*

The federal *Fisheries Act*, administered by DFO and EC, is the main statute related to the conservation and protection of marine fish, fish habitat and marine mammals. Fish and fish habitat protection measures include a prohibition, if unauthorized, against serious harm to fish that are part of a CRA fishery, or to fish that support such a fishery

(subsection 35[1]); and a prohibition against the deposition of deleterious substances in water frequented by fish (subsection 36[3]).

DFO is responsible for administering all aspects of SARA related to aquatic species at risk. SARA contains specific requirements for when project reviews are being undertaken under CEAA 2012. It requires the assessment of adverse effects of a proposed project on any species listed in Schedule 1 of SARA, for measures to be taken to avoid or lessen those effects, and requires those measures to be monitored. All measures must be consistent with any recovery strategies or action plans in place for SARA listed species.

EC administers the *Canadian Environmental Protection Act, 1999* and the Disposal at Sea Regulations, which regulate the disposal of material at sea (e.g., dredge material). Schedule 5 of the *Canadian Environmental Protection Act, 1999* lists the type of substances that may be considered for a disposal-at-sea permit, which include dredged materials, inert inorganic geological matter, and uncontaminated organic matter of natural origin.

The *Canada Shipping Act, 2001* governs safety and protection of the environment for all marine transportation, including recreational pleasure craft. The *Canada Shipping Act, 2001* and its supporting regulations apply to every Canadian vessel operating in all waters worldwide and to all foreign vessels when operating within Canadian waters. It is supported by two primary environmentally focused marine transportation regulations: the Vessel Pollution and Dangerous Chemical Regulations and the Ballast Water Control and Management Regulations (Ballast Water Regulations).

## 5.6.2 Potential Project Effects and Proposed Mitigation Described in the Application

### *Baseline Context– Marine Habitat and Species*

Marine habitat in the LSA is characterized by turbid surface layers, estuarine circulation, and typically low oxygen (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 along the shipping RSA. CRA fisheries may have historically affected fish populations in the RSA.

Marine riparian, intertidal, subtidal, eelgrass and kelp bed, estuary, and salt marsh habitats occur in the facility LSA (Figure 5-2) and RSA. The RSA and BSAs overlap with DFO Important Areas for eulachon, tanner crabs, and cloud sponges; and the RSA encompasses salmon and eulachon spawning rivers and Pacific herring spawning areas.



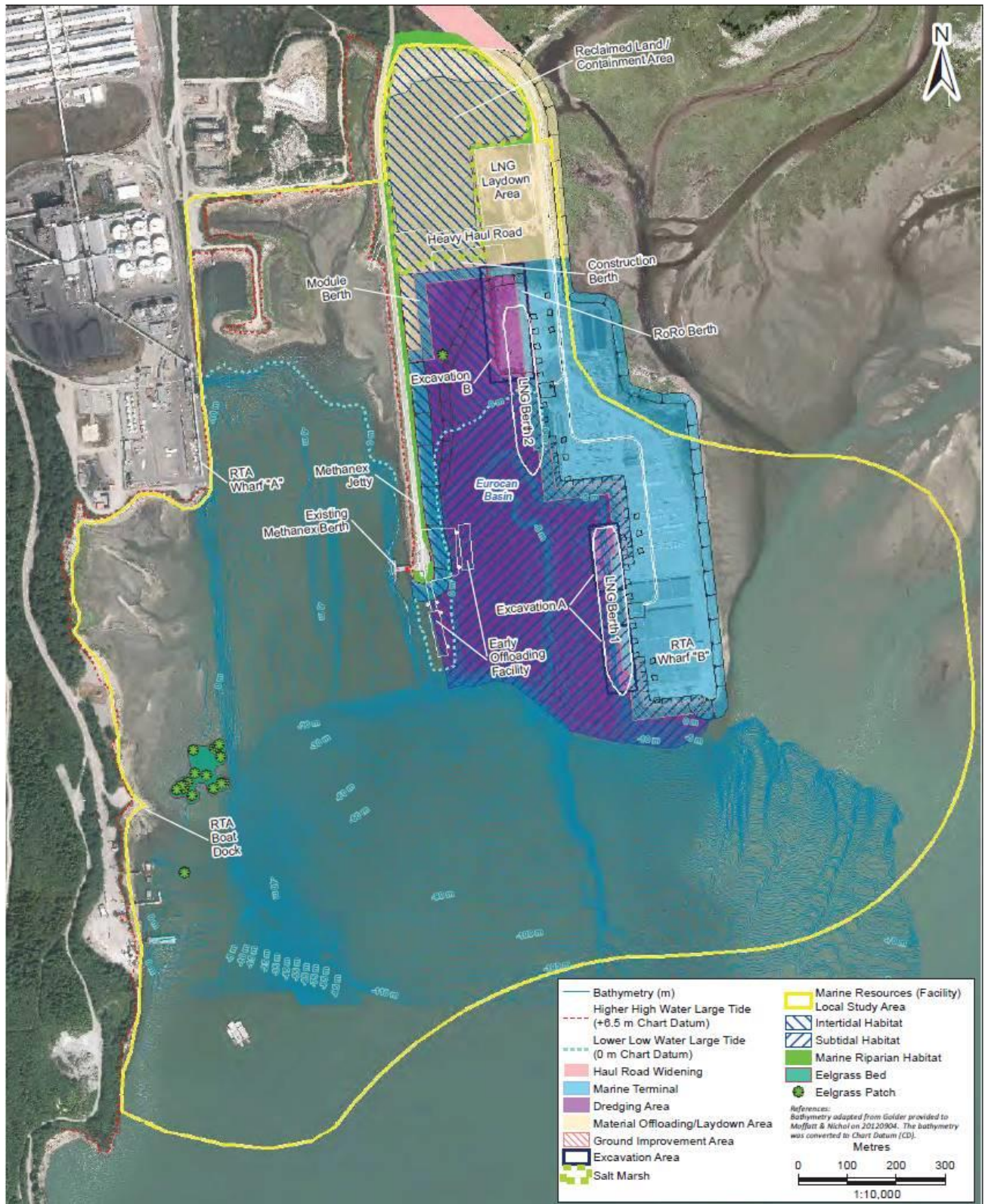
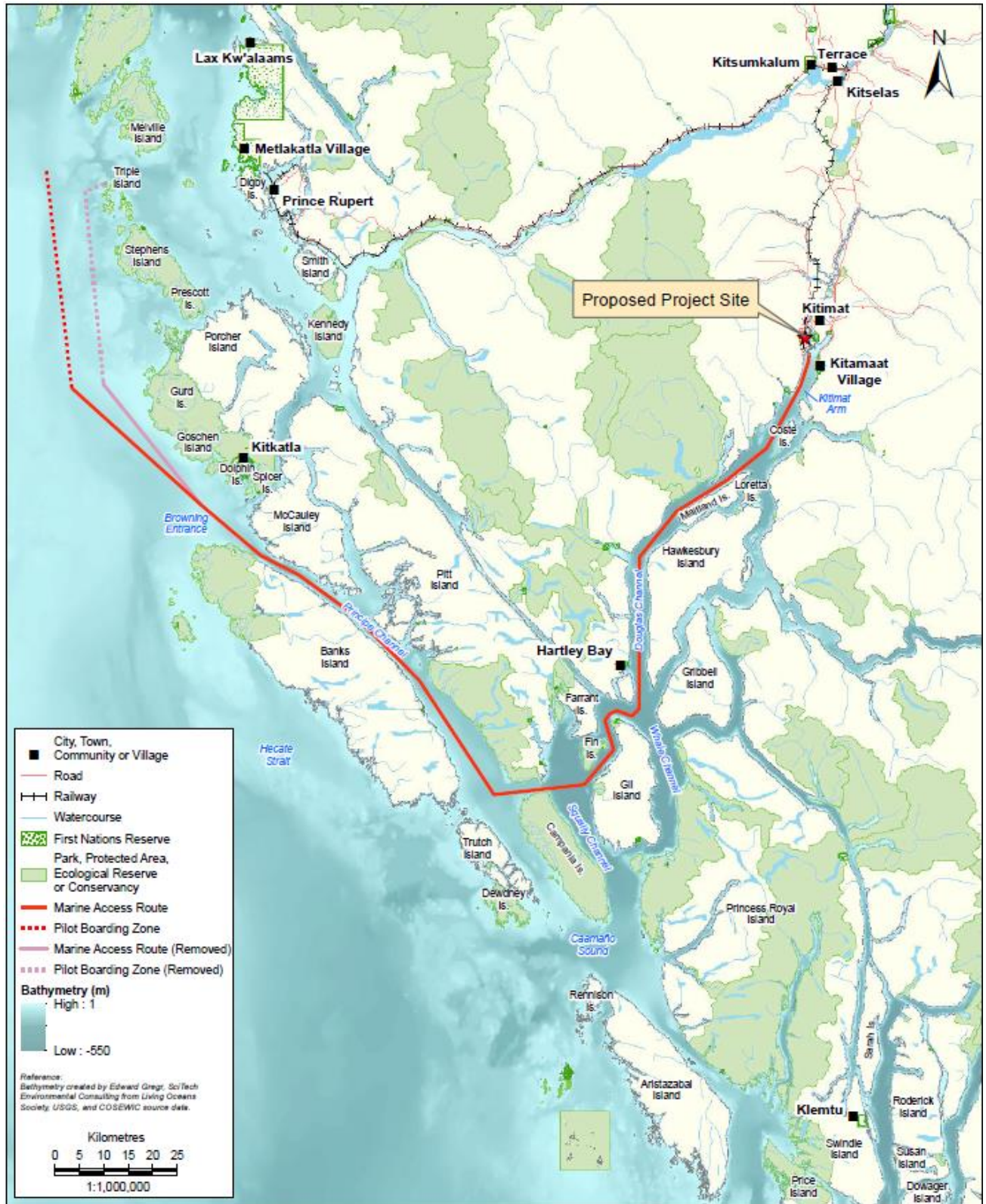


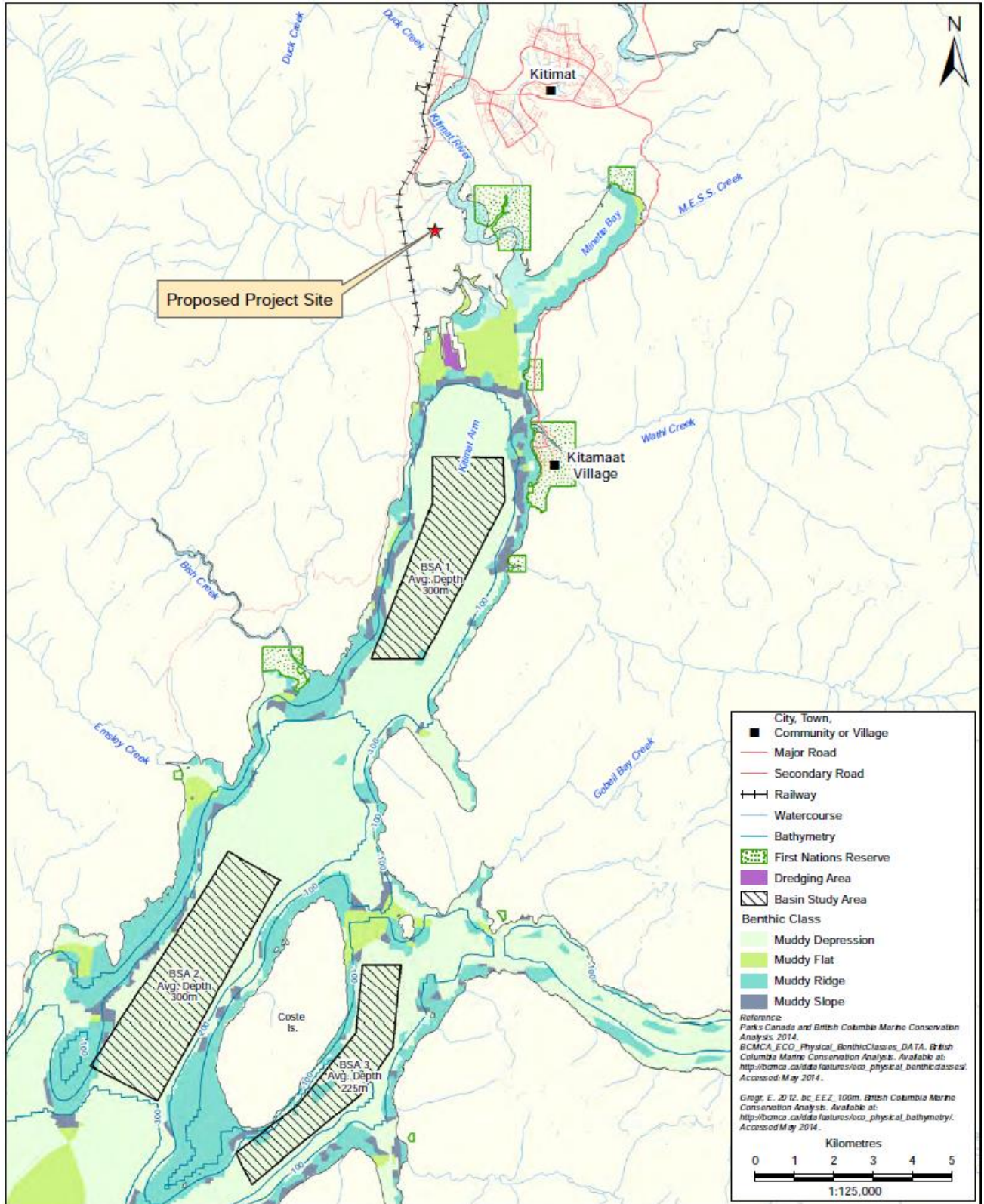
Figure 5-2: Marine Terminal





**Figure 5-3: Changes to the Marine Access Route**





**Figure 5-4: Proposed Disposal at Sea Locations**

In the intertidal zone, four marine fish species, 15 invertebrate species, one seagrass species, 12 algae species, and five marsh plant species were observed. The Proponent identified approximately 20 commercial, aboriginal and recreational species in the facility RSA. Many of these species, including all five species of pacific salmon, would utilize the intertidal zone to carry out one of more life processes. During intertidal surveys, a patchy eelgrass (*Zostera marina*) bed covering approximately 9,100 m<sup>2</sup> was observed in the southwest portion of the LSA. Within the bed, 12 small patches of eelgrass were identified ranging in size from 1 m<sup>2</sup> to 30 m<sup>2</sup> with densities of 10% to 95% cover.

A salt water marsh covering an area of 84,000 m<sup>2</sup>, consisting of marsh vegetation and a network of tidal channels subject to daily inundation at high tide, provides habitat for juvenile salmon and non-migratory fish species. The marsh substrate consists of mud and is covered by beds of unattached rockweed (*Fucus gardneri*) in many areas. Two marine algae species, six marsh plant species, two marine invertebrate species, and two marine fish species were observed in the salt marsh during the surveys.

Subtidal habitat in the facility LSA consists of mud flats (58% of LSA), mud depressions (15% of LSA), mud ridges (15% of LSA), and mud slopes (11% of LSA) with limited structural complexity (e.g., lacking rocky substrates and biogenic habitats). The Proponent found 51 marine fish and invertebrate species, five algae species, and one seagrass species (common eelgrass) at or near the seabed of the LSA during surveys. Overall, coverage of marine algae in the subtidal zone was sparse, with densest coverage in shallow areas of the LSA, typically at depths of less than 5 m, on rocky substrates.

The DAS BSAs are characterized by steep bedrock walls and a gently sloping soft seabed comprised of mud and silt sediment.

Marine mammals are abundant on the north coast of BC, and many species are found year-round and seasonally within the shipping RSA. Baleen whales commonly observed in the region include humpback, grey, fin and minke whales. Toothed whales that frequent the shipping RSA include northern resident and Bigg's killer whales, Pacific white-sided dolphins, Dall's porpoise and harbour porpoise. Harbour seals, Steller sea lions and sea otters are also found within the shipping RSA.

Species at risk listed on Schedule 1 of SARA potentially occurring in the facility and shipping LSA are: blunt nose sixgill shark, green sturgeon, longspine thornyhead, northern abalone, Olympia oyster, rougheyeye rockfish, tope, yelloweye rockfish, humpback whale, fin whale, grey whale, northern resident killer whale, Bigg's killer whale, harbour porpoise, Steller sea lion, and sea otter.

#### *Baseline Context – Water Quality and Sediment*

Sediment and water quality have been affected by historic industrial activities over the past 60 years, including 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.

The Application stated that elevated contaminant levels above natural background concentrations, particularly for polycyclic aromatic hydrocarbons (PAHs), have been recorded in waters of the facility RSA. PAHs are the contaminants of most concern due to their high concentrations and potential for toxicity. The Application stated that these PAHs are present in large soot/coke particles and are considered to have low bioavailability and, therefore, have low toxicity to marine organisms.

The Application stated that analysis of sediment sampling from 2012 to 2014 in the dredge area indicated that levels of individual PAHs were above CCME probable effects levels (PEL) at 43 locations, which means that they are likely to result in adverse biological effects.

Total parent PAH levels were higher than the DAS Tier 1 screening criterion (2.5 mg/kg) in 75% of the locations, mainly in the top 3 m of sediment, but extending to 6 m in the area west of LNG Berth 2 (Figure 5-2). Copper and zinc concentrations were higher than PEL in some locations, and dioxin and furan levels were above the CCME *Interim Sediment Quality Guidelines*, but below the PEL in several locations. Sampling from previous studies reported that PAH concentrations were highest in the Alcan Harbour, but were also elevated in the facility LSA and, to a lesser extent, throughout Kitimat Arm, compared with reference sites.

#### *Effects and Mitigation – Marine Habitat*

The proposed Project has the potential to result in the loss or alteration of marine habitat. Marine construction will result in alteration or destruction of marine riparian, intertidal, and subtidal habitats. The marine terminal, consisting of two LNG berths and a MOF, and a temporary early offloading facility (EOF) would be built in the Eurocan Basin, shown in Figure 5-2. In-water construction for this infrastructure would involve dredging, excavation, placement of scour protection, soil improvements, and pile installation.

Soil modification along the RTA Wharf “B” and Methanex jetty in the subtidal zone would involve vibro-densification and installation of stone columns in the subtidal mudflat. Tops of the stone columns will be approximately 30 cm below the seabed after installation, and this space would be backfilled with sediment from the area. Scour protection at the RTA Wharf “B” and Methanex jetty would involve placement of a rock apron/blanket on the seabed.

Approximately 84,000 m<sup>2</sup> of salt marsh immediately north of the dredge area would be permanently destroyed. The salt marsh would be used for the construction of the heavy haul road and the MOF, as well as for disposing of some of the dredged material.

Dredging of the mudflat in the dredge pocket to depths of -10 m to -14 m chart datum would affect an estimated area of 248,600 m<sup>2</sup>, including approximately 43,600 m<sup>2</sup> of intertidal mudflat habitat, 3,262 m<sup>2</sup> of eelgrass, and 190,800 m<sup>2</sup> of subtidal mudflat habitat. The remaining area represents the excavated areas of RTA Wharf “B” that do not provide fish habitat at present.

The Proponent stated that maintenance dredging would be required approximately every 10 years, but could happen as often as every 5 years, and so the Proponent assumed that all habitat from the dredge pocket would be permanently removed.

The Application stated that approximately 4,970 m<sup>2</sup> of new constructed intertidal habitat (i.e., rock riprap/boulder) would be installed along RTA Wharf “B” and the Methanex jetty to provide slope protection. Marine algae, fish, and invertebrate communities are expected to become established in the newly created habitat within six months to two years of disturbance.

The marine terminal footprint and the changes in water depth from dredging have the potential to alter sediment transport, erosion, and deposition patterns as the area adjusts to the new conditions and moves toward stability. Along the seaward slope and step of the dredge footprint, a narrow band of deposition (less than 1 m change) interspersed with small areas of erosion (less than 1 m change) is predicted to occur. A narrow band of erosion is also predicted to occur along the western edge of the berth area (less than 0.5 m change) and also along the western shore of Kitimat Arm directly west of the southern extent of the berth area (less than 1.0 m change in an area 100 m by 200 m in size). Increased sediment deposition associated with dredging has the potential to smother or bury eelgrass in the patchy area on the western shore of Kitimat Arm, which is about 450 m from the dredge area.

The predicted total area of permanent alteration or destruction of marine fish habitat resulting from Project activities stated in the Application is summarized in Table 5-4.

**Table 5-4: Total Area of Marine Fish Habitat Types Permanently Altered or Destroyed**

Habitat Type	Project Activity	Potential Area of Serious Harm
Salt Marsh	<ul style="list-style-type: none"> <li>• Construction of heavy haul road and MOF</li> </ul>	84,000 m <sup>2</sup>
Intertidal Mudflat	<ul style="list-style-type: none"> <li>• Dredging</li> <li>• Construction of heavy haul road</li> <li>• Installation sheet piled wall</li> </ul>	51,663 m <sup>2</sup>
Eelgrass Bed	<ul style="list-style-type: none"> <li>• Dredging</li> <li>• Altered sediment transport</li> </ul>	3,262 m <sup>2</sup>
Constructed Intertidal	<ul style="list-style-type: none"> <li>• Excavation of RTA Wharf “B” and Methanex jetty</li> <li>• Construction of EOF and MOF</li> </ul>	14,193 m <sup>2</sup>
Subtidal Mudflat	<ul style="list-style-type: none"> <li>• Dredging</li> <li>• Soil Improvements and scour protection</li> <li>• Installation of piles and sheet pile wall</li> </ul>	190,800 m <sup>2</sup>

Habitat Type	Project Activity	Potential Area of Serious Harm
Marine Riparian	• Construction of heavy haul road, MOF and EOF	16,049 m <sup>2</sup>

The total dredge volume would be a maximum of 3.5 million m<sup>3</sup>. Up to 3 million m<sup>3</sup> of dredged material from the marine terminal would be deposited at a disposal site in upper Kitimat Arm (Figure 5-4). Only sediment that meets the EC disposal at sea regulated criteria would be disposed of at sea. The dredged material that does not meet the criteria for disposal at sea, but does meet the BC contaminated site regulations for on land disposal would be dredged and placed directly in the salt marsh immediately north of the MOF following its isolation. The remaining dredge material that does not meet the BC contaminated site regulations for on land disposal would be disposed of at an appropriate permitted facility.

DAS would affect an estimated area of 1.2 million m<sup>2</sup> of subtidal soft substrate. The Application stated that deep-water habitat in the BSAs makes large-scale sediment movements following disposal unlikely; therefore, the further alteration of habitat structure or cover following deposition is expected to be minimal. Substrate at the disposal site would be located well below the photic zone at depths greater than 150 m; therefore, no marine vegetation is expected to be smothered or buried during disposal. The DAS site would not be located in an area with high structural complexity and sensitive habitats, and would have high resilience. Benthic communities and fish assemblages in the soft bottom habitat at the disposal site are expected to recover within two years following disposal; therefore, disposal of dredged material at sea is not expected to affect the population viability of any fish species, including species at risk.

Key mitigation measures that would be incorporated to address impacts to fish habitat caused by project activities are:

- A fish habitat offsetting plan would be developed and implemented to offset unavoidable serious harm to fish from Project activities and works; and
- A marine activities plan would be developed in accordance with applicable federal and provincial legislation and regulations, and would include measures to address potential effects from dredge activities, pile installation (including marine mammal exclusion zone, soft start procedures and consideration of sound dampening technologies) and shipping.

#### *Effects and Mitigation – Injury or Mortality of Fish and Marine Mammals*

The proposed Project has the potential to result in the direct mortality or injury of species and avoidance behavior of species as a result of underwater noise. There is potential for Project-related vessels to collide with marine mammals. At full build-out, up to 350 LNG carrier transits to the marine terminal could take place annually. During construction, ship traffic volumes may be sporadic with periods of high activity. On average, ship traffic volumes during construction and operation are expected to be similar (approximately one vessel per day visiting the marine terminal). The slower speeds planned for the vessels along the marine access route in designated areas of

high marine mammal density (maximum speed of 10 knots for approximately 18 km/h) during specific periods of high marine mammal densities should decrease the likelihood and severity of a collision and reduce underwater vessel noise. The LNG carrier would also have two BC Coast Pilots accompanying all LNG carriers when travelling between Triple Island and the port of Kitimat, enhancing the look-out capacity of the bridge team during transits in the channels. Direct harm to marine mammals from shipping is also discussed in the accidents and malfunctions section (section 10).

Direct physical injury or mortality to marine fish and invertebrate species may occur due to burial or crushing during dredging, DAS, soil improvements, installation of scour protection, excavation of areas of the RTA Wharf "B" and Methanex jetty, installation of piles and sheet piled wall, construction of the heavy haul road and MOF across the intertidal mudflat (marine construction), and dismantling of marine infrastructure. Physical injury or mortality would most likely occur to slow-moving and sessile marine invertebrates because they are unable to relocate. Harm to fish and mobile invertebrates are likely to be negligible because they are typically able to avoid burial or crushing by leaving the area once activities are underway. No endangered or threatened fish species are expected to be harmed. Prior to isolation of the salt marsh habitat immediately north of the dredge area, fish using the area would be captured and relocated to areas that would not be affected by the proposed Project activities.

Fish and marine mammals would be exposed to underwater noise and high pressure waves produced during pile installation that could result in harm. With monitoring noise levels and implementing mitigation measures such as applying sound dampening and/or alternative pile installation methods, the Application stated that the number of fish within any given species expected to be harmed was anticipated to be negligible relative to their total population size in the facility RSA. No endangered or threatened species at risk fish species are expected to be injured or killed due to noise or pressure waves during pile installation.

The Application stated that the expected number of marine mammals that could potentially be exposed to noise capable of causing permanent auditory damage is likely to be low, largely due to the low numbers of marine mammals modelled to be near construction activities. Endangered and threatened species (e.g., humpback whales, fin whales, Bigg's and northern resident killer whales, harbour porpoise, and Steller sea lion) are expected to be present in low numbers within the facility RSA. Dredging and DAS activities would not create underwater noise that could cause harm to marine mammals. Mitigation measures, such as marine mammal exclusion zones, would reduce the potential for marine mammals to be exposed to underwater noise above the injury threshold during pile installation.

The Application stated that the following key mitigation measures would be implemented to reduce the potential for injury or mortality to fish and marine mammals during construction, including:



- Measures to address potential effects from dredge activities and pile installation, including a marine mammal exclusion zone, soft start procedures and consideration of sound dampening technologies;
- Use of timing windows and mitigations developed in consultation with DFO at the permitting stage, and in consideration of the location and timing of sensitive life stages specific to CRA fishery species. In-water marine construction, dredging, and sediment disposal activities would be conducted throughout the year; for the periods outside the timing windows of least risk, additional mitigation measures would be implemented to protect sensitive species and life stages as appropriate; and
- For marine pile installation, the Proponent would proactively manage pile installation with noise measurement and active monitoring of marine mammal exclusion zones. Additional sound dampening methods and/or alternative pile installation methods would be investigated and applied if necessary, to prevent the exposure of marine mammals to underwater noise exceeding defined thresholds.

#### *Effects and Mitigation – Change in Behaviour to Fish and Marine Mammals*

BSA2 and 3 overlap with DFO recognized important habitat for humpback whales. Marine mammal behavioural responses to underwater noise could include increased stress and disrupted communications, disrupted migration and foraging patterns, and changes in surfacing and diving behaviour.

Underwater noise from shipping may result in a change in behavior by marine mammals potentially causing temporary stress-induced physiological changes, altered sound perception and impaired communication, and avoidance behaviors that may disrupt migration or foraging patterns. Underwater noise from shipping may result in temporary changes in behavior to marine fish, but are unlikely to result in large-scale displacement of populations from foraging, spawning, rearing, or migration habitat, or otherwise affect population viability.

SARA Schedule 1 marine mammals and marine fish expected to be present along the marine access route and potentially affected by underwater noise are: humpback whale, fin whale, grey whale, Bigg's and northern resident killer whales, harbour porpoise, Steller sea lion, blunt nose sixgill shark, green sturgeon, longspine thornyhead, roughey rockfish, tope, and yelloweye rockfish. Other marine mammals that may be affected by shipping underwater noise are: Dall's porpoise, Pacific white-sided dolphins, harbour seals, fin whales, and minke whales.

The Application stated that the following key mitigation measures would be implemented to reduce the potential for behavioural change to fish and marine mammals during operations, including:

- 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 would travel at speeds not greater than 10 knots from July through October (which is the predicted period of high use by marine mammals).

### *Effects and Mitigation – Water Quality and Sediment*

The proposed Project has the potential to result in indirect impacts to marine species and habitat as a result of sedimentation or water quality. Sediment within the Project footprint contains contaminants, primarily PAHs, but also metals, dioxins, and furans. Dredging and marine construction have the potential to change fish health when sediment is disturbed and existing contaminants are released into the water column. The human health effects of country foods contamination is assessed in section 9.1. The greatest amount of sediment disturbance would be associated with dredging.

The sediment surface layer would be disturbed during dredging, and disturbed contaminants and sediment would be re-suspended in the water column, with the possibility of it settling in areas with lower contaminant levels. Uptake of contaminants may lead to toxicity in fish.

The Application stated that dredging, DAS, installation of scour protection, soil improvements and pile installation would result in re-suspension of sediment that would increase levels of total suspended solids (TSS). This increase in TSS levels may harm fish through gill or egg abrasion, reduced pumping rates in bivalve molluscs, and direct mortality. Modelling carried out by the Proponent suggests that disposal of dredged material at sea has the potential to result in an exceedance of water quality guidelines (WQGs) for TSS, which would result in temporary effects to some species of marine fish and invertebrates at or near the disposal site. The Application stated that effects on marine mammals are not expected as these organisms are not known to be sensitive to elevated TSS levels. The likelihood of harm to fish depends on factors such as species, life stage, TSS concentration, and duration of exposure.

The Application identified the following key mitigation measures that would be implemented to reduce effects to sediment or water quality:

- In-water marine construction, dredging, and sediment disposal activities would be conducted throughout the year, and for the periods outside the timing windows of reduced risk additional mitigation measures would be implemented to protect sensitive species and life stages as appropriate; and
- Optimization of sediment containment would be considered when selecting dredging and sediment disposal methods/equipment.

### 5.6.3 Potential Project Effects and Proposed Mitigation Identified During Application Review

#### *Offsetting*

DFO determined that the Application and the initial CFHOP did not have enough information on how the Project impacts to fish habitat in the marine and estuarine environments would be offset.

The Proponent worked with DFO through application review to come up with the types and amount of habitat offsetting that would meet DFO requirements. The final estimate provided by the Proponent stated that 92,316 m<sup>2</sup> of marine and estuarine fish habitat would be lost, and the offset would result in a gain of 184,632 m<sup>2</sup> of salt marsh habitat and 18,210 m<sup>2</sup> of intertidal rock reef habitat. The final offsetting would be determined in subsequent permitting through the *Fisheries Act*.

DFO stated that they were comfortable with the completeness of the conceptual information provided to inform the EA, and that they would provide additional comments on the proposed fish habitat offsetting during their regulatory review.

EAO has proposed a condition requiring the development and implementation of a fish habitat offsetting plan that would ensure that lost fish habitat is offset.

#### *Zone of Influence for Noise to Marine Mammals*

DFO requested additional information on the zone of influence for underwater noise effects from construction, and an understanding of species utilization within that area. DFO requested additional information on high utilization periods, and any species dependency within the zone of influence to understand the context of potential effects.

The Proponent did not find high species abundance near the proposed terminal. During Application review, the Proponent proposed additional mitigation measures regarding the delineated zone of influence. The Proponent committed to testing each pile rig before commencing to determine a 160 dB mammal observation limit, and that piling would cease if a mammal was observed within this zone.

In response to these concerns, EAO has proposed a condition requiring the development and implementation of a marine mammal monitoring plan that would identify areas and periods of risk for sensory disturbance and injury to marine mammals and would identify measures to minimize sensory disturbance or injury to marine mammals during construction and operations.

#### *Shipping Effects to Marine Mammals*

Some Working Group members expressed concern regarding the Proponent's reported low to medium level of confidence in the assessment of noise effects from shipping on

marine mammal populations. There were concerns raised that there may be greater behavioural effects to marine mammals than predicted in the Application. To address the uncertainty in the effects, there was interest in a marine mammal monitoring program to monitor the effects of shipping on marine mammals.

The Proponent responded that it is of the view that the increase in vessel activity on the North Coast, and the related potential effects, are not exclusive to the LNG Canada project. The Proponent considered that monitoring effects along the marine access route would be more effective if undertaken as part of a broader shipping industry effort, and proposed to participate in a broader shipping industry effort.

In response to these concerns, EAO has proposed a condition requiring the development of a marine mammal management and monitoring plan to mitigate, monitor, and adaptively manage potential behavioural change or injury to marine mammals from shipping.

The Proponent also revised the location of the marine access route so that it moves further offshore as it travels between Browning Entrance and Triple Island, as seen in Figure 5-3. This revision is a result of input received from Aboriginal groups about potential interactions with marine mammals, potential impacts from the pilot vessels in the vicinity of Triple Island, and interactions with vessels bound for Prince Rupert. The new marine access route is captured in the CPD.

#### *Marine Habitat in Dredge Pocket*

There were concerns raised by the Working Group about the potential of elevated TSS levels from propeller wash, and the potential effects on fish, especially during sensitive spawning times. There also were concerns raised that if maintenance dredging occurred more frequently, that marine habitat would not have time to recover between each dredge.

The Proponent provided additional information on scour protection, and mitigation actions that would be taken to minimize propeller wash. A rock apron/blanket would be installed on the seabed at the berths, and tugs would maneuver the LNG carriers in and out of berths. The point where LNG carriers would disengage and engage the propellers would be in approximately 100 m of water depth. Propeller wash is not expected to increase TSS levels above the CCME guideline.

In communication with DFO late in Application review, the Proponent was unable to state that dredging would not occur more frequently than every 10 years, and, therefore, the Proponent would assess the dredge pocket as “serious harm” for the *Fisheries Act* authorization. The Proponent would increase its amount of marine offsetting for the *Fisheries Act* approval to account for this potential effect.

### *Bioavailability of PAHs*

There were concerns raised by the working group that there was too much uncertainty in the bioavailability of PAH, that additional study and monitoring should be carried.

The Proponent responded by initiating tissue sampling for crab and sole to confirm bioavailability, the results of which was shared with the working group when the lab analysis is completed late in Application Review.

In response to these concerns, EAO has proposed a condition requiring the development and implementation of a marine water quality and contaminants plan that would limit the re-suspension of sediment, and to carry out follow-up tissue sampling to confirm the assessment of predictions. The baseline tissue sampling results would help form the baseline for monitoring.

### *Timing Windows*

DFO requested more information on timing windows for dredging and DAS to understand effects to CRA fish species during sensitive life stages to provide advice on the effects to fish.

During Application review, the Proponent proposed a timing window of September 1 to February 15 for construction activities that occur below the high tide mark (i.e. dredging and DAS; construction of the EOF, MOF, and marine impact pile driving) to avoid injury to fish or the death of fish, and to avoid disruption to sensitive life stages and processes of fish.

In response, DFO stated that the least risk marine work window for that area is November 30 to February 15, and that working outside of these timing windows would require the specific avoidance and mitigation measures outlined in the EMP.

In response to these concerns, EAO has proposed a condition requiring the development and implementation of a fish habitat offsetting plan that would identify reduced risk work windows where marine construction work would occur.

### *Effluent discharge*

Several Working Group members expressed concerns regarding the level of detail in the Application on the possible contaminants in the facility's effluent discharge.

The Proponent provided a list of possible contaminants of potential concern (COPCs) for hydrostatic test/commissioning water, cooling tower water, sanitary sewage, and hydrocarbon-contaminated site water. The Proponent also outlined their approach to effluent treatment, and stated that the facility would be designed to meet discharge water quality specifications and BC Water Quality Guidelines for the protection of marine aquatic life.

The Proponent also assessed the potential effects for effluent discharge into marine waters. The assessment concluded that effluent discharge would not be acutely toxic to fish or aquatic life at the outfall location. It is anticipated that exposure to COCPs would be greater for sessile invertebrates and vegetation at the outfall location than for mobile fish and invertebrates that move in and out of the area.

MOE still had uncertainty that the proposed mitigation would effectively remove all COCPs to levels below the BC Water Quality Guidelines, and uncertainty about the acute toxicity of the effluent discharge. To ensure that effluent discharge meets BC Water Quality Guidelines, EAO has proposed conditions requiring the development and implementation of a water quality monitoring program.

### *Disposal at Sea*

Working group members (including EC, DFO, Health Canada, Haisla Nation, Gitga'at First Nation and Metlakatla First Nation) raised concerns that all of the five proposed DAS sites were assessed generally, and did not contain site-specific assessments. EC also requested sediment fate modelling for each of the proposed DAS sites.

The Proponent conducted additional analysis and provided additional site-specific information during Application review. During review of this information, Haisla Nation stated that they would experience economic and cultural effects if the DAS sites within BSA2 and BSA3 (Figure 5-4) were used. Other issues identified in the Proponent's additional analysis found that there was the potential presence of sensitive species in BSA2 and BSA3, particularly eulachon and glass sponges observed in Amos Passage during the ROV survey. The Proponent also found that these sites are in closer proximity to recreational sites.

Based on this additional information, the Proponent determined that the candidate DAS sites within BSA2 and BSA3 would not be further evaluated as part of the EA or proposed as alternate options for disposal at permitting. Only the candidate DAS site in BSA1 would be evaluated in the environmental assessment and in the Environment Canada Disposal At Sea Permit Application.

#### **5.6.4 Characterization of Residual Project Effects**

After considering all relevant proposed mitigation measures, EAO concludes that the proposed Project would result in the following residual adverse effects on marine resources:

- Change in marine habitat;
- Change in fish health at the LNG facility as a result of toxicity from dredging;
- Harm to fish and mammals during construction;
- Potential harm to fish or marine mammals due to underwater noise or pressure waves during construction; and

- Potential avoidance behaviour of marine mammals due to underwater noise from shipping during operations.

Summarized below is EAO's characterization of the expected residual effects of the proposed Project on marine resources, as well as EAO's level of confidence in the effects determination (including their likelihood and significance).

Criteria	Assessment Rating	Rationale
Context	<p><b>Marine Habitat:</b> Moderate to high resilience</p> <p><b>Fish Health:</b> Moderate resilience</p> <p><b>Fish and Marine Mammal Harm:</b> Moderate to high resilience</p> <p><b>Marine Mammal Behaviour:</b> Moderate resilience</p>	<p><b>Marine Habitat:</b> Nearshore habitats, which include marine riparian habitat, mudflats, eelgrass beds and saltwater marsh, provide important hiding and feeding environments for juvenile fish. Some important intertidal and shallow subtidal habitats have been affected by previous development.</p> <p>DAS sites provide fish habitat, are soft bottom, and have a similar grain size to the dredge material. Proposed sites are below the photic zone, below which marine plants cannot grow.</p> <p><b>Fish Health:</b> Sediment within the Project footprint was previously impacted by historic contaminants, primarily PAHs, but also metals, dioxins, and furans.</p> <p><b>Fish and Marine Mammal Harm:</b> The Kitimat River estuary at the head of Kitimat Arm is important rearing habitat for numerous fish of CRA importance. CRA fish can be sensitive to disturbance and interference at critical life history stages.</p> <p><b>Marine Mammal Behaviour:</b> Kitimat Arm and Douglas Channel are used by many marine mammal species, including some that are SARA listed species. Designated SARA humpback whale critical habitat is identified in the shipping RSA, as is potential SARA critical habitat for northern resident killer whale.</p>
Magnitude	<p><b>Marine Habitat:</b> Low</p> <p><b>Fish Health:</b> Low</p> <p><b>Fish and Marine Mammal Harm:</b> Low to</p>	<p><b>Marine Habitat:</b> Marine construction will result in permanent alteration and destruction of marine habitat. With implementation of the Fish Habitat Offsetting Plan it would be of low magnitude because it would counterbalance Project residual serious harm and maintain the ongoing productivity and sustainability of CRA fisheries. DAS habitats are expected to recover within two years following disposal.</p> <p><b>Fish Health:</b> The top 3 m of sediment are where contaminant levels are higher. The release and dispersal of contaminants would be controlled and would result in low magnitude effects to fish. Sediment that does not meet the DAS screening criteria would not be disposed of at sea, and, therefore, should have minimal effect on fish health.</p> <p><b>Fish and Marine Mammal Harm:</b> Pile driving causes high-intensity impulse sound and changes in underwater pressure</p>

Criteria	Assessment Rating	Rationale
	<p>moderate</p> <p><b>Marine Mammal Behaviour:</b> Moderate</p>	<p>levels that can injure fish and marine mammals and potentially kill fish, and would be above suggested thresholds for effects. Mitigation would effectively reduce noise effects, and effects would be of moderate magnitude.</p> <p>Burial or crushing during dredging, marine construction, and dismantling of marine infrastructure would be of low magnitude because of the localized affect that would mostly affect slow moving or sessile invertebrates.</p> <p>Elevated levels of TSS from dredging, DAS, and marine construction would be of moderate magnitude because TSS levels would go above BC Water Quality Guidelines, and could cause temporary harm or cause mortality to fish and bivalve molluscs.</p> <p><b>Marine Mammal Behaviour:</b> Underwater noise from shipping may result in some behavioral change by marine mammals, potentially causing temporary stress-induced physiological changes, temporary altered sound perception and impaired communication, and avoidance behaviors that may disrupt migration or foraging patterns.</p>
Extent	<p><b>Marine Habitat:</b> Local</p> <p><b>Fish Health:</b> Local</p> <p><b>Fish and Marine Mammal Harm:</b> Local</p> <p><b>Marine Mammal Behaviour:</b> Local to regional</p>	<p><b>Marine Habitat:</b> Direct habitat effects are from marine terminal construction (modifications to the existing wharf, installation of sheet piling, material and offloading and laydown areas, transfer piping, electrical installations), dredge pocket, and the DAS area.</p> <p><b>Fish Health:</b> Extent would be in the vicinity of the dredge pocket due to contaminated sediment. DAS sediment would disperse locally during disposal activities.</p> <p><b>Fish and Marine Mammal Harm:</b> Impacts would be primarily at marine terminal construction, dredge pocket and DAS area.</p> <p><b>Marine Mammal Behaviour:</b> Impacts would be local for the marine construction zone of influence and regional during shipping during operations.</p>
Duration	<p><b>Marine Habitat:</b> Short term to long term</p> <p><b>Fish Health:</b> Short term</p> <p><b>Fish and Marine Mammal Harm:</b> Short term</p> <p><b>Marine Mammal</b></p>	<p><b>Marine Habitat:</b> During marine terminal construction and operation (due to maintenance dredging). DAS would cause a temporary loss in habitat, but is expected to recover in two years.</p> <p><b>Fish Health:</b> Short term exposure to toxins during dredging.</p> <p><b>Fish and Marine Mammal Harm:</b> Short term during marine construction.</p> <p><b>Marine Mammal Behaviour:</b> Short term during marine</p>



Criteria	Assessment Rating	Rationale
	<b>Behaviour:</b> Short term and long term	construction and long term during operations with regular ship transits.
Reversibility	Reversible	<p><b>Marine Habitat:</b> Net loss of habitat is reversible with implementation of offsetting; and DAS area is reversible following disposal activities; dredge area is only fully reversible following the cessation of maintenance dredging or creation of offsetting habitat.</p> <p><b>Fish Health:</b> Reversible after construction dredging stops.</p> <p><b>Fish and Marine Mammal Harm:</b> Reversible after marine construction is complete.</p> <p><b>Marine Mammal Behaviour:</b> Reversible after marine construction is complete and reversible after operations when shipping ceases.</p>
Frequency	<p><b>Marine Habitat:</b> Multiple events</p> <p><b>Fish Health:</b> Single</p> <p><b>Fish and Marine Mammal Harm:</b> Multiple events</p> <p><b>Marine Mammal Behaviour:</b> Regular</p>	<p><b>Marine Habitat:</b> Loss of habitat will happen during marine terminal construction within specific timing windows for fish.</p> <p><b>Fish Health:</b> Single event during construction.</p> <p><b>Fish and Marine Mammal Harm:</b> Multiple irregular events during marine construction.</p> <p><b>Marine Mammal Behaviour:</b> Would occur on a regular basis at regular intervals with a maximum of 700 ship transits per year at full build out along the shipping route.</p>
Likelihood	There is a high likelihood of residual effects of change in marine habitat, sediment and water quality, mortality or injury, and disturbance.	
Significance	Considering the above analysis and having regard to the conditions identified in the TOC (which would become legally binding as a condition of an EAC), EAO is satisfied that the proposed Project would not have significant adverse residual effects on marine resources.	
Confidence	There is a moderate to high level of confidence in the likelihood and significance determinations based on the effectiveness of mitigation and offsetting measures, existing federal and provincial regulatory requirements, and compliance with the proposed EAC conditions. There is some uncertainty because the mitigation of habitat effects depends on the effectiveness of the implementation of the Fish Habitat Offsetting Plan.	

### 5.6.5 Cumulative Effects Assessment

The Application included a cumulative effects assessment of the combined residual effects that the proposed Project, existing projects and reasonably foreseeable future projects could have on marine resources. Cumulative effects on marine resources are

likely to occur if there is a spatial and/or temporal overlap of past, present and reasonably foreseeable projects.

Past and current projects that resulted in changes in marine habitat in the facility RSA are the RTA facility, Eurocan Pulp and Paper Company Kraft Mill, former Methanex/Cenovus Terminal, former Moon Bay Marina, MK Bay Marina, and forestry activities. The majority of habitat affected is common intertidal and shallow subtidal habitat (rocky shorelines, sand and mud substrates), although some productive salt marsh habitat and eelgrass beds have also been affected. To some extent, habitat lost at the time of construction of those projects has been re-colonized by marine organisms, which often re-establish themselves on constructed substrates such as rock riprap.

Reasonably foreseeable future projects that may have spatial and/or temporal overlap with the proposed Project are the RTA Terminal A Extension, KLNG, Enbridge Northern Gateway, and the Douglas Channel LNG Terminal. If these future projects are likely to result in the permanent alteration or destruction of fish habitat resulting in serious harm to fish, DFO would require an authorization, including offsetting measures under the *Fisheries Act*. These projects would also likely result in harm to marine fish and marine mammals within the facility LSA and RSA.

The proposed Project would contribute to the cumulative effects of shipping on marine mammals. If all of the above projects proceed, the number of ship transits in Kitimat Arm and Douglas Channel would increase from 0.5 transits daily currently, to 4.3 transits daily cumulatively. Up to 348 vessels currently travel within the proposed Project's shipping RSA each year (80 for RTA and 8 for Methanex, which traverse Douglas Channel and Kitimat Arm; 225 ferries and 35 cruise ships in the shipping RSA outside of Douglas Channel). This number does not include smaller commercial and recreational boats that use MK Bay Marina. Commercial fishing vessels may have, and continue to, produce underwater noise at levels that could induce behavioural change (e.g., avoidance of noisy areas) in fish or marine mammals. The Application stated that there is uncertainty and low confidence in determining the level of behavioural response by marine mammals, but it is anticipated that for most species a relatively low proportion of the population would be affected.

In response to this uncertainty, EAO has proposed a condition requiring the development and implementation of a program to understand impacts to behavioural change or injury to marine mammals from shipping, to support the mitigation of any cumulative effects to marine mammals.

Past projects are responsible for the existing marine sediment contamination levels. The RTA Terminal A Extension would involve dredging and disturbance of these existing contaminants. RTA marine construction is planned for 2015 through 2017, and would likely overlap temporally and spatially with the proposed Project's construction; TSS plumes from dredging for the extension of RTA Wharf "A" and construction of the barge ramp and tug dock are likely to extend to the proposed Project's facility LSA. The

Application stated that the RTA project is not expected to contribute to cumulative change in fish health because the effects would be short term and involve localized dispersal of PAHs during dredging.

RTA dredging and marine construction activities are also expected to result in harm to fish or marine mammals through similar mechanisms as the proposed Project, such as underwater noise, pressure waves, burial and crushing and exposure to elevated TSS levels. The proposed RTA Terminal A Extension project is also subject to an EA by the EAO, which is currently in Pre-Application stage. Potential effects from their marine construction activities would be assessed in their EA.

Considering the above analysis, and having regard to the conditions identified in the TOC, and the implementation of mitigation measures for this proposed Project and others, particularly the mitigation measures to be imposed by federal and provincial regulators, the cumulative effects on marine resources are not likely to be significant.

#### 5.6.6 Conclusions

Considering the above analysis and having regard to the conditions identified in the TOC (which would become legally binding as a condition of an EAC), EAO is satisfied that the proposed Project would not have significant adverse effects on marine resources.

## 5.7 Vegetation and Wetland Resources

### 5.7.1 Background

Vegetation and wetland resources was selected as a VC because of its ecological, aesthetic, recreational, economic, and cultural importance to Aboriginal Groups, the public, the scientific community, and government agencies. The assessment considered the potential for the proposed Project to adversely affect:

- Listed plant species (as defined by the BC Conservation Data Center (CDC), SARA, and the Committee of the Status of Endangered Wildlife in Canada (COSEWIC);
- Traditional use plants (identified through Aboriginal engagement);
- Non-native invasive plant species (as listed in the *Weed Control Act* and associated Regulation, or the Northwest Invasive Plant Council);
- Provincially listed ecological communities, as defined by the CDC;
- Wetlands and wetland function;
- Floodplain associations;
- Old forests; and
- Vegetation communities sensitive to air emissions.

The terrestrial LSA is used to assess potential effects on vegetation related to physical works and includes the Project footprint plus a 120 m buffer. The terrestrial RSA is used to place potential effects from physical works on vegetation in a regional context and to assess cumulative change in abundance of vegetation resources.

Federal and provincial Acts and policies relevant to vegetation and wetland function include:

- The federal SARA prohibits killing, harming, or taking of federally-listed species;
- The federal Policy on Wetland Conservation commits all federal departments to the goal of no net loss of wetland functions on federal lands and waters, or where there are federal permits, licenses, or authorizations required;
- BC OGAA directs proponents to avoid operating in wetlands and riparian reserve zones, maintain natural flows, retain vegetation within riparian management areas, prevent the transport of invasive species, and limit alteration to natural surface drainage patterns;
- The BC *Forest Act* requires a master license to cut Crown timber for purposes under BC OGAA; and
- The BC *Weed Control Act* and associated regulations requires control of designated noxious plants.

## 5.7.2 Potential Project Effects and Proposed Mitigation Described in the Application

The terrestrial LSA falls within the Coastal Western Hemlock Very Wet Maritime biogeoclimatic variant and is 14% upland forest, 33% floodplain, 17% wetland, and 36% anthropogenic. The most common ecosystem in the terrestrial LSA is the Sitka spruce-salmonberry high fluvial bench floodplain, covering 180 ha (23%).

The Application identified and assessed the following potential effects on vegetation resources:

- Change in abundance of plant species of interest;
- Change in abundance or condition of ecological communities of concern; and
- Change in native vegetation health and diversity due to air emissions.

### *Plant Species of Interest – Species at Risk*

Twenty-four species at risk have the potential to occur in the terrestrial RSA (all are provincially listed and three are listed by SARA and COSEWIC). During field surveys, no SARA-listed species were found; however, three-provincially listed species were found in the terrestrial LSA, which included:

- Eminent bluegrass (blue-listed) located in the terrestrial RSA and LSA but outside the Project footprint;
- Rock sandwort (blue-listed) located in the Project footprint; and
- Long-leaved aster (red-listed) located in the Project footprint.

Cryptic paw lichen and old growth specklebelly, two blue-listed species also listed as special concern under SARA, are known to occur within the RSA. Plant species at risk occurring in the Project footprint would be lost during vegetation clearing, and one location of eminent bluegrass detected outside the Project footprint would be vulnerable to potential indirect effects.

Three invasive species occur within the RSA, including Canada thistle, oxeye daisy and common tansy, although none are within the Project footprint.

### *Plant Species of Interest – Traditional Use Plants*

Forty-nine genera and/or species used by Aboriginal Groups were detected within the terrestrial RSA, including seven trees, 20 shrubs, 18 forb, two ferns and two mosses. Clearing of vegetation in the construction phase would result in the removal of 25 traditional use plant species in the proposed Project footprint. The Application stated that these plants are not limited to habitat in the terrestrial LSA; they have an equal or greater abundance and are common species throughout the terrestrial RSA.

### *Ecological Communities – Red and Blue Listed Communities*

A total of 123 ha of listed ecological communities occurring in the Project footprint would be lost, including 31 ha containing 6 blue-listed ecosystems, and 92 ha containing six red-listed ecosystems (Table 5-5). The proposed Project would result in the loss of approximately 22% of the red-listed tufted hairgrass / meadow barley estuary ecosystem within the RSA and 86% of the Sitka willow / Pacific Willow / stunk cabbage swamp ecosystem within the RSA. All of the blue- and red-listed communities that would be lost in the Project footprint occur elsewhere in the terrestrial RSA.

**Table 5-5: Red- and Blue-Listed Communities in the Project Footprint, LSA and RSA**

<b>Ecosystem Name</b>	<b>Rank</b>	<b>Area in Project Footprint (ha)</b>	<b>Area in LSA (ha)</b>	<b>Area in RSA (ha)</b>	<b>% of RSA</b>
Sitka spruce / salmonberry	Red-Listed	66.9	84.3	895.4	7%
tufted hairgrass / meadow barley estuary	Red-Listed	1.1	5.0	≥5.1	22%
tufted hairgrass / Douglas aster estuary	Red-Listed	3.5	10.8	≥87.4	4%
Lyngbye's sedge estuary	Red-Listed	7.7	13.1	≥78.3	10%
sweet gale / Sitka sedge fen	Red-Listed	1.4	4.7	≥10.2	14%
Sitka willow / Pacific willow / skunk cabbage swamp	Red-Listed	11.4	12.5	≥13.2	86%
amabilis fir – Sitka spruce / devil's club	Blue-Listed	1.9	4.1	3,328.0	0%
western redcedar – Sitka spruce / skunk cabbage	Blue-Listed	6.7	8.3	1,040.2	1%
Sitka spruce / Pacific crab apple	Blue-Listed	11.6	20.2	≥50.3	23%
Lyngbye's sedge / Douglas water hemlock estuary	Blue-Listed	1.3	2.8	≥74.8	2%
cattail marsh	Blue-Listed	2.6	6.8	≥6.8	38%
Sitka sedge / hemlock / parsley marsh	Blue-Listed	7.3	11.4	≥15.3	48%

### *Ecological Communities – Wetlands*

Wetlands occupy approximately 136 ha (17%) of the terrestrial LSA. Six wetland classes occur, and include 13 wetland site associations. There would be a loss of 90 ha of wetlands in the Project footprint representing 5 wetland classes and 13 wetland associations, including 23 ha and 17 ha of red and blue-listed wetland communities, respectively (which are also assessed in previous section on ecological communities). The total loss of wetlands is less than 1% of the wetland area in the terrestrial RSA.

Of the 90 ha of wetland affected within the Project footprint, 41 ha are provincially red- or blue-listed or estuarine (or both) and, therefore, are subject to the Federal Policy on Wetland Conservation. The policy includes the goal of no net loss of wetland function for wetlands that are ecologically important (including provincially red and blue-listed and estuarine wetland communities) and for wetlands functions that coincide with areas of federal jurisdiction such as habitat for SARA listed species or migratory birds, or where there are federal permits, licenses, or authorizations required.

The Application stated that where the loss of ecologically important wetland function cannot be avoided, compensation would be provided. The Application stated that with the implementation of mitigation measures to manage potential impacts on wetlands adjacent to the Project footprint, residual effects on wetlands would be restricted to the Project footprint.

The Marine Fisheries Habitat Offsetting Plan would provide approximately 8 ha of compensatory estuarine wetland. The remaining loss of ecologically important wetlands and their associated functions would be approximately 33 ha, of which estuarine and listed wetlands would be compensated at a 2:1 ratio totaling 66 ha of restored, enhanced or created (or both) wetlands as outlined in the Wetland Compensation Plan.

#### *Ecological Communities – Floodplain communities*

Floodplain communities, or flood associations, are non-wetland ecosystems that occur on regularly flooded riparian sites with well-drained soils. These communities occupy 261 ha (33%) of the terrestrial LSA, including 171 ha in the Project footprint would be lost during construction. This includes 67 ha of the red-listed mature/old floodplain unit (included in the discussion of listed ecological communities, above). The loss of floodplains represents 3% of the area of comparable flood communities in the RSA.

#### *Ecological Communities – Old forest*

Old forest comprises 61 ha (8%) of the terrestrial LSA and 43,255 ha (34%) of the terrestrial RSA. In the terrestrial LSA, old forest is primarily restricted to three ecosystem units, the majority occurring in the CWHvm1/09 Sitka spruce / salmonberry community (34 ha), which is also addressed as one of the red-listed ecological communities and one of the floodplain communities.

Approximately 51 ha of old forest would be lost in the Project footprint, including 17 ha of blue-listed and 34 ha of red-listed old forest communities. The loss of old forest in the Project footprint is less than 1% of the total area of old forest in the terrestrial RSA.

Key mitigation measures for vegetation and wetlands include:

- Clearing boundaries would be clearly delineated prior to site preparation;
- A pre-construction salvage and translocation program would be implemented for the identified occurrences of blue-listed rock sandwort and red-listed long-leaved aster;

- Incorporate traditional use plants, where appropriate and technically feasible, in wetland compensation measures and reclamation of construction areas;
- An erosion and sediment control plan would be developed and implemented to manage surface water and avoid sedimentation in adjacent vegetation communities;
- An invasive plant management plan would be incorporated into the Project's EMP describing the control of invasive species;
- Design of the LNG loading corridor would consider and incorporate, where practicable, ways to maintain tidal flow and wildlife passage;
- A surface water management plan would be developed to address storm water collection, treatment, and disposal during construction and operation; and
- Develop and implement a wetland compensation plan to address loss of wetland habitat function for breeding and foraging terrestrial mammals, amphibians, and birds.

### *Vegetation Impacts due to Air Emissions*

Section 5.1 of this Report contains EAO's assessment of air quality effects, including a summary of key mitigation measures for air emissions. Air emissions also have the potential to affect vegetation health and diversity through the following pathways:

- SO<sub>2</sub> fumigation (direct effect);
- Nitrogen deposition (indirect effect of eutrophication), and
- SO<sub>4</sub> and acid deposition (indirect effect).

Critical levels of SO<sub>2</sub> and NO<sub>2</sub> refer to thresholds of atmospheric concentrations above which direct adverse effects are expected to occur on plant health through fumigation. These include disruption of photosynthesis, decreased growth rates and tissue lesions.

Critical loads of SO<sub>4</sub>, nitrogen or acid refer to the deposition of these contaminants from Project emissions that can affect ecosystem structure and function. Critical loads are expressed as annual deposition rates (kg/ha/y or keq/ha/y). Nitrogen and SO<sub>4</sub> deposition act together to reduce soil pH (i.e., increase soil acidity) which indirectly affects vegetation. SO<sub>4</sub> deposition also reduces soil pH, which affects vegetation in a similar way as acid deposition. Effects of nitrogen deposition are assessed in terms of critical loads that affect vegetation indirectly through excessive soil fertilization (or eutrophication). Likewise, effects of acid deposition are assessed for critical loads that affect vegetation indirectly through soil acidification (reduced pH).

The results of air dispersion modeling indicate that air emissions of NO<sub>2</sub> would be less than the critical level of 30 ug/m<sup>3</sup>/y. The critical level of 10ug/m<sup>3</sup>/y for SO<sub>2</sub> is modeled to be already exceeded in the base case in 2,729 ha of vegetated area. The proposed Project is expected to increase the area over which the critical level for sulphur dioxide is exceeded by 268 ha. Lichens are more sensitive than vascular plants to SO<sub>2</sub> fumigation, and, therefore, communities that support a relatively high abundance of lichen species are considered to be particularly sensitive.



Critical loads for nitrogen deposition would not be exceeded in the base case. In the application case, critical load is exceeded in approximately 4 ha of vegetated communities beyond the Project footprint, most of which is amabilis fir-western hemlock forest. Wetlands occupy 1 ha of the exceedance area and have notable sensitivity to eutrophication.

Critical loads for acid and SO<sub>4</sub> deposition are not exceeded in base case, but are close to the calculated critical loads (e.g., at 99% for SO<sub>4</sub> deposition and acid deposition). In the application case, critical load is exceeded in approximately 4 ha of vegetated communities, the same area as the exceedance for nitrogen deposition. Old forest, which can support lichens that are sensitive to acid deposition, do not occur in the exceedance area.

A key mitigation measure for vegetation impacts due to air emissions is to adhere to the air quality management plan.

### 5.7.3 Potential Project Effects and Proposed Mitigation Identified During Application Review

MOE and FLNR raised concerns about the proposed Project impacting up to 86% of the regional extent of the red-listed Sitka Willow / Pacific Willow / skunk cabbage swamp ecosystem and 22% of the red-listed tufted hairgrass / meadow barley estuary ecosystem.

The Proponent responded that the mapped regional area of these communities is a minimum extent and there is high confidence that both communities occur in the regional area more than what was mapped, although MOE stated that there is uncertainty with this hypothesis due to lack of supporting data. The Proponent responded that these two communities are expected to persist in the RSA. The Proponent also responded that the functions of these two wetland communities would be replaced at a 2:1 ratio through the proposed wetland compensation plan, and that although the communities are red-listed, replacement of the functions and perhaps even the composition and structure of a 9.9 ha Sitka willow / Pacific willow / skunk cabbage swamp, or 1.1 ha tufted hairgrass / meadow barley estuary community is technically feasible.

FLNR recommended that pre-clearing surveys and a discovery and management contingency plan for listed plants and plant communities be included as a mitigation measure. MOE also recommended that a vegetation monitoring plan be implemented. EC questioned why no follow-up programs for vegetation resources were identified by the Proponent in the Application.

The Proponent responded that complete baseline surveys for vegetation species and ecological communities of concern were conducted and their confidence in the ability to detect species and ecological communities of concern is high, therefore, pre-clearing surveys and a discovery contingency plan were not included as mitigation measures.

The Proponent responded that the activity of clearing and grading a site has a predictable effect on vegetation and a follow-up program is not necessary, or feasible, to verify the accuracy of this effect, as vegetation would be removed. The Proponent responded that the effectiveness of mitigation measures would be monitored in a few specific instances, including species at risk translocation and the wetlands compensation plan.

EAO has proposed a condition that would require as part of the vegetation management and monitoring plan, a pre-construction salvage and translocation program and a contingency plan.

MOE raised concerns about the Kitimat River estuary population of *Poa eminens* (eminent bluegrass), which has only four known locations in BC. The Application stated that this species was not found within the Project footprint.

The Proponent responded that known locations adjacent to the Project footprint would be marked to prevent disturbance.

Early in Application Review, the Proponent provided its draft Wetland Compensation Plan to EAO and the Working Group. Gitga'at First Nation raised concerns on how wetland compensation would be carried out, and a member of the public also asked where wetland compensation would be carried out.

The Proponent indicated that at the time of Application Review, CWS only required a conceptual plan with a commitment and general framework providing reasonable assurance that the goals of the Federal Policy on Wetland Conservation would be met. If the proposed Project is granted an EAC and moves into permitting stages, the details of the wetland compensation, including the organization that would carry out the compensation plan and the associated legal agreements would be provided to CWS and be subject to their approval. The Proponent stated that while the location of compensation sites is unknown at this time, their first priority is to implement offsetting measures in the immediate vicinity of the affected habitats. The wetland compensation plan includes direction that the wetland compensation would occur as close as possible to the site of disturbance. The Proponent has initiated preliminary discussions with the local community and Aboriginal Groups to identify potential compensation sites and seek input to assist in development of the wetland compensation plan and this consultation would continue as the plan is further refined.

Haisla Nation requested a mitigation plan for anticipated effects to traditional use plant species and asked that the Proponent undertake further mitigation to preserve old growth areas during construction. A member of the public also raised a concern about the loss of estuarial old growth forest.

The Proponent responded that their proposed mitigation aims to incorporate traditional use plants where appropriate and technically feasible in wetland

compensation measures and reclamation of temporary construction areas. The Proponent also responded that they are committed to conducting an assessment during pre-construction and forest harvest planning to determine feasibility of implementing wind firming techniques in the mature and old growth forest along the Kitimat River within the LSA.

EAO has proposed a condition requiring the maintenance of a mature vegetation buffer of at least 30 m between the Kitimat River and the Project area where such a buffer currently exists.

#### 5.7.4 Characterization of Residual Project Effects

After considering all relevant proposed mitigation measures, EAO concludes that the proposed Project would result in the following residual adverse effects on vegetation resources:

- Change in abundance of plant species of interest, including the potential reduction of two occurrences of provincially-listed plant species, and local reduction of traditional use plants;
- Change in abundance or condition of ecological communities of interest, including a reduction within the local area of red and blue-listed wetland and floodplain communities, and old forest; and
- Change in native vegetation health and diversity due to air emissions effects of sulphur dioxide fumigation, nitrogen deposition and acid deposition.

Summarized below is EAO’s characterization of the expected residual effects of the proposed Project on vegetation and wetland resources, as well as EAO’s level of confidence in the effects determination (including their likelihood and significance).

Criteria	Assessment Rating	Rationale
Context	<p><b>Plant species:</b> Low to high resilience</p> <p><b>Ecological communities:</b> Low to moderate resilience</p> <p><b>Health and diversity:</b> Moderate diversity</p>	<p>The resilience of vegetation resources affected by the proposed Project varies. Plant species of concern have a low resilience to disturbance based on their rarity. The majority of traditional use plants are widely dispersed throughout the LSA and RSA and have high resilience.</p> <p>Wetland communities are highly sensitive to disturbance and have low resilience, while floodplain communities have high resilience because these communities generally adapt to unstable conditions and recover from the disturbance of flood events. Old forest has a moderate resilience to disturbance events, depending on level of disturbance and length of time to fully recover to baseline conditions would be greater than 250 years.</p> <p>The health and diversity of native vegetation is moderately resilient to air emissions. The sulphur critical level is already exceeded in some areas of the RSA, and acid and sulphur deposition is close to critical loads.</p>

Criteria	Assessment Rating	Rationale
Magnitude	<p><b>Plant species:</b> Moderate and low</p> <p><b>Ecological communities:</b> Low to moderate</p> <p><b>Health and diversity:</b> Low</p>	<p>The effects to listed plant species are expected to be moderate, given that the impacted plant species occur elsewhere in the RSA, but recognizing uncertainty regarding the full extent of the regional population. The magnitude of effects to traditional use species is expected to be low due to the prevalence of species throughout the region.</p> <p>The effects to ecological communities of concern are considered moderate because they occur elsewhere in the RSA, and would persist. Effects to wetlands are considered moderate because although compensation would replace 41 ha of ecologically important wetland communities, 49 ha of other wetland communities would be lost due to the Project footprint. Effects to old forest are considered low magnitude because the loss of old forest is less than 1% of the total area in the terrestrial RSA.</p> <p>The magnitude of indirect effects from emissions and deposition on the health and diversity of native vegetation is low. There would be 4 ha within the area of exceedance for nitrogen, acid and SO<sub>4</sub> deposition consisting of (upland forest, floodplain and wetland). There would be an additional 268 ha of sulphur dioxide exceedance, largely occurring in upland forest ecosystem.</p>
Extent	Local and regional	The direct effects of loss of plant species and ecological communities would be confined to the Project footprint, with some effects extending into LSA. The indirect effects of air emissions and deposition would extend to the regional area.
Duration	<p><b>Plant species and ecological communities:</b> Permanent and medium term</p> <p><b>Health and diversity:</b> Long term</p>	<p>The effect on vegetation would be permanent, as there would be a permanent loss of vegetation in the Project footprint. The effect on listed plant species would be of medium duration as those species would be trans located to outside the Project footprint and are expected to re-establish in the medium term (e.g. longer than one growing season).</p> <p>Indirect effects from air emissions would be long-term for the duration of the proposed Project.</p>
Reversibility	<p><b>Plant species and ecological communities:</b> Irreversible</p> <p><b>Health and diversity:</b> Reversible</p>	<p>The loss of plant species and ecological communities would be irreversible.</p> <p>Indirect effects from air emissions are expected to be reversible after operations cease.</p>

Criteria	Assessment Rating	Rationale
Frequency	<p><b>Plant species and ecological communities:</b> Single event</p> <p><b>Health and diversity:</b> Continuous</p>	<p>Vegetation clearing would be a single event.</p> <p>Air emissions would be continuous for the duration of proposed Project operations.</p>
Likelihood	<p>The likelihood is high of direct residual effects to vegetation and wetland resources from the construction of the proposed Project.</p> <p>The likelihood is low of a residual effect from nitrogen and acid deposition, because the effect is restricted to 4 ha. The likelihood is medium of a residual effect from sulphur dioxide fumigation because operations would exceed critical levels, but there is uncertainty as to exactly how native vegetation would respond in the operations timeframe.</p>	
Significance	<p>Considering the above analysis and having regard to the conditions identified in the TOC (which would become legally binding as a condition of an EAC), EAO is satisfied that the proposed Project's residual adverse effects on vegetation resources would not be significant.</p>	
Confidence	<p>There is a moderate to high level of confidence in the likelihood and significance determination for effects to plant species and ecological communities because of the quality of the data, including detailed mapping and large number of field studies, and the effectiveness of mitigation measures.</p> <p>There is moderate confidence in the likelihood and significance determination for effects to native plant health and diversity given the uncertainty of vegetation responses to air emissions over the operation phase of the proposed Project.</p>	

### 5.7.5 Cumulative Effects Assessment

The area of baseline disturbance in the terrestrial RSA is approximately 13,600 ha. Harvested cutblocks and cutlines are the largest baseline disturbance, accounting for 6%. The proposed Project would result in 278 ha of vegetation loss and reasonably foreseeable projects would result in an additional 470 ha of vegetation loss for a combined loss of <1% in the RSA.

#### *Plant Species of Interest*

Listed plant species were not reported to occur for past, present and reasonably foreseeable projects within the RSA for the proposed Project; therefore, no cumulative effects on plant species of concern are expected. The effects on traditional use plants were not reported for other projects; however, traditional use plants identified in the terrestrial LSA are common and abundant throughout the RSA, therefore, cumulative effects on traditional plant species are expected. Given the distribution of traditional use plants, it is expected that regional populations would persist.

### *Ecological Communities of Interest*

There would be a cumulative loss of approximately 176 ha of listed ecological communities in the terrestrial RSA as a result of the proposed Project, KLNG, and Northern Gateway.

Approximately 6 ha of wetlands would be impacted from reasonably foreseeable future projects; however, wetland compensation is anticipated for wetland loss associated with most other projects, and, therefore, minimal residual effects are expected.

The proposed Project effect of loss of floodplains would interact with the estimated loss of 1.5 ha of Sitka spruce – salmonberry floodplain affected by the KLNG Terminal, resulting in a cumulative loss of approximately 173 ha, 3% of the estimated area for floodplains in the terrestrial RSA.

Residual effects of loss of old growth forest would combine with effects from reasonable foreseeable projects resulting in an estimated minimum loss of 297 ha of old forest within the RSA, <1% of the terrestrial RSA.

### *Emissions*

SO<sub>2</sub> is predicted to exceed critical levels at base case and in the cumulative case from foreseeable future projects. Nitrogen, SO<sub>4</sub> and acid deposition are not modeled to exceed calculated critical loads at base case, but are exceeded in the cumulative case. In the cumulative case SO<sub>2</sub> concentrations exceed 10 ug/m<sup>3</sup>/y within 3,042 ha of vegetated communities. The change from base case to application case is modelled to increase by 268 ha and the change from application case to cumulative case is an additional 45 ha. The Kitimat Airshed study carried out on behalf of MOE, and the RTA studies reported an overall low rating for the direct effects of SO<sub>2</sub> to vegetation, with effects very unlikely and of minor-medium consequence. The Kitimat Airshed Assessment looked at the cumulative effects of industrial air emissions, primarily sulphur and NO<sub>2</sub>, and their potential impacts on both human health and the environment from the following: four proposed LNG facilities; RTA's existing aluminium smelter and its planned modernization; a proposed oil refinery; BC Hydro gas turbine powered electrical generation facilities; and predicted increased to marine shipping in Douglas Channel.

Nitrogen deposition is modeled to exceed critical loads in 86 ha of vegetation communities, 4 ha in the Application case, and an additional 82 ha in the cumulative case.

Acid and SO<sub>4</sub> deposition exceed the calculated critical levels in the cumulative case; however, there is no increase in the spatial extent where this occurs relative to the application case.

EAO agrees with the Proponent's conclusion that the proposed Project's residual effects acting cumulatively with other current and proposed projects in the area would most likely not threaten the regional sustainability of the vegetation resources identified in this assessment.

In determining the potential significance of cumulative adverse effects to vegetation and wetlands, EAO has considered the residual effects from the proposed Project, the cumulative disturbance to the RSA from the Project and reasonably foreseeable projects, including consideration of historical disturbance. EAO concludes that the cumulative residual adverse effects to vegetation and wetlands within the RSA are not likely to be significant.

#### 5.7.6 Conclusions

Considering the above analysis and having regard to the conditions identified in the TOC (which would become legally binding as a condition of the EAC), EAO is satisfied that the proposed Project would not have significant adverse effects on vegetation communities.

## 5.8 Terrestrial Wildlife and Marine Birds

### 5.8.1 Background

Terrestrial wildlife and marine birds were selected as a VC because of their ecological, aesthetic, recreational, economic, and cultural importance. The assessment focussed on terrestrial wildlife (e.g., terrestrial mammals, birds and amphibians), marine birds (including migratory birds, shorebirds and waterfowl), and their habitats. Eleven key species were identified for the assessment, and are listed in Table 5-6.

**Table 5-6: Key Assessed Wildlife Species**

Terrestrial Wildlife	Marine Birds
Harlequin duck	Black oystercatcher
Marbled murrelet	Double crested cormorant
Pacific marten	Common golden eye
Grizzly bear	Glaucous winged gull
Western sandpiper	Marbled murrelet
Western screech owl	
Western toad	

The Project footprint includes the physical area cleared for the proposed Project and the area cleared for safety reasons.

The Facility LSA includes the Project footprint plus a 1 km buffer to the east and west and a 500 m buffer to the north and south. The Facility RSA encompasses the area within the North Coast and Bulkley Lakes Grizzly Bear Population Units (GBPU).

The Shipping LSA encompasses the nearshore waters of the northern end of Kitimat Arm, including Minette Bay, and extends through the confined channels with a buffer of 1 km on either side of the marine access route between the terminal and the Triple Island Pilot Boarding Station. The Shipping RSA includes the marine waters and associated marine bird shoreline habitats along the marine access route from the Triple Island Pilot Boarding Station through Principe and Douglas channels to the LNG facility. Where the marine access route is not confined by geography in the north end, a buffer of approximately 10 km is used on the west side of the marine access route.

Federal and provincial Acts and policies relevant to wildlife and marine birds include:

- The federal SARA prohibits killing, harming, or taking of federally-listed species;
- the federal *Migratory Birds Convention Act*, regulates and restricts the harvest of individuals and the disturbance of habitat, prohibits destruction or possession of migratory birds, their nests, or eggs;



- The federal Policy on Wetland Conservation commits all federal departments to the goal of no net loss of wetland functions on federal lands and waters;
- The BC *Wildlife Act* prohibits disturbance or destruction of any bird or its eggs, or its nest (while occupied by a bird or its eggs). Nests of eagles, peregrine falcon, gyrfalcon, osprey, heron, or burrowing owl are protected year-round;

### 5.8.2 Potential Project Effects and Proposed Mitigation Described in the Application

The Application assessed the following potential effects on terrestrial wildlife and marine birds from the proposed Project:

- Loss or change in habitat from vegetation clearing, dredging, construction activities, and temporary infrastructure;
- Risk of injury or mortality from vegetation clearing, land and water-based traffic, artificial lighting and noise causing nest abandonment; and
- Sensory disturbance or behavioral alterations during construction and operations could reduce the suitability of habitat for wildlife, and wildlife movements could be altered by physical barriers to movement corridors.

Species at risk listed on Schedule 1 of SARA potentially occurring in the facility and shipping LSA are: coastal tailed frog, western toad, marbled murrelet, pink-footed shearwater, great blue heron, band-tailed pigeon, common nighthawk, olive-sided flycatcher, rusty blackbird, red knot, northern goshawk, peregrine falcon, and western screech-owl.

#### *Loss or Change in Habitat*

An estimated 278 ha of vegetation would be cleared within the proposed Project footprint to accommodate the full build out of the LNG facility. This would result in a direct and permanent loss of habitat for some key species, or an alteration of habitat to early seral plant communities. Habitat loss would include approximately 17 ha of upland forest, 90 ha of wetland habitats and 171 ha of floodplain habitat. Approximately, 31 ha may be subject to tree clearing but would not result in loss of understory vegetation. Key wildlife species most affected by these habitat losses include Pacific marten, marbled murrelet, grizzly bear, western screech owl and western toad (Table 5-7).

**Table 5-7: Effective Wildlife Habitat Availability**

Species	Habitat Type	Baseline Area in LSA (ha)	Operations Area in LSA (ha)	Change from Baseline to Operation (ha)	Decrease in LSA (%)	Decrease in RSA (%)
Grizzly bear	Spring foraging	627.5	498.2	-129.3	21%	≤0.003
	Fall foraging	680.0	557.5	-122.5	18%	≤0.003
Harlequin duck	Summer / fall foraging	182.0	169.3	-12.7	7%	≤0.003

Species	Habitat Type	Baseline Area in LSA (ha)	Operations Area in LSA (ha)	Change from Baseline to Operation (ha)	Decrease in LSA (%)	Decrease in RSA (%)
Pacific marten	Year-round living	132.7	83.4	-49.3	37%	≤0.003
Western Sandpiper	Summer / fall foraging	142.1	121.9	-20.2	14%	≤0.003
Western screech- owl	Year-round living	288.1	207.2	-80.9	28%	≤0.003
Western toad	Breeding	143.6	82.1	-61.5	43%	≤0.003

Baseline studies show grizzly bear were seasonally abundant in the facility LSA, especially during the fall salmon migration in the Kitimat River. Movement corridors used by bears that normally reside in upland habitat outside of the facility LSA were evident on human-made dikes in the central portion of the facility LSA. The dikes were used to approach the sedge communities along the river, riparian zones, and the river itself. Grizzly bear spring and fall feeding habitat is primarily associated with the Kitimat River and sedge-dominated habitats surrounding the estuary.

A western screech owl survey suggested a potential nest location within the facility LSA, but this was not confirmed in follow-up surveys. If a nest is present, it would be considered regionally important given the relatively limited distribution of suitable breeding habitat. The loss of riparian-associated mature deciduous and old-growth mixedwood forest is the primary contributor to the loss of effective western screech-owl year-round living habitat.

The LSA overlaps with 187.4 ha of marbled murrelet critical nesting habitat as defined by EC, of which 68.6 ha is within the Project footprint. The area of critical habitat in the Project footprint has the potential to support one marbled murrelet nesting pair. The Proponent conducted field surveys for marbled murrelet, and did not detect resident birds. The federal recovery plan for marbled murrelet indicates that for the Northern Mainland Coast conservation region, the critical threshold amount of suitable breeding habitat is 68% retention of 2002 suitable nesting habitat. The Application stated that critical habitat in the facility LSA that would be affected has elongated and convoluted edges, comprises relatively small patch sizes, and is located relatively near ocean shoreline and the surrounding industrial activities. These conditions reduce the suitability of this habitat for marbled murrelet nesting in the facility LSA.

The Application stated that areas of breeding concentrations of western toad were observed at wetland sites within the facility LSA. Western toads have high breeding site fidelity in successive years and, as such, breeding ponds in and around the facility LSA have the potential to be important habitat for western toad. Clearing for construction would result in the loss of 61.5 ha of breeding habitat, including known breeding ponds.

Removal of high suitability old-growth coniferous forest in the facility LSA is the primary effect on Pacific marten year round living habitat. The facility LSA represents a very small portion of regionally available habitat within the context of the larger facility LSA.

Two active and one inactive bald eagle nests were found in the central portion of the LSA but outside of the Project footprint. Two osprey nests, one active and one inactive, were also detected in the facility LSA, both on poles on the RTA Wharf B.

### *Risk of Injury or Mortality*

The risk of injury and mortality to terrestrial wildlife is expected to be greatest during the vegetation clearing stage of site preparation. Wildlife with limited ability to disperse or that have strong site fidelity are at greatest risk of injury or mortality. This includes amphibians, small mammals and animals that are nesting or in dens or burrows. Larger mammals such as grizzly bears and ungulates as well as adult birds are less likely to be affected by clearing activities because they are highly mobile and will likely disperse from areas being affected by Project activities.

Risk of mortality from traffic has the potential to affect western toad as well as large mammals such as grizzly bear. Breeding, dispersing, or migrating western toads are at risk of mortality from traffic along sections of road adjacent to suitable breeding habitat. Bears can be attracted to roads for ease of movement and forage opportunities, making them vulnerable to collisions.

Direct mortality as a result of human wildlife interactions may also occur. Human-wildlife conflicts may occur sporadically throughout the life of the proposed Project. The Application stated that with mitigation measures, mortality as a result of nuisance wildlife is not expected to be an issue.

There is risk of bird mortality associated with flaring events. Flaring would primarily occur during unanticipated instances (e.g. train upset or shutdown), but would also occur during planned events, such as project commissioning and planned maintenance activities (every 1-2 years). This potential impact on wildlife related to unanticipated instances is discussed in the Accidents and Malfunctions section of this Report. Flaring can cause potential injury or mortality to birds.

There is potential for injury or mortality of some marine bird species as a result of bird strikes with the marine terminal and related infrastructure due to disorientation from nighttime lighting. The Application stated that baseline information indicates alcid species (e.g., marbled murrelet, tufted puffin, and common murre) are uncommon in the Kitimat River estuary habitats and are unlikely to interact with sources of artificial light at the proposed Project facility. Black oystercatchers are unlikely to occur near the marine terminal because it is an artificial structure and provides no suitable nesting or foraging habitat. A variety of shorebirds use the Kitimat River estuary; artificial lighting is not expected to cause potential injury or mortality to shorebird species moving past the terminal to reach this site. Double-crested cormorants have been observed using the

Kitimat River estuary foreshore, Kitimaat Village, and Minette Bay. This species uses artificial marine structures for roosting. Glaucous-winged gulls are highly mobile and use human-made structures opportunistically. Resident individuals of both species are likely to be familiar with structures similar to those of the proposed Project from other urban and industrial sites.

The Application estimates the number of injuries or mortality events associated with shipping activities to be low and affect only a few individuals, which would be offset by natural recruitment in secure populations.

#### *Sensory Disturbance or Behavioral Alteration – Facility and marine terminal*

Noise, artificial light, and other human and equipment activities may cause sensory disturbance to wildlife primarily during the construction phase and to a lesser degree during the operation phase. Disruption of terrestrial wildlife movement will be higher during construction and in the currently undisturbed areas in the south and east portions of the facility LSA. During operations, disturbance events will be regular and predictable, and wildlife may habituate to those events.

There is potential that the proposed upgrade to the existing haul road would disrupt the dispersal and migration of western toad between terrestrial habitats and breeding wetlands along the existing road.

Marine in-water construction and related activities might cause distress, flushing behaviour, and behavioural alterations in marine birds that include less effective foraging or avoidance of preferred feeding habitats. This is of particular concern during peak migratory periods when high densities of birds are on the ocean. The harm from, or avoidance of, sensory disturbance events could adversely affect feeding effectiveness and the energetics critical to staging and migration periods.

The marine terminal would operate 24 hours a day, creating a continuous sensory disturbance for wildlife in that area. Double crested cormorants may temporarily avoid the marine terminal area during construction; however, use of the marine terminal area to forage and perch is expected to continue during operation. Common goldeneye is expected to avoid the marine terminal during construction and operations, whereas glaucous-winged gulls are readily adapted to industrial development and are expected to continue to use the area, but may be temporarily displaced by certain sounds and activities.

#### *Sensory Disturbance or Behavioral Alterations – Shipping*

Sensory disturbance from noise and the presence of ships could affect marine birds, and has the greatest potential effect during migration periods. Double crested cormorants appear to habituate to the presence of vessels, and are unlikely to be affected by the ships associated with the proposed Project. Glaucous-winged gulls spend more of their time in the air and are less susceptible to vessel disturbance than

diving birds. Vessel traffic near seabird colonies is presently not an uncommon occurrence; marine traffic would increase as a result of the proposed Project.

### *Mitigation*

Key mitigation measures for terrestrial wildlife and marine birds include the following:

- Develop and implement a wetland compensation plan to address loss of wetland habitat function for breeding and foraging terrestrial mammals, amphibians, and birds;
- Clearly delineate vegetation clearing limits to avoid damage to important wildlife habitat features (e.g., large boulders, nurse logs, raptor nests, mammal dens, ungulate mineral licks) in the facility LSA but outside of the proposed Project footprint or the areas of temporary construction disturbance. Major game trails will be cleared of equipment, brush piles, and felled trees to maintain their use as movement corridors for wildlife, where practicable;
- Develop and implement an approved raptor management plan;
- A wildlife management plan will be developed and will include requirements for reporting wildlife sightings, including bat or bird collisions. Reporting would include information such as species, location, and weather conditions;
- Supervisory staff on berthed vessels will be alerted to the hazards and potentially high-risk periods for bird strikes caused by deck lighting. Facility staff would report bird collisions to a member of the project environmental team, including information on bird species and weather conditions. Vessel personnel would be provided with information on how to treat and release marine birds that become grounded on vessel decks;
- Develop and implement a decommissioning plan before decommissioning to allow habitat recovery and wildlife movement to proceed as soon as possible;
- Construction activities will account for applicable breeding bird periods. Clearing activities that need to occur during bird breeding periods will incorporate measures to protect birds and their eggs as per federal and provincial regulations. These measures will be detailed in the wildlife management plan;
- Bear-proof fences will be installed around the workforce accommodation centre and Project site boundary to reduce potential for on-site interactions with wildlife;
- Protocols will be developed and implemented as outlined in a wildlife management plan, including measures such as bear awareness to avoid or mitigate human-wildlife conflicts and injury to humans or wildlife; and Pre-clearing bear den surveys will be required for clearing occurring between October and March. Identified bear dens will be protected by a 200 m no disturbance buffer during the denning period.

### 5.8.3 Potential Project Effects and Proposed Mitigation Identified During Application Review

#### *Migratory Birds*

EAO requested an additional, separate analysis for migratory birds to support the requirements of CEAA 2012.

The Proponent provided a supplementary memo (*Assessment of Effects to Migratory Birds*, undated) which described that the assessment for the proposed Project used key species to assess potential Project effects on wildlife (including migratory birds) that have overlapping habitat requirements. The Proponent indicated that 42 taxonomic bird families have the potential to occur in the spatial boundaries of the Project. The habitat requirements of these families were represented by the key species (both birds and mammals) used in the assessment.

Key species selected for the proposed Project are identified as priority species in the *Bird Conservation Strategy for Bird Conservation Region 5: Northern Pacific Rainforest* (EC 2013) and occur in each broad habitat type that exists at baseline within the spatial boundaries of the proposed Project. These habitat types include marine (ocean), intertidal, estuary, river, riparian, mixedwood and coniferous forest habitats. Results from the analysis on key species were used to estimate potential effects to other migratory bird species. Other key wildlife species that share habitat requirements with migratory birds were also used in the assessment to estimate potential effects to migratory birds. These included western toad, which share habitat requirement with wetland birds, pacific marten, which shares habitat requirements of old growth and mature forests with forest dwelling song birds and cavity nesters and grizzly bear that share habitat requirements with migratory birds that use mature forest, riparian and riverine habitats.

Overall, the residual effects of the proposed Project would potentially affect only a negligible percentage of the regional migratory bird populations (e.g., estimated at only a few individuals).

#### *Marbled Murrelet*

EC sought clarification on the Proponent's characterization of "marginal habitat" for marbled murrelet and how that corresponds with the habitat rankings in the recovery strategy of "most likely" "moderately likely" or "least likely" and how the final critical habitat suitability ranking was determined.

The Proponent stated that critical habitat within the proposed Project footprint is ranked as "moderately likely" to support biophysical attributes for marbled murrelet breeding. The Proponent concluded habitat was of marginal value based on further investigation through habitat assessment and audio-visual surveys. The factors considered to reduce the effectiveness of breeding habitat included non-uniform distribution of biophysical attributes, relatively close proximity to the ocean, presence

of industry nearby, small patch size, increased predation risk from convoluted and elongated edges and no detections of marbled murrelet during surveys.

EC sought clarification that alternative approaches to the Project had been considered and the best option adopted, what measures would be taken to minimize the impact of the Project on marbled murrelet and how these measures are consistent with the recovery strategy.

The Proponent confirmed that no further adjustments could be made to reduce the proposed Project's direct effects on marbled murrelet critical habitat, given the site constraints (see memo *Requirements under Section 79(2) of the Species at Risk Act in relation to marbled murrelet and their critical habitat*, undated). The memo identified mitigation measures already in the Application to minimize impacts to marbled murrelet.

The Proponent concluded that the proposed Project is consistent with the recovery strategy and is unlikely to result in the inability to meet the strategy's short, medium or long term objectives. The area of critical habitat is less than 0.001% of the assumed supply in the Northern Mainland Coast. Marbled murrelet are not expected to breed in the Project footprint, however, if that was the case the predicted effect would be restricted to one breeding pair which would be less than 0.001% of the potential breeding population in the Northern Mainland Coast.

EC identified that multi-year surveys are important to determine the occupancy of marbled murrelet critical habitat. The Proponent committed to undertaking additional marbled murrelet presence surveys in 2015, which EAO proposes as a condition.

#### *Other Wildlife*

EC expressed concern regarding two bat species (little brown myotis and Keen's myotis), and that they were not included as key species in the assessment.

EAO did not require the Proponent to assess these key species, but included other key species which had habitat that overlapped considerably with the habitat of those species. In addition, key sites for bats were not present in the Project footprint. The Proponent committed to completing bat surveys during 2015 to confirm the presence/absence of bats within the wildlife resources LSA.

EAO has proposed a condition requiring site assessment survey plans for bat species within the Project area that specifies mitigation to avoid or reduce adverse effects of the proposed Project on habitat.

EC raised concerns about bird mortality due to flaring.

Bird interaction with a flare is most likely to occur at night in conjunction with adverse weather conditions when the artificial light from the flare is apparent and birds are

attracted to the light. The rarity of a major flaring scenario occurring at night in conjunction with adverse weather conditions suggests that bird mortality would be a rare event. However, the Application indicates that planned flaring could occur for several weeks during commissioning of the proposed Project. The Proponent assessed emergency flaring in the Accidents and Malfunctions section of the Application, and emergency flaring is discussed in section 10 (Accidents and Malfunctions) of this Report.

In response to these concerns, EAO has proposed a condition requiring the Proponent to identify mitigation measures, including timing period, to minimize risk of mortality and injury to birds during planned flaring events prior to operations.

EC noted that amphibians are sensitive to low pH and that there are nine lakes that were identified in the Surface Water Quality section of the Application as sensitive to acidification and could be further stressed by proposed Project activities.

The Proponent indicated that the assessment of the effects of the proposed Project on western toad did consider the potential loss of habitat due to degradation of habitat quality. The Proponent considered the effects of wetland habitat loss reversible through the implementation of the wetland no-net loss component of the Wetlands Compensation Plan. The Proponent also indicated that they would provide funding to an environmental non-governmental organization as a component of the Wetlands Compensation Plan for the monitoring of compensatory wetlands to ensure water quality (chemical composition and pH) and effectiveness of the compensation methods.

EAO has proposed a condition requiring the Proponent to develop a wetland compensation plan that is consistent with the *Federal Policy on Wetland Conservation*.

#### 5.8.4 Characterization of Residual Effects

After considering all relevant proposed mitigation measures, EAO concludes that the proposed Project would result in the following residual adverse effects on terrestrial wildlife and marine birds:

- Loss or change in terrestrial, and marine habitat;
- Sensory disturbance or behavioral alterations; and
- Increased risk of injury or mortality.

EAO's characterization of the residual effect of the proposed Project is summarized below, as well as EAO's level of confidence in the effects determination (including their likelihood and significance).



Criteria	Assessment Rating	Rationale
Context	Medium resilience	<p>The proposed Project would occur in an area with existing disturbance resulting in past habitat loss and current sensory disturbance. Regional populations are expected to demonstrate a moderate degree of resilience to changes in habitat availability caused by the proposed Project, as most have secure populations and access to additional suitable habitat within the RSA.</p> <p>Vessel traffic near seabird colonies is not currently an uncommon occurrence. Marine birds are expected to have a moderate degree of resilience to sensory disturbance in the shipping area.</p> <p>Species at risk have less resilience to changes in habitat, in particular western toad. The proposed Project site has marginal value habitat for marbled murrelet.</p>
Magnitude	<b>Habitat:</b> Low to Moderate	<b>Habitat:</b> Effects are considered low to moderate because of the permanent loss of 278 ha of habitat. For some species the habitat loss constitutes 20-40% of habitat in the LSA; however, it is generally considered to be a low magnitude effect when taking into account regional habitat availability.
	<b>Sensory disturbance:</b> Low to Moderate  <b>Mortality risk:</b> Low to Moderate	<p><b>Sensory disturbance:</b> Site clearing and construction activities are expected to result in avoidance behaviour by many wildlife species. During operation, sensory disturbance will occur but will be lower during operation. Some species of terrestrial wildlife and marine birds may habituate to regular disturbance events, including vessel traffic. Disturbance events during peak migratory periods could affect feeding effectiveness and energetics critical to staging and migratory periods.</p> <p><b>Mortality risk:</b> Effects are considered moderate for wildlife species with limited ability to disperse, or with strong site fidelity, would be at risk from vegetation clearing. The effect of vessel or facility collision mortality is considered low magnitude as it is expected to affect only a small number of individuals.</p>
Extent	Local	Effects to habitat, sensory disturbance and mortality risk would be within the footprint or LSA.
Duration	<b>Habitat:</b> Permanent	<b>Habitat availability:</b> Construction of the proposed Project would result in the permanent loss of habitat for wildlife and marine birds, though during operations habitat in some areas is expected to recover to an early seral plant community within 10 to 15 years.
	<b>Sensory disturbance:</b> Long-term	<b>Sensory disturbance:</b> Sensory disturbance would occur for the lifetime of the Project through to decommissioning.
	<b>Mortality risk:</b> Medium to Long-term	<b>Mortality risk:</b> Effects on mortality risk from construction would be medium-term because the effects would occur for more than one breeding season or generation. Effects on mortality risk from operations would be long-term because the effects occur across

Criteria	Assessment Rating	Rationale
		multiple breeding seasons or generations.
Reversibility	<p><b>Habitat:</b> Irreversible</p> <p><b>Sensory disturbance:</b> Reversible</p> <p><b>Mortality risk:</b> Reversible</p>	<p><b>Habitat:</b> Habitat loss in most of the Project footprint would be irreversible; however, during operations habitat in some areas is expected to recover to an early seral plant community within 10 to 15 years.</p> <p><b>Sensory disturbance:</b> Effects of sensory disturbance would cease when Project operation and decommissioning ceases.</p> <p><b>Mortality risk:</b> Effects of mortality risk would cease when Project operations cease.</p>
Frequency	<p><b>Habitat:</b> Single event</p> <p><b>Sensory disturbance:</b> Multiple regular, irregular and continuous events</p> <p><b>Mortality risk:</b> Multiple events</p>	<p><b>Habitat availability:</b> Impacts to habitat would result once from construction clearing.</p> <p><b>Sensory disturbance:</b> Sensory disturbance would occur irregularly during construction and regularly during operations due to noise and activity from construction and regular marine vessel activity. Sensory disturbance from the marine terminal would be continuous.</p> <p><b>Mortality risk:</b> Effects due to construction, operations and collisions due to lighting would occur during multiple events.</p>
Likelihood	The likelihood is high that some degree of residual adverse effects would occur, particularly during construction of the proposed Project due to direct habitat loss and sensory disturbance. The likelihood of mortality is moderate for terrestrial wildlife during clearing activities and is low during operations and decommissioning, and low for marine birds in all Project stages.	
Significance Determination	Taking into consideration the long-term and permanent duration of residual effects, which are low to moderate in magnitude, and the mitigation measure identified by the proponent and proposed conditions, EAO concludes that the proposed Project's residual adverse effects on terrestrial wildlife and marine birds are not significant.	
Confidence	There is a high level of confidence in the likelihood and significance determination of effects on terrestrial wildlife and marine birds based on the effectiveness of mitigation and the quality of the data used to support the assessment.	

### 5.8.5 Cumulative Effects Assessment

Forest harvesting is common within most watersheds in the facility RSA and is a dominant disturbance. At baseline, approximately 2.5 million ha (81%) of the facility RSA is undisturbed habitat and 580,000 ha (19%) is disturbed. Reasonably foreseeable projects and activities might lead to the loss of an additional 3,333 ha (less than 0.1%). Each of these projects will also contribute to an increase in linear density through construction of roads, placement of pipes or clearing vegetation.

Reasonably foreseeable future projects would contribute to the loss or change in habitat for marbled murrelet, in particular those projects that would lead to further loss of old-growth habitat. The critical threshold amount for suitable breeding habitat in the Northern Mainland Coast area is 68% retention of 2002 levels. As of 2011, 97% of critical habitat remained. Oil and gas development will be the largest future source of future loss of habitat in the facility RSA, but only a small portion of this would like be within critical habitat. Most of this development is from proposed pipelines developments, which are generally located off floodplains where the highest-value marbled murrelet breeding habitat occurs.

The number of ship transits in Kitimat Arm and Douglas Channel would increase from 0.5 transits daily currently, to 4.3 transits daily cumulatively. Up to 348 vessels currently travel within the proposed Project's shipping RSA each year (80 for RTA and 8 for Methanex, which traverse Douglas Channel and Kitimat Arm; 225 ferries and 35 cruise ships in the shipping RSA outside of Douglas Channel). The increase in marine traffic has the potential to affect marine birds through increased mortality risk and sensory disturbance. Individual birds are expected to adjust daily or seasonal movement patterns in response to increased vessel traffic in the RSA. The Application stated that declines in the sustainability of marine bird populations have not been directly associated with effects from alteration of movement.

The adverse effects from past, present and future projects and activities are not expected to effect the long-term viability of populations of terrestrial wildlife and marine birds. EAO concludes that no significant cumulative effects to terrestrial wildlife and marine birds are expected as a result of effects of the proposed Project interacting with the effects of other past, present and reasonably foreseeable future projects and activities.

#### 5.8.6 Conclusions

Considering the above analysis and having regard to the conditions identified in the TOC (which would become legally binding as a condition of an EAC), EAO concludes that the proposed Project would not have significant adverse effects on terrestrial wildlife and marine birds.

## 6 Assessment of Economic Effects

### 6.1 Economic Conditions

#### 6.1.1 Background

Economic conditions was selected as a VC because of potential interactions between the Project and the local, regional, and provincial economies. The assessment of economic conditions considered the following two potential effects and associated measurable parameters:

- Change in labour supply and demand:
  - Labour availability (persons);
  - Labour force skill levels;
  - Supply of local and regional training programs related to skills required for the Project; and
  - Labour wages.
- Change in economic activity of other sectors:
  - Cost of living;
  - Change in availability of goods and services; and
  - Measurements of economic activity.

The assessment of economic conditions is closely linked to social VCs (e.g. Infrastructure and Services, Visual Quality, Marine Transportation and Use and Community Health and Wellbeing), which are addressed in section 7 of this Report.

The LSA directly encompasses each of the following communities: Kitsumkalum, Terrace, Kitselas, Prince Rupert, Kitimat, Kitimaat Village, Lax Kw'alaams, Metlakatla Village, Port Edward, Kitkatla, and Hartley Bay. The RSA encompasses the RDKS and the SQCRD areas A and C.

#### 6.1.2 Potential Project Effects and Proposed Mitigation Described in the Application

Over the last 20 years, northwest BC has experienced an economic decline and a drop in population, attributable mainly to the closure of multiple large industrial operations. However, recent industrial and infrastructure projects, including BC Hydro's Northwest Transmission Line, RTA Kitimat Modernization Project and port expansions in Prince Rupert, have been sources of employment and economic spinoffs, but have also affected local and regional labour supplies while also contributing to increased cost of living.

The Application stated that there is potential for adverse effects on the local supply of labour and that Project employment would increase demand for skilled and unskilled labour. Additionally, wage inflation in a competitive labour market could potentially lead

to adverse effects on labour conditions. In addition to direct employment, the proposed Project would also create indirect employment locally and regionally due to procurement of goods and services, and induced employment would be generated as wages and other income are spent in local, regional, provincial, and national economies.

Although the unemployment rates decreased slightly in the preceding 5 years, by 2011 the rates in the LSA were notably higher than in BC as a whole (see Table 6-1). In those Aboriginal communities for which information was available, the participation rates were considerably lower than the provincial rate and unemployment rates were up to three times greater than the provincial rate. Selected employment data is shown in Table 6-1.

**Table 6-1: Population and Labour Force (2011)**

Location	Population Age 15 +	Participation Rate (%)	Labour Force	Employment	Unemployment	Unemployment Rate
BC	3,646,840	64.6	2,345,245	2,171,465	182,775	7.8%
<b>LSA</b>						
Kitamaat 2 IR (Kitamaat Village)	420	47.6%	200	135	60	30%
Kitselas 1 IR (Kitselas)	155	45.2%	70	50	25	35.7%
Kulspai 6 IR (Kitselas)	60	50%	30	25	10	33.3%
Kitsumkaylum 1 IR (Kitsumkalum)	NA	NA	NA	NA	NA	NA
Kulkayu 4 IR (Hartley Bay)	NA	NA	NA	NA	NA	NA
Lax Kw'alaams 1 IR	NA	NA	NA	NA	NA	NA
Dolphin Island 1 IR (Kitkatla)	335	35.8%	120	75	45	37.5%
s1/2 Tsimpsean 2 IR (Metlakatla)	NA	NA	NA	NA	NA	NA
Kitimat DM	6,965	61.3%	4,270	3,765	505	11.8%
Terrace CA	12,320	66.1%	8,145	7,495	650	8%
<b>LSA</b>						
Port Edward	NA	NA	NA	NA	NA	NA
Prince Rupert CA	10,410	65.9%	6,860	5,865	995	14.5%
<b>LSA Total</b>	<b>30,665</b>	<b>64.2%</b>	<b>19,695</b>	<b>17,410</b>	<b>2290</b>	<b>11.6%</b>
<b>RSA</b>						
RDKS	29,795	62.2%	18,530	16,135	2,395	12.9%
SQRD	14,875	62.8%	9,340	8,010	1,330	14.2%
<b>RSA Total</b>	<b>44,670</b>	<b>62.4%</b>	<b>27,870</b>	<b>24,145</b>	<b>3,725</b>	<b>13.4%</b>

According to the Application, due to the recent regional economic activity, wage increases, worker recruitment, and worker retention may not be reflected in the labour

market data. With continued economic growth, skilled trades workers are predicted to be in short supply along with trades helpers and labourers.

Direct construction employment would occur in Kitimat and would require 26,300 PYs for over five years to construct trains 1 and 2, and 10,200 PYs for four years to construct trains 3 and 4. The estimated distribution of construction employment would be:

- 5% would be current local residents;
- 5% would relocate locally;
- 20% would be hired from elsewhere in BC;
- 50% would be from elsewhere in Canada; and
- 20% would be from abroad.

With a potential peak construction workforce of 7,500 persons, peak local employment is estimated to be 750 workers. This number includes individuals currently residing locally, as well as those who may move to the area in search of employment. In addition to direct on-site employment, Project construction expenditures would result in indirect and induced employment. Additional information on economic benefits can be found in section 2.3 of this Report.

Based on the existing labour availability and skill levels in northern BC, the Proponent predicted that labour supply shortfalls are expected for Project construction and operation. The Application stated that during construction, there could be a reduced availability of skilled and unskilled labour and increased wages, which could make recruitment and retention of workers difficult for other businesses. Additionally, because the Project would require skilled workers from the region and elsewhere in the province, the effects on labour supply and demand could contribute to a general shortage of certain types of skilled labour in the workforce. The Application does not contain an estimated quantification of the potential labour shortages.

During operations, labour needs would decrease and workers with higher skills levels would be required. It is expected that some non-local skilled workers would be recruited. It is estimated that the proposed Project would employ between 350 and 550 people to operate trains 1 and 2 and from 450 to 800 people if trains 3 and 4 become operational. Approximately 50% to 70% of the operation staff would be full time LNG Canada employees, with the balance of work provided by contractors. The Proponent anticipates that the majority of the operational workforce would be Canadian residents and would reside locally.

The 2010 average annual local earnings is \$50,124. According to the Application, average annual compensation for oil and gas facility construction employees is \$140,200. The large differential between current average wages and expected construction wages could result in upward pressure on local wages, and impact recruitment by other sectors, particular for some skilled trades.

Project demand for goods and services in addition to labour, has the potential to contribute to adverse economic effects if the availability of goods and services is reduced and prices increase. Similarly, increased wages could potentially drive up prices of local goods and services and the cost of living.

The Application identified increased cost of living as a potential negative effect of the proposed Project that could affect economic activity in other sectors. Increases in cost of living would be largely due to an increased demand for local housing. Although, additional demand and supply constraints could result in higher housing costs, the construction phase is unlikely to directly affect local housing markets and demand for temporary accommodation due to the use of the workforce accommodation centre. During operations, the Proponent would work to manage demands on local housing (e.g., apartments and single-family houses) in Kitimat to accommodate Project staff and their families who would permanently relocate to Kitimat; however, additional demand could occur due to migration associated with indirect and induced employment.

The increased level of economic activity associated with the Project would endure over the operational period due to direct spending on local goods and services, as well as household spending from the Project workforce. While it is possible that the increased economic activity associated with Project operation would contribute to some localized inflation, this impact would be minor relative to other drivers of inflation.

The following key mitigation measures are proposed in the Application:

- Local residents would be informed of job and procurement opportunities;
- Develop work packages that would consider the capabilities of local and regional businesses to enhance local procurement opportunities;
- Potential shortages of workers with specific skill requirements would be identified and training and educational facilities would be engaged so that regional residents have the opportunity to upgrade their skills;
- Identify training and capacity building partnerships or other arrangements for potentially affected Aboriginal Groups and local communities;
- Construct and operate a workforce accommodation centre for non-resident workforce;
- Manage demands on local housing (e.g., apartments and single family houses) due to the anticipated requirements of the construction management and operational workforce; and
- Participate in initiatives and recommended measures identified in the Kitimat Housing Plan (developed based on Northwest Communities Housing Action Plan) to address the availability of affordable housing within northwest communities.

Additional mitigations and detail can be found in the Proponent's Application and additional materials submitted during Application review.

### 6.1.3 Potential Project Effects and Proposed Mitigation Identified During Application Review

During Application Review, questions and concerns were raised by the Working Group about the potential effects on labour supply and demand and economic activity of other sectors. Concerns regarding the potential Project-related social effects on housing are discussed in section 7.1 of this Report. Concerns regarding the effects of the Project on marine-based industries are discussed in section 7.3 (Marine Transportation and Use) of this Report.

Gitga'at First Nation, Kitselas First Nation and Kitsumkalum First Nation raised concerns that competition for labour and the higher wages associated with the Project would lead to wage inflation, affecting the viability of local businesses due to increased costs and the ability of local businesses and Aboriginal Groups to recruit and retain employees. The availability of high paying short term jobs could result in shortages of qualified employees for Aboriginal-based employment.

The Proponent responded that although there is a potential for the proposed Project to adversely affect local businesses and Aboriginal Groups, they were not able to quantify the potential effects or be able to control local wages. Additionally, the Proponent responded that the proposed Project would bring economic development opportunities and, although costs could potentially increase, revenues would also increase. The Proponent cited a survey of local small businesses, which found that the higher costs associated with recent economic activity has been offset by higher revenue. The Proponent committed to continuing to engage local businesses and Aboriginal and local communities on a case-by-case basis.

Kitsumkalum First Nation expressed concern that local businesses would need to be able to access opportunities to provide goods and services to the Project. Gitga'at First Nation also raised concerns regarding the barriers to members of Aboriginal Groups finding employment with major projects.

The Proponent responded that they have mitigations in place to address local procurement and that they would encourage their suppliers and subcontractors to adopt local procurement. The Proponent would require their contractors to include a "local implementation plan" to describe how they would employ local businesses and suppliers, including Aboriginal businesses. The Proponent would also set up a database of local contractors to determine contractors and services available in the community, and committed to hold workshops to gather information from local business.

Based on comments and concerns raised regarding local access to economic opportunities, EAO is proposing a condition that would require the Proponent to ensure local businesses and residents are provided opportunities to participate in the proposed Project, and to identify and implement training and capacity-building to support Aboriginal and local communities.



#### 6.1.4 Characterization of Residual Project Effects

After considering all relevant proposed mitigation measures, EAO concludes that the proposed Project would result in the following residual adverse economic effects:

- Decreased labour availability and increased labour costs; and
- Negative effects on other sectors through increased cost of goods and services.

EAO's characterization of the residual effect of the proposed Project is summarized below, as well as EAO's level of confidence in the effects determination (including their likelihood and significance).

Criteria	Assessment Rating	Rationale
Context	Moderate sensitivity	Compared to provincial averages, the RSA and LSA have high unemployment rates, although the number of workers with appropriate skills is limited. A recent economic resurgence in the region is increasing labour demands and business costs.
Magnitude	Low	<p>A construction workforce peaking at 7,500 would likely result in imbalances in the regional labour supply and demand, particularly during construction. Indirect and induced demand for labour would further this impact. Due to increased demand, the supply of some skilled labour may lessen.</p> <p>Upward pressure on wages, cost of living and costs of goods and services could have a negative effect on other sectors. Some effects would be lessened by the positive effect of increased economic activity.</p> <p>The magnitude of adverse economic effects would be mitigated by increased economic opportunities.</p>
Extent	Regional	While adverse construction-related effects would be most acute in Kitimat and Terrace, they would also be felt regionally.
Duration	Medium	The duration of effects from the facility would be primarily during the first phase of construction (5 years), but could persist into operation as the economy balances.
Reversibility	Reversible	The effects would be reversible as the local economy balances.
Frequency	Continuous	The adverse economic effects would occur continuously during construction (5 years), but would lessen and stabilize during the initial years of operation.
Likelihood	The likelihood is high that the facility would have some degree of adverse effects on labour supply and demand and economic activity of other sectors, particularly during construction. However, many local residents and businesses would also experience benefits from the increased economic activity.	

Criteria	Assessment Rating	Rationale
Significance		Considering the above analysis and having regard to the conditions identified in the TOC (which would become legally binding as a condition of an EAC), EAO is satisfied that the proposed Project would not have a significant adverse residual effect on economic conditions.
Confidence		There is a high level of confidence in the likelihood and significance determination. However, there is some uncertainty regarding the ratio of workers that would be hired from the local and regional labour force and in predicting how local labour markets and local economies may respond to the proposed Project.

### 6.1.5 Cumulative Effects Assessment

The Application's cumulative effects assessment identifies 23 projects and activities that have the potential to interact cumulatively with the proposed Project. Substantial economic expansion is expected in the region through 2020 based on proposed major projects, particularly LNG-related projects.

Although there is considerable uncertainty regarding which major projects will be constructed, the Application stated that the direct cumulative workforce demand for major projects in the region could peak at 14,500 workers in 2017, exceeding the supply of appropriately skilled workers in the region. Based on the current economic conditions, in which there are known labour availability issues and cost of living issues related to recent economic expansion, the effects from employment and expenditures are likely to cause adverse effects on economic conditions. Additionally, the cumulative effects of the regional labour requirements would extend to elsewhere in BC. Project operation labour requirements would continue to act cumulatively with labour demand of other projects requiring workers with similar skills.

There is also the potential for cumulative effects to the cost of living as a result of increased demand for housing and accommodations during construction and operations. Increased cost of living as a result of rapid economic growth has been noted for comparable areas. For businesses in other sectors, there is the potential that increased demand for labour and retail space will drive costs up, resulting in higher prices for consumer goods, and decreased profitability for businesses.

#### *Additional Initiatives to Address Cumulative Effects to Labour Market*

The BC Government, industry, Aboriginal communities and other communities have embarked on several initiatives to identify potential adverse cumulative effects on labour markets to help mitigate labour shortages expected in Northern BC and/or increase the proportion of potential benefits likely to accrue to local communities and Aboriginal Groups from the LNG sector. These include:

- British Columbia Natural Gas Workforce Strategy Committee: The Committee was established with financial support from the provincial and federal governments under the Labour Market Partnership Program and comprises representatives from major companies, industry associations and provincial government ministries. In July 2013, the Committee released the BC Natural Gas Workforce Strategy and Action Plan, which details multiple strategies and actions on the local, regional, Canadian and international front to help overcome issues that have prevented portions of the labour force from participating in regional employment. That report estimated that at peak construction, which could occur between 2016/2017 and 2021, some 21,600 jobs could be directly involved in building up to 5 LNG export facilities and associated pipelines in Northern BC. (BC Natural Gas Strategy, 2013);
- Premier's LNG Working Group: In September 2013, the BC Government established the Premier's LNG Working Group with representatives from organized labour, industry, Aboriginal Groups and the Province to review the skills training and workforce planning issues associated with the LNG industry. In March 2014, this Working Group issued a detailed report outlining key strategies for addressing the potential skilled labour shortages likely to emerge as major proposed Projects in the LNG and other sectors proceed to the construction phase. (Premier's LNG Working Group, 2014);
- Northwest Readiness Project: In December 2013, the BC Ministry of Community, Sport and Cultural Development initiated the Northwest Readiness Project in consultation and collaboration with the BC Ministry of Jobs, Tourism and Skills Training. This Project is key in ensuring provincial service providers and communities expected to experience significant population growth in the Northwest region are prepared to meet infrastructure, health, safety and social services demands as proposed new industrial projects move from concept to construction stages and beyond. Drawing from data sourced from Project proponents, and in consultation with a number of regional stakeholders, the Northwest Readiness Project Team has now begun to develop a standardized set of scenarios of probable employment and population growth resulting from major project development in the region to assist communities with service planning;
- Northwest Regional Economic Collaborative: The BC Jobs, Tourism and Skills Training Northwest Regional Economic Collaborative includes the Northwest Labour Market Partnership, Northwest Tourism Strategy, Regional Investment Readiness and Bio-Energy Investment Attraction. The Northwest Regional Economic Collaborative brings the communities of Kitimat, Terrace and Prince Rupert, as well as the Aboriginal communities of Kitselas First Nation, Kitsumkalum First Nation, Haisla Nation, Metlakatla First Nation and Lax Kw'alaams Band, together to identify priority areas for regional collaboration and promote economic diversification across the region; and

- Industry – BC LNG Alliance: The BC LNG Alliance brings together four major BC LNG proponents to coordinate community relations and labour strategies related to the proposed LNG facilities in northwest BC. They include: Petronas' Pacific Northwest LNG (PNW LNG), Shell Canada Energy's LNG Canada, BG Group's Prince Rupert LNG, and Chevron's KLNG.

Due to in-migration for direct, indirect and induced economic opportunities, EAO determines the magnitude of cumulative residual adverse effects to be low to medium in magnitude as construction of the proposed Project would combine with other reasonably foreseeable developments to cause an increase in demand for skilled labour and goods and services, which could in some cases exceed existing capacity. Simultaneously, the increased level of development would generate numerous economic opportunities for local and regional businesses. EAO concludes that no significant cumulative effects to economic conditions are expected as a result of effects of the proposed Project interacting with effects of other past, present and reasonably foreseeable future projects and activities.

#### 6.1.6 Conclusions

Considering the above analysis and having regard to the CPD and the conditions identified in the TOC (which would become legally binding as a condition of an EAC), EAO is satisfied that the proposed Project would not have significant adverse effects on Economic Conditions.

## 7 Assessment of Social Effects

### 7.1 Infrastructure and Services

#### 7.1.1 Background

Infrastructure and Services was included as a VC because of the potential for population increases to lead to increased demands for regional infrastructure and services and displacement of low-income households.

The assessment considered three potential Project effects, each with its own set of measurable parameters (see Table 7-1).

**Table 7-1: Potential Project Effects on Infrastructure and Services**

Potential Effects	Measurable Parameters
Change in housing availability	<ul style="list-style-type: none"> <li>Housing supply and demand, including government-assisted housing; and</li> <li>Indicators of housing affordability.</li> </ul>
Effects on community infrastructure and services	<ul style="list-style-type: none"> <li>Population/demographic composition;</li> <li>Demand and supply of community, social, and government infrastructure and services (e.g., education facilities, community centres, first responder services, domestic water supply, wastewater, solid waste);</li> <li>Access and availability of green spaces, and land-based parks and places of recreation;</li> <li>Parameters based on affected infrastructure and services (e.g., students/educator, police officers/1,000 people); and</li> <li>Local government cost measurements.</li> </ul>
Effects on traffic and pressure on transportation infrastructure	<ul style="list-style-type: none"> <li>Daily road traffic volume (vehicles/day);</li> <li>Traffic collisions (collisions/year); and</li> <li>Air and rail traffic volumes.</li> </ul>

The LSA for assessing Project effects on infrastructure includes nearby communities and rural areas, including Aboriginal communities where it can reasonably be expected that direct adverse effects from the proposed Project would occur. Additionally, this area encompasses transportation and utility infrastructure between the City of Terrace and the District of Kitimat, and the Northwest Regional Airport.

#### 7.1.2 Potential Project Effects and Proposed Mitigation Described in the Application

Potential Project effects on community infrastructure and services relate primarily to the expected changes in population and demographics. In 2011, the population of the LSA was approximately 24,910. The Proponent anticipates that the proposed Project would employ 4,500 to 7,500 people during peak construction and 450 to 800 people during operation.

During the peak of construction, the Project would directly cause a 6,170 person (25%) increase in the population of the LSA. During the operation phase, the permanent population of the LSA is forecast to increase by approximately 7% (1,765 people). During both construction and operation, overall population changes would be greatest in Kitimat (see Table 7-2).

**Table 7-2: Predicted Population Changes in Terrace and Kitimat\***

	Population (2011)	Estimated Population at Peak of Construction	Estimated Population During Operation
Kitimat area**	8,849	14,877	10,127
Terrace area***	16,072	16,080	16,088

\*Includes estimate of workers and accompanying spouses and children

\*\*Consists of the following census sub-division: Kitimat, Kitamaat 2 IR

\*\*\*Consist of the following census sub-divisions: Terrace Census Agglomeration, Kitselas 1 Ir, Kitsumkaylum 1 IR

The Application stated that the proposed Project is expected to affect the population of Aboriginal communities in the LSA. Some Aboriginal members living elsewhere might move back to their home reserves or communities to participate in Project-related economic opportunities. Off-reserve community members might also move on-reserve to seek lower-cost housing.

### *Housing*

Due to an influx of workers associated with recent large infrastructure and construction projects, communities in the LSA have experienced increased demand for housing, reduced availability of housing and increased housing costs.

Of the communities in the region, Kitimat has experienced the greatest decline in vacancy rates and increase in rents. Recent increases in the cost of rent and eviction notices in Kitimat and Terrace have also led to a number of housing challenges for Aboriginal communities. These include increased homelessness and multiple families living under one roof in Kitamaat Village, long wait lists for on-reserve housing in Kitselas First Nation, and general overcrowding and limited developable land.

Project-related demand for temporary housing would peak during construction. During this phase, the Proponent expects that most of the temporary workforce would be housed in the workforce accommodation centre.

During operation, the permanent workforce, accompanying spouses and children, and other Project-related in-migrants would require local accommodation. Based on the predicted population change and in-migrant demographic characteristics, the Proponent forecasted that up to 490 housing units could be needed by 2025. The Application stated that the Proponent would work to add permanent housing and apartment units in Kitimat to help accommodate Project operations staff and their families who would relocate to Kitimat. Additional demand during both phases would occur due to in-migration associated with indirect and induced employment.

During operations, maintenance turnarounds would bring an additional 500 to 1,000 contractors to the LSA for up to 58 days every three years. After the construction phase, the workforce accommodation centre would be decommissioned and the turnaround workforce would generate additional indirect and induced demand for temporary accommodations, such as hotels and motels.

The Proponent stated that the increased housing demand caused by the proposed Project could be expected to contribute to increases in both rental and owner-occupied housing costs during construction and into the first few years of operation, until Project-associated population change stabilizes and the real estate market reaches a new equilibrium.

The proposed Project might indirectly affect housing in Aboriginal communities in the LSA. Increased costs for rental housing outside the reserves could compel more individuals and households to seek band-owned housing. Because Aboriginal communities have limited ability to expand their stock of band-owned housing, crowding and homelessness might increase in these communities.

Following is a summary of the key mitigation measures proposed in the Application:

- Construct and operate a workforce accommodation centre during the pre-construction and construction phase;
- Develop a worker accommodation plan;
- Manage demands on local housing (e.g., apartments and single family houses) due to the anticipated requirements workforce, and conduct periodic reassessments of the housing market;
- Communicate with local and provincial housing authorities as early as possible regarding anticipated changes in the demand for accommodations; and
- Participate in initiatives and recommended measures identified in the Kitimat Housing Action Plan (developed based on the Northwest Communities Housing Action Plan) to address the availability of affordable housing within northwest communities.

Additional mitigations and detail can be found in the Application and additional materials submitted during Application Review.

### *Effects on Community Infrastructure and Services*

The Application stated that Project-related population changes could be expected to increase demands on utilities (water and sewer, and waste management facilities), education (daycare), access to and use of public recreation sites during construction and operation, and emergency response (police, fire protection, and ambulance) primarily during construction.

*Water, Sewer and Wastewater* – Peak demand for water in Kitimat and Terrace is near the capacity of the existing infrastructure. According to the Application, an increase in demand would require upgrades to the Kitimat Service Centre lift station. In Kitimat,

peak sewer and wastewater treatment demand is at capacity and peak sewer demand in Terrace is below capacity.

The Proponent predicted that the workforce accommodation centre housing the construction labour force would place little or no demand on municipal infrastructure because it would have its own water treatment facility and wastewater (sewage) treatment facility. Construction workers and their dependents that relocate to the area—thus living outside of the workforce accommodation centre—could be expected to increase average daily demand for potable water and wastewater treatment services. In Kitimat, projected peak demand for potable water could reach nearly 90% of rated capacity, while peak demand for sewage and wastewater treatment could exceed rated capacity. Thus, the Proponent predicted that current infrastructure in Kitimat may need to be upgraded to handle demand due to Project-associated population growth. Current potable and wastewater treatment facilities in Terrace could also need to be upgraded to meet peak demands.

*Solid waste* – The Application stated that depending on the construction timelines and opening of the RDKS's Forceman Ridge Landfill planned for 2016, additional pressure and challenges could be created for the District of Kitimat Landfill or other landfills located in the LSA. As a result of Project-related population increase, the lifespan of the Kitimat landfill would decrease.

*Schools and daycares* – The Application stated that in the LSA, there would be sufficient schoolroom space to accommodate the expected increase in elementary, middle, and high school students associated with the proposed Project. Some additional hiring would likely be necessary so that student to teacher ratios remain within provincial standards. Demand for daycare in the LSA exceeds supply at current levels, and there is insufficient daycare capacity in the LSA to handle demand associated with the Project.

*Emergency services* – Local service providers are under increasing pressure to provide ambulance, fire, and police services and have limited capacities to accommodate an increase in demand.

During construction, workers who are housed at the accommodation centre would have access to health-related services. During both construction and operations, minor incidents on site would be addressed by an occupational first-aid provider. Workers at the accommodation centre would have access to a full suite of health related services. More severe incidences would require ambulance transport to appropriate health facilities. Increased demand could result in the need for additional staffing. Based on the current firefighter to population ratio and provincial averages, the Application estimates that Terrace would need three additional volunteer firefighters, and Kitimat would need three additional firefighters to handle increased service demand associated with projected permanent population change related to the Project. Kitimat could need three to four additional firefighters because of service demands associated with the temporary workforce during construction.



Based on the current officer to population ratios and anticipated Project-related increases in population, one or two additional full-time police officers would be needed in Kitimat to address call volumes associated with the temporary construction workforce and the Project-related population increase predicted to occur during construction. Terrace and Kitimat would each need approximately two additional full-time police officers to address increased call volume due to the permanent population change associated with the Project.

*Municipal government expenditures* – The Application stated that in the LSA, municipal governments could anticipate increased expenditures during construction but that these would be offset by taxation, fees, charges, and levies during operation. The lag between expenditures and realization of additional revenues might create short-term deficits that would eventually be followed by a period of surplus.

In Kitimat, additional annual expenditures associated directly with the proposed Project and with the temporary workforce were forecast to reach \$6.7 million per year by 2024, before declining in the operation phase. Additional annual expenditures associated with the in-migrating population are forecast to reach \$4 million by 2025 and would remain at that level throughout the operation phase. Terrace would incur additional expenditures associated with an increase in temporary and permanent population growth. As the proposed Project becomes operational, more households would be expected to settle in Terrace, resulting in an increase in expenditures by approximately \$1.4 million by 2026. The Application stated that revenues generated for the District of Kitimat and Terrace would offset the increased expenditures.

The Application stated that Aboriginal communities in the LSA may experience in-migration resulting in increased demand on infrastructure and services in their community.

Following is a summary of the key mitigation measures proposed in the Application:

- Develop and implement a social management plan to manage potential social effects of the Project and optimize potential benefits;
- Construct and operate a workforce accommodation centre that would:
  - Be self-sufficient with respect to potable water and wastewater treatment services (to extent practicable);
  - Provide on-site health services and medical emergency response for primary care, including health promotion, injury/illness prevention, and injury/illness management;
  - Include recreational venues, and entertainment and communications amenities.
- Communicate anticipated changes in resident populations attributable to the Project, to local government and service providers to enable them to plan for changes in service requirements;
- Log, monitor, and work to address community complaints to reduce community concerns associated with changes resulting from the proposed Project; and

- Develop and implement a worker code of conduct.

Additional mitigations and detail can be found in the Application and additional materials submitted during Application Review.

#### *Effects on Traffic and Pressure on Transportation Infrastructure*

The construction phase is expected to have the highest associated volumes of heavy and oversized loads. Traffic during the operations phase would primarily include the movement of locally-based workers and incremental increases to local traffic resulting from Project-related population growth. The Proponent predicted that traffic volumes at key intersections and road segments in the LSA would increase by approximately 11% to 36% in the construction phase and 16% to 21% in the operation phase, but that these increases would not result in any locations exceeding design capacity. However, the Haisla Bridge, an older two-lane truss bridge in Kitimat, was identified as a potential concern because it is heavily-used during peak hours and is a key link to industry activity on the Douglas Channel in the Kitimat area.

The Northwest Regional Airport, located 10 km south of Terrace is the only airport in the LSA. The Application stated that the increased workforce and local population in combination with the movement of Project supplies and equipment would increase demand for air travel. For up to three years at the peak of construction, the Northwest Regional Airport could see an increase of up to 133,000 air passengers per year, exceeding the capacity of the airport. Air traffic volumes would remain elevated, to a lesser degree, during the operation phase as a result of Project visitors, and a smaller continuing fly-in-fly-out worker population, plus the Project-related increase in local population. If demand nears or exceeds capacity, it may result in a decreased level of service for all users.

CN Rail is the primary heavy rail service provider in the LSA. Rail would be used to import items that can fit onto standard-sized rail cars during construction and to export stabilized condensate during operation. Although a precise estimate of needs is not available, the Proponent estimated that up to 10 additional trains (30 to 60 cars each) per week (or the equivalent number of additional cars on existing trains if feasible) would be required during the peak construction phase. Up to 50 additional rail cars per week would be required during the operation phase.

Following is a summary of the proposed mitigations included in the Application:

- Develop and implement a traffic management plan;
- Provide relevant information on Project transportation planning to MOTI and District of Kitimat;
- Monitor travel-related incidents involving LNG Canada workers, to identify how travel could be improved to reduce risks to safety and further incidents;
- Worker rotations and charter flights, where practical, would be scheduled to alleviate peak pressures on the airport terminal facilities;

- Peak-hour traffic volumes, particularly across the Haisla Bridge, would be managed by scheduling worker rotations, and equipment, material, and goods deliveries to the off-peak hours whenever practicable; and
- Commuter support would be provided between Terrace and the Project Area.

Additional mitigations and detail can be found in section 7.2 of the Application and additional the materials submitted during Application review.

### 7.1.3 Potential Project Effects and Proposed Mitigation Identified During Application Review

#### *Housing*

During Application review, Gitga'at First Nation, Kitselas First Nation, Kitsumkalum First Nation, Haisla Nation, RDKS and the District of Kitimat voiced concerns regarding in-migration and negative project effects on the availability and cost of housing. They also expressed concern about the adequacy of the workforce accommodation centre and that subcontractors might seek accommodation outside of the accommodation centre with the demand for housing expanding to Terrace.

The Proponent responded that their estimate was conservative and that although they are expecting the workforce accommodation centre to house 3500 people, it could be expanded to accommodate up to 7500 people. The workforce accommodation centre would be designed to attract workers to reside in the camp (e.g., recreation and entertainment opportunities) rather than neighbouring communities and that workers choosing to live outside of camp would not receive a housing allowance. Additionally, the Proponent is currently working to quantify the Project-related housing demand they would need to offset during operation by entering into leases with local contractors to construct adequate new housing. The Proponent also committed to provide additional information on the concerns raised above in their social management plan and the worker accommodation plan.

In response to these concerns, EAO has proposed a condition requiring the development of a socio-economic effects management plan, which would require the Proponent to engage with potentially affected Aboriginal Groups, local governments, and provincial infrastructure and service agencies regarding the management of Project effects on infrastructure and services.

#### *Community Infrastructure and Services*

Members of the Working Group, including Gitga'at First Nation, Kitsumkalum First Nation, Kitselas First Nation and Northern Health and District of Kitimat were concerned that an increase in population would place extra demands on emergency and health service providers. It was pointed out that this discussion needed to extend beyond Kitimat to include service providers in Terrace, and that recruitment and

retention of a number of emergency and health service providers is difficult in the region and would require advance planning. Multiple Working Group members raised the need for ongoing monitoring and management of the effects on community infrastructure and services.

The Proponent responded that in addition to mitigations such as providing onsite health and safety services, the development of a code of conduct and cultural awareness training, they have committed to ongoing engagement with emergency and health services providers.

Gitxaala Nation raised concerns regarding how their health and wellbeing would be directly impacted by cumulative effects.

The Proponent responded that they do not anticipate that health care services within Kitkatla would be affected due to its geographic location. However, it is possible that in the cumulative effects scenario members of the Gitxaala Nation may experience a decreased quality of service in those facilities shared with the region (e.g., hospitals such as the Prince Rupert Regional Hospital).

With regard to solid waste, the RDKS raised concerns regarding their capacity and authority to receive the types and volumes of waste that may be generated by the construction camp and other forms of associated development.

The Proponent committed to engage with relevant stakeholders in development of the waste management plan as more information on types of waste becomes available. EAO has also proposed a condition requiring the development of a socio-economic effects management plan that would address this.

### *Traffic and Pressure on Transportation Infrastructure*

During Application Review, MOTI raised concerns regarding the adequacy of the effects assessment contained in the Application and requested additional details on the proposed mitigation. Kitselas First Nation voiced concerns regarding highway safety and the negative effects of increased traffic.

In response, the Proponent stated that project-related traffic volumes along Highway 16 are anticipated to be relatively low. Volumes on nearby Highway 37 are estimated to be 686 vehicles per day at peak construction and 313 vehicles per day during operations. These estimates take into account traffic volumes generated between the Northwest Regional Airport and the Project site, which Highway 16 would not experience.

In light of concerns raised during Application Review regarding ongoing monitoring and the uncertainty surrounding predicted population changes, EAO proposes conditions that would require the Proponent to develop and implement a plan to manage socio-economic effects that particularly focuses on infrastructure and services, a health and

medical services plan, as well as a traffic impact assessment and a traffic management plan.

#### 7.1.4 Characterization of Residual Project Effects

After considering all relevant proposed mitigation measures, EAO concludes that the proposed Project would result in the following residual adverse effects on infrastructure and services:

- Increased demands for community infrastructure and services;
- Negative effects on housing availability and affordability; and
- Increased traffic and pressure on transportation infrastructure, including air and road corridors.

Summarized below is EAO's characterization of the expected residual effects of the proposed Project on community infrastructure and services, housing availability and affordability, and increased traffic and pressure on transportation, as well as EAO's level of confidence in the effects determination (including their likelihood and significance).

Criteria	Assessment Rating	Rationale
Context	<p><b>Community Infrastructure and Services:</b> Low resilience</p> <p><b>Housing Availability and Affordability:</b> Low to moderate resilience</p> <p><b>Traffic and Transportation:</b> Low to moderate resilience</p>	<p><b>Community Infrastructure and Services:</b> There is low capacity for community services and infrastructure to meet additional demand.</p> <p><b>Housing:</b> In Kitimat, Terrace and local Aboriginal communities there is a low to moderate ability to meet additional housing demand.</p> <p><b>Traffic and Transportation:</b> Highways and roads in the area have a moderate capacity to accommodate increased traffic volume with the possible exception of Haisla Bridge. Currently, Northwest Regional Airport has low capacity to accommodate additional demand, although expansion is planned.</p>
Magnitude	<p><b>Community Infrastructure and Services:</b> Moderate</p> <p><b>Housing Availability and Affordability:</b> Moderate</p> <p><b>Traffic and Transportation:</b> Low</p>	<p>Although impact directly related to the temporary workforce would be mitigated through the Proponent's proposed mitigations and EAO's proposed community services and infrastructure condition, in-migration due to indirect and induced economic opportunities would result in a moderate increase in demand for infrastructure services and housing.</p> <p>There would be an increase in demand for transportation infrastructure, including airports and road corridors throughout the LSA that could result in a low decrease in the level of service.</p>
Extent	<p><b>Community Infrastructure and Services:</b> Local to Regional</p> <p><b>Housing Availability</b></p>	<p>Effects on community services and infrastructure would be most acute in the local communities, although there would be some regional effects.</p> <p>Effects on housing would be felt primarily in the local communities (e.g. Kitimat, Terrace and neighbouring Aboriginal and non-</p>

Criteria	Assessment Rating	Rationale
	<b>and Affordability:</b> Local <b>Traffic and Transportation:</b> Local to Regional	Aboriginal communities). Effects on Traffic and Transportation would be felt in the local communities. Effects on airports would primarily be local although may spillover regionally.
Duration	Medium term	Effects would be felt during the construction of phase 1 (five years) and would likely persist into the initial years of operations, until infrastructure and services (including housing supply and demand) have adapted to increased demand.
Reversibility	Reversible	The adverse effects to infrastructure and services would lessen once local and regional communities have adapted, however, housing costs would likely stabilize at a higher point than prior to the recent wave of development in the region.
Frequency	Continuous	The effect would occur continuously.
Likelihood	The likelihood is high that some degree of adverse effects would occur to infrastructure and services.	
Significance Determination	Considering the above analysis and the conditions identified in the TOC (which would become legally binding as a condition of an EAC), EAO is satisfied that the proposed Project would not have significant adverse residual effects on infrastructure and services.	
Confidence	There is a moderate to high level of confidence in the likelihood and significance determination, particularly in consideration of the on-going monitoring and adaptive management that would be required in the proposed Community Services and Infrastructure condition.	

### 7.1.5 Cumulative Effects Assessment

Infrastructure and services could be affected by accommodation of direct demands from other projects and the demands associated with increased population. The Application identifies 23 projects and activities that could potentially interact cumulatively with the proposed Project. Recognizing that there is considerable uncertainty regarding which projects will proceed and regarding timelines, based on the Proponent's calculations, regional population could increase by approximately 7,600 people (19%) by 2025. If multiple projects are constructed between 2015 and 2025, there may be a rapid increase in population (temporary and permanent) and municipalities and Aboriginal communities might not have time adjust to the increased demand.

The Northwest Regional Airport and the Prince Rupert Airport would be heavily used by the projects and activities in the RSA. These airports would likely have to upgrade their facilities, extend their hours of operation, or optimize their operations to accommodate these additional demands.

Highway 16 between Smithers and Terrace and Highway 37 between Terrace and Kitimat are likely to be used for road access to most of the proposed regional projects.

Cumulative effects would be greatest between 2015 and 2025, when multiple projects would be under construction. Traffic volumes in the local communities would also increase. Although extensive analysis has not yet been done, the Haisla Bridge may not be able to accommodate the additional demand generated by several large, simultaneous projects in the vicinity of the Douglas Channel, without negative impacts for other users. Further analysis will be conducted as part of the Proponent's Traffic Impact Assessment. Additionally, MOTI is actively engaging with key project proponent's (including the Proponent) to address this and other regional issues regarding transportation infrastructure management and upgrading.

In addition to direct housing demand created by workers who choose not to live in the workforce accommodation centres, these projects would also create indirect and induced employment during both construction and operation. The housing needs of these workers and their dependents would also contribute to the overall demand for housing. Should multiple projects proceed, local shortages of housing could be expected, leading to price increases, and consequently affordability issues with vulnerable population groups. There could be some spillover effects on housing availability between Prince Rupert and Terrace.

Haisla Nation, Gitga'at First Nation, Kitselas First Nation, Kitsumkalum First Nation, RDKS and the District of Kitimat voiced concern that in both Kitimat and Terrace there would be residual cumulative effects due to cumulative population increases. There was concern regarding the availability and affordability of housing and that there would be negative effects on community health and wellbeing. Furthermore, there was concern that these effects could extend beyond a short term "housing crunch".

If multiple projects are built in the Terrace, Kitimat and Prince Rupert areas over the 2015 to 2025 period, without additional mitigation, the influx of workers and the induced population change could create a rapid increase in demand for health services. In the absence of additional resources, service levels could be compromised.

The BC Government, industry, Aboriginal communities and other communities have initiated multiple programs to identify potential cumulative effects on communities, infrastructure and services expected from this and other proposed projects, and to develop mitigation strategies to address these effects. In addition to the activities summaries in section 6.1.5 of this Report, additional activities include:

- BC Government Community Readiness Initiatives and Grants from Northern Development Initiative Trust: Grants totalling up to \$1 million are being provided to help local governments in the Northwest plan for economic growth associated with LNG developments and industrial expansion. The grants are available to the City of Terrace, City of Prince Rupert, District of Kitimat, District of Port Edward, RDKS, and the SQCRD. Awards are available through two grant programs, at up to \$500,000 each, to assist communities to develop plans for:
  - Asset Management Capacity Building grants will support the review of infrastructure capacity (water, sewer, drainage, local roads) and assist

communities in determining what additional services are required for their specific growth needs; and

- Community Land-Use Planning grants will support local governments in doing the work required so that their land use bylaws, policies and plans align with the needs associated with industrial expansion and maintain community health and quality of life for existing residents. This could include updating local official community plans or zoning bylaws, or conducting new studies for targeted areas like housing affordability.
- Federal government and Aboriginal Groups: The federal government has announced the establishment of a major projects management office in Vancouver to help develop greater cooperation with Aboriginal Groups on energy development;
- Fair Share Agreements: In northeast BC, the Fair Share Agreements provide for provincial royalties in the oil and gas sector to be reallocated to municipalities in the Peace River Regional District to support infrastructure development;
- Other Initiatives: Several government funded projects and initiatives such as Western Diversification, Community Futures, and the Northern Development Initiative Trust make strategic investments in initiatives that enhance and strengthen businesses and the economy of northern BC; and
- Kitimat West Douglas Channel Corridor Analysis: Sponsored by the Ministry of Natural Gas Development (MNGD), MOTI is leading the Kitimat West Douglas Channel Corridor Analysis. The primary objective of the corridor analysis is to ensure infrastructure requirements and timeframes are fully considered in planning processes and a coordinated approach is taken to development opportunities in the Kitimat area. In addition to the Proponent, the Project involves other industry representatives, government, community and First Nations stakeholders. The analysis will include a review of the District of Kitimat municipal roads and infrastructure (e.g., Haisla Boulevard and the Haisla Bridge) and Provincial Highway 37, in addition to the West Douglas Channel segment of the road corridor. The outcomes will be used by government agencies to inform land use planning and permitting decisions with respect to infrastructure requirements for proposed industrial developments in the vicinity of the Kitimat West Douglas Channel. The Corridor Analysis is targeted to be completed by summer, 2015.

EAO recognizes that there are a number of developments being contemplated or proposed in the RSA, and that there is substantial uncertainty regarding which projects would proceed and the timing of development. The temporal overlap of the construction of multiple projects is an important factor for an increase in cumulative effects.

EAO has proposed a condition requiring the Proponent to develop a plan to adaptively manage socio-economic effects that particularly focuses on effects on infrastructure and services. As part of the plan, the Proponent would be required to address cumulative effects and to engage with local, regional and provincial governments in order to



facilitate planning for capacity adjustments to infrastructure and services. EAO has proposed similar conditions for the Prince Rupert Gas Transmission Project, Westcoast Connector Gas Transmission Project, Coastal GasLink Pipeline Project and the PNW LNG Project. Additionally, at EAO's request, the Proponent would be required to participate in any multi-stakeholder initiatives undertaken by the Province with regards to managing cumulative effects to community infrastructure and services.

Due to in-migration for direct, indirect and induced economic opportunities, EAO determines the magnitude of cumulative residual adverse effects to be medium to high in magnitude as construction of the proposed Project is likely to combine with other reasonably foreseeable developments to cause an increase in demand for infrastructure and services, which could in some cases, exceed existing capacity. The effects would be medium term in duration, continuous and reversible, as infrastructure and service funding levels increase to reflect population changes and as the housing market stabilizes. EAO concludes that no significant cumulative effects to infrastructure and services are expected as a result of effects of the proposed Project interacting with effects of other past, present and reasonably foreseeable future projects and activities.

#### 7.1.6 Conclusions

Considering the above analysis and having regard to the conditions identified in the TOC (which would become legally binding as a condition of an EAC), EAO is satisfied that the proposed Project would not have significant adverse effects on infrastructure and services.

## 7.2 Community Health and Well-Being

### 7.2.1 Background

Community Health and Well-being are considered a VC because of the potential for the proposed Project to affect key areas of health, diet, and nutrition. The Proponent's assessment of impacts on the Community Health and Well-Being VC considered the following two potential project effects, each with its own set of measurable parameters:

- Change in community health and wellbeing:
  - Demand and supply of health infrastructure and services;
  - Changes in health outcome indicators;
  - Indicators of community cohesion and resilience; and
  - Indicators of factors affecting families.
- Change in diet and nutrition:
  - Proportion of diets from country foods; and
  - Composition of country foods in diet.

The LSA for change in community health and wellbeing encompassed the communities in the Northwest Health Service Delivery Area (NWHSDA) of Northern Health. The LSA for diet and nutrition encompassed a broader area, also including nearby Aboriginal Groups.

The RSA for both measures encompasses the communities in the Kitimat Local Health Area (LHA), the Terrace LHA and the Prince Rupert LHA of the NWHSDA.

### 7.2.2 Potential Project Effects and Proposed Mitigation Described in the Application

The Application stated that Project-related changes in population, employment and income could adversely affect community health and wellbeing by increasing demands on health care infrastructure and services, changing community and family health, and changing community cohesion and resilience. Given the relative size of the temporary construction workforce and the predicted rate of population change, these effects are predicted to be greatest during Project construction and to lessen during operation and decommissioning.

The Application characterized the LSA and RSA as having health care infrastructure and services that are near capacity and as ranking low in-terms of provincial measures of community health and wellbeing. In the NWHSDA and the Kitimat and Terrace LHAs, many indicators of health and wellbeing were worse than the provincial averages. For example, measures of community cohesion and resilience are used to illustrate the vulnerability of communities and disadvantaged individuals and groups to social change. For most of these measures, the region and local areas rated poorly.

According to the Application, vulnerable populations (e.g., people with physical or mental health conditions and less education) would be less likely to gain employment

and realize economic benefits associated with the proposed Project. Additionally, if the costs of living, food, and other goods rise as predicted, mental wellbeing stressors for vulnerable populations could increase. Mental wellbeing could also be negatively impacted by increased noise from Project construction and operation; changes in traffic; changes in demographic and social environments resulting from the influx of workers; and potential changes in environmental quality. However, the Application predicts that the proposed Project would not cause acute or chronic physical or mental health outcomes that are highly distinguishable and beyond the normal range of variability of baseline conditions.

Both positive and negative effects on food security could occur. Positive effects would stem from increased levels of employment and income, increasing buying power. However, increased cost of living could result in a larger proportion of income for some households being spent on housing and other costs.

Due to changes in population, increased disposable income and potential adverse effects on mental wellbeing, crime rates could increase, particularly during Project construction. Rotational construction workers' extended absences from home could lead to increased strain on family relationships, reduced mental wellbeing, juvenile and youth crimes and increased divorce rates. During construction, increased disposable income and the presence of a large mobile work population could result in increased rates of sexually transmitted infections (STIs) in the LSA, thus increasing demand for local health care infrastructure and services. Increased rates of infectious disease among residents of the LSA could result from increased crowding due to changes in housing availability.

Medical personnel and local residents reported to the Proponent that many health care services are at or over capacity and in the NWHSDA there is a limited number of medical specialists. According to the Application, Project-related effects of increased hospitalizations and demand for health infrastructure and services would be greatest during construction and would decrease during operations.

Health care funding regimes are based on permanent populations and are not necessarily responsive to mobile populations, meaning that increased demand from construction workers may not be funded. The Application stated that through mitigation measures, the local health care infrastructure and services would be able to cope with the added demand associated directly with the proposed Project. Similarly, Project-related demand would not result in a substantial and persistent decline in the quality or accessibility of such services.

Following is a summary of the proposed mitigations included in the Application:

- Construct and operate a workforce accommodation centre during the pre-construction and construction phase;
- Implement a worker wellbeing and accommodation program to promote holistic worker health from a physical, mental, cultural and social perspective;

- Provide on-site health services and medical emergency response for primary care, including health promotion, injury/illness prevention, and injury/illness management, in order to manage impact on the local public health care system
- Implement an employee alcohol and drug policy. Additional testing (with cause) may occur if required and in accordance with labour legislation; and
- Develop a community engagement plan to assist in planning for an influx of workers; this plan would be developed through consultation with Aboriginal Groups and local communities.

The Application also stated that prior to the construction of temporary worker accommodation, health services would be provided at an alternate location. Additional mitigations and detail can be found in the Application, section 7.5 Community Health and Wellbeing.

A discussion of country foods and diet and nutrition can be found in section 9 (Human Health) of this Report.

### 7.2.3 Potential Project Effects and Proposed Mitigation Identified During Application Review

This section summarizes the primary concerns raised by Working Group members and the public during Application Review regarding potential Project-related adverse effects on community health and well-being.

Northern Health, Kitselas First Nation, Kitsumkalum First Nation, Haisla Nation, Gitxaala Nation, and Gitga'at First Nation expressed several concerns regarding the potential negative social effects of the temporary construction workforce and of increased levels of income. A non-exhaustive list includes the following:

- Increased crime, including drugs, prostitution and reckless driving;
- Higher risks to vulnerable social groups; and
- Increased drug use, alcohol use, unplanned pregnancy, and rates of STIs.

Kitselas First Nation and Kitsumkalum First Nation expressed concern that effects to Terrace may have been underestimated in the Application, and that an influx of camp workers into Terrace could have serious and long-lasting adverse social impacts due to the proximity of Kitselas communities to Terrace.

The Proponent responded that they are working to address concerns over an influx of construction workers into the community through the workforce accommodation centre, which would be designed to attract workers to reside in the camp and stay in camp when they are not working. While a final Project rotation schedule has not yet been determined, the Proponent is currently forecasting a 21/7 rotation, minimizing the effect of the non-local workforce on the LSA, including Terrace. The Proponent also described a number of measures they would be implementing to address the issues raised, including developing and implementing an engagement plan, a worker wellbeing program to promote holistic worker health and a drug and alcohol policy.

They also stated that they would continue to engage with communities and Aboriginal Groups in the development of these programs and in continuing to address concerns.

In light of the social and economic concerns raised during Application Review, and the links between community infrastructure and services and community health and wellbeing, EAO has proposed a condition requiring the Proponent to develop and implement a plan to manage socio-economic effects. The plan would provide:

- An effective engagement process between the Proponent and Aboriginal Groups, local governments, and government service providers;
- An approach to implementing mitigations and plans contained in the Application;
- Clarity for all participants about timing of Project activities so that planning and actions are based on current information;
- An approach to ensure unplanned effects are understood and new mitigations are considered; and
- A monitoring and reporting framework.

Additionally, EAO has proposed a condition requiring the Proponent to develop a health and medical services plan in accordance with Northern Health’s *Health and Medical Services Plan: Best Management Guide for Industrial Camps*.

#### 7.2.4 Characterization of Residual Project Effects

After considering all relevant proposed mitigation measures, EAO concludes that the proposed Project would result in residual adverse effects on community health and wellbeing.

Summarized below is EAO’s characterization of the expected residual effects of the proposed Project during construction on community health and well-being, particularly the social determinants of health and composition of diets, as well as EAO’s level of confidence in the effects determination (including their likelihood and significance).

Criteria	Assessment Rating	Rationale
Context	Low resilience	Indicators of health and wellbeing suggest that the LSA and RSA have a low level of resilience to accommodate a rapid population change. Many health care services that are integral to health and wellbeing are at or near capacity.
Magnitude	Moderate	The construction workforce and additional population changes as a result of indirect and induced economic opportunities would have a moderate negative effect on community wellbeing and place additional strain on related services and infrastructure. During operation, increases in permanent populations would increase funding levels for some services. Permanent and temporary population changes could disrupt community cohesion, although in-migrating families associated with operations could

Criteria	Assessment Rating	Rationale
		have positive effects.
Extent	Local	Adverse effects on community health and wellbeing would be felt primarily in the LSA.
Duration	Medium to long term	Adverse effects on community health and wellbeing would peak during the 5-year construction period. Most negative effects should stabilize during the initial years of operation when the benefits associated with in-migrating operation employees and their families would increase.
Reversibility	Reversible	The adverse effects on community health and wellbeing are generally reversible. After construction in the initial years of operation community population and service and infrastructure funding levels would stabilize.
Frequency	Continuous	The effects would occur continuously, with population-related effects peaking during construction.
Likelihood	The likelihood is high that there would be residual effects to community health and well-being as a result of the proposed Project.	
Significance Determination	Considering the above analysis and having regard to the conditions identified in the TOC (which would become legally binding as a condition of an EAC), EAO is satisfied that the proposed Project would not have significant adverse residual effects on community health and wellbeing.	
Confidence	There is a moderate to high level of confidence in the likelihood and significance determination, particularly in consideration of the on-going monitoring and adaptive management that would be required in the proposed Community Services and Infrastructure condition.	

### 7.2.5 Cumulative Effects Assessment

In the Application, the Proponent identified 23 projects in the RSA that could overlap spatially and temporally with the proposed Project. Residual effects of large facility-based projects (such as Kitimat Clean, BG Group–Prince Rupert LNG and PNW LNG) could act cumulatively with Project residual effects on community health and wellbeing, particularly from 2015 to 2020 when most of these projects are scheduled for construction and would require large temporary workforces. To a lesser degree, the residual effects of other projects (such as Coastal GasLink Pipeline Project, Pacific Trail Pipelines Project, Spectra Energy–Natural Gas Pipeline and Prince Rupert Gas Transmission Project) could also interact cumulatively with Project residual effects on community health and wellbeing.

In a scenario in which multiple projects are constructed in the RSA over the 2015 to 2025 period, there would be a rapid increase in in-migrating and temporary populations. Temporary workforces in the Kitimat area could peak at 14,500 in 2017. In addition, there could be a secondary increase in population due to indirect and induced economic opportunities. Assuming that all projects proceed to construction and operation, the Proponent estimated that the permanent population in the RSA could increase by

approximately 5,200 by 2025 (13% increase over baseline). There is, however, considerable uncertainty regarding which proposed projects will proceed and construction timelines.

Rapid population changes would have the greatest effects on community health and wellbeing, primarily as a result of increased demand for health care infrastructure and services and indicators of community cohesion for communities in the RSA. In the longer term, additional tax revenue generated from proposed projects could help fund major health infrastructure improvement projects and social health programs. A large influx of workers could also have cumulative effects on community cohesion.

EAO recognizes that there are considerable uncertainties relating to the geographical and temporal overlap of effects from multiple projects given the lack of quantifiable data about the precise location, footprint, schedule and design of many of the reasonably foreseeable future developments. This increases the challenge of forecasting potentially important temporal overlaps or adjacencies in effects from other projects.

EAO has proposed a condition requiring the Proponent to develop a plan to manage socio-economic effects to address risks and uncertainties identified in the EA process regarding Project effects on socio-economic values, including the Project's contribution to cumulative effects. As part of this socio-economic effects plan, the Proponent would be required to inform local, regional and provincial governments in planning for capacity adjustments to infrastructure and services, including those directly linked to community health and wellbeing, and address adaptive management to mitigation, if necessary. For the Prince Rupert Gas Transmission Project, Westcoast Connector Gas Transmission Project, Coastal GasLink Pipeline Project, and the PNW LNG Project, EAO has proposed similar conditions regarding potential effects to community infrastructure and services.

EAO is satisfied that the adoption of the Proponent's mitigation strategies and the Community Services and Infrastructure condition, supplemented by initiatives by the BC Government and others that are documented in section 6 (Economic Conditions) of this Report would be sufficient to mitigate cumulative adverse effects to community health and well-being. EAO concludes that the residual adverse cumulative effects on community health and well-being would not be significant.

#### 7.2.6 Conclusions

Considering the above analysis and having regard to the conditions identified in the TOC (which would become legally binding as a condition of an EAC), EAO is satisfied that the proposed Project would not have significant adverse effects on community health and well-being.

## 7.3 Marine Transportation and Use

### 7.3.1 Background

The Proponent identified Marine Transportation and Use as a VC because Project construction, operation, and decommissioning could conflict with existing marine uses. The Application's assessment of impacts on marine transportation addresses four potential project effects, each with its own set of measurable parameters (see Table 7-3).

**Table 7-3: Potential Effects and Measurable Parameters for Marine Transportation and Use**

Potential Effects	Measurable Parameters
Interference with marine navigation	<ul style="list-style-type: none"> <li>Proportion of navigable channel affected by construction and operation of marine terminal, including safety zones.</li> </ul>
Change in demand on marina and moorage facilities	<ul style="list-style-type: none"> <li>Attribute data on marina and moorage facilities (e.g., moorage slips).</li> </ul>
Interference with marine fisheries and shoreline harvesting	<ul style="list-style-type: none"> <li>Number and types of marine vessels as a result of the Project (per month);</li> <li>Location of fisheries, including access routes; and</li> <li>Attribute data (e.g., characteristics of a fishery, such as type of fish caught, location of landings) on marine uses along shipping channel (e.g., fishing, aquaculture, other seafood and shoreline harvesting).</li> </ul>
Interference with marine recreation and tourism	<ul style="list-style-type: none"> <li>Recreational and tourism activities, destinations, and access routes overlapping with Project infrastructure and marine access route indicators of visitor frequency (e.g. visitor days).</li> </ul>

The LSA includes waters surrounding the marine terminal where interference with navigation could occur, plus the confined channels along the marine access route and waters extending 6 km on both sides of the marine access route between Browning Entrance and the Triple Island Pilot Boarding Station.

The RSA encompasses the extent of shipping activities within the confined channels (e.g., Kitimat Arm, Douglas Channel, Principe Channel), and waters to the Pilot Boarding Station area near Triple Island in the north. Where the marine access route is not confined by geography, a buffer of approximately 10 km is used on both sides of the route.

In addition to the study areas, the following descriptive areas for Project activities are used:

- *Marine terminal* includes the area for construction of the marine terminal and waters immediately surrounding the marine terminal;
- The *shipping corridor* is 2 km wide, extending 1 km from each side of the centre line of the marine access route. In confined waters where the width of the



channel is less than 2 km, the shipping corridor is taken to be the entire width of the channel; and

- *Safety zones* are areas extending up to 300 m around each berth of the marine terminal: a 200 m ignition free radius from the loading point and 300 m to the public. During transit, LNG carriers should maintain standard safe shipping distances from other vessels.

The Proponent is currently undertaking a Technical Review Process of Marine Terminal Systems and Transshipment Sites (TERMPOL) for the proposed Project and is anticipating completion of the application in mid-2015. TERMPOL is a voluntary review process that may be requested by proponents involved in building and operating a marine terminal system for bulk handling of oil, chemicals and liquefied gases. It focuses on the marine transportation components of a project and examines the safety of tankers entering Canadian waters, navigating through channels, approaching berthing at a marine terminal and loading or unloading oil or gas. The review is led by TC and can involve other federal departments and other stakeholder representatives. The review may consider any safety measures above and beyond existing regulations to address any site-specific circumstance. According to the Application, the recommendations resulting from this process would be included, as appropriate, in the construction, operation and decommissioning phases of the Project.

Acts and regulations concerning commercial shipping and construction activities in navigable waters include:

- *Navigation Protection Act (NPA)*;
- *Canada Shipping Act, 2001*, and its regulations, including the Ballast Water Control and Management Regulations;
- *Transportation of Dangerous Goods Act and Regulations*; and
- *Canada Marine Act*.

The NPA protects the public's right to navigate and regulates the construction of works that might affect this right. The NPA is administered by TC and applies to scheduled waterways in Canada. TC would only authorize major works upon satisfactory review of the final design and development plan for the works.

### 7.3.2 Potential Project Effects and Proposed Mitigation Described in the Application

Although designated to become a public port, the Port of Kitimat is currently a private, industrial port and, therefore, does not have a federal port authority. Since the 1950's, the port has accommodated large vessel traffic bound for international markets. In terms of international trade, Kitimat is the third largest port on the west coast of Canada. On average, between 1978 and 2011, 203 commercial vessel visits occurred in the port each year, with up to 102 of those vessel visits piloted by the Pacific Pilotage Authority (PPA). The number of vessels entering the Port of Kitimat has varied considerably from a 1993 peak of 279 to less than 150 vessels per year in 2008.

The LSA includes several parks, most of which are boat-access only. Several major commercial fisheries occur in the Fisheries Management Areas that overlap with the RSA. Harvesting marine resources is also an important part of traditional life for most coastal Aboriginal Groups, with over 40% of meals being traditionally sourced from the sea for some members, including eulachon, salmon, herring eggs, crab, seaweed, abalone, mussels, black cod, shrimp, prawns, halibut, clams, and cockles. Sockeye salmon is the primary salmon species targeted by Aboriginal Groups, with this species making up to 98% of their annual catch.

During the Proponent's public consultation, Aboriginal Groups and stakeholders expressed concern about vessel wake along the marine access route. Concerns included effects on shoreline harvesting, small craft safety, and shoreline erosion processes.

### *7.3.2.1 Effects of Shipping Activities*

The Application stated that effects on marine transportation and use could occur either through interference by Project-related shipping traffic or as a result of wake waves generated by LNG carriers and escort tugs.

The maximum Project-related increase to shipping traffic volume after full build out, is estimated to be approximately 350 vessel visits per year, a 172% increase from current average commercial shipping levels and a 125% increase from peak shipping levels in 1993. LNG carriers would travel at a maximum speed of 14 knots. Project-related shipping traffic volume during construction and operation is predicted to be similar. Because the operation phase would include a greater number of larger and less common vessel types (e.g., LNG carriers), the Proponent focused the Application on operation-related traffic.

Some overlap would occur between the shipping corridor and both salmon and groundfish, including halibut fishing locations. The Application stated that in most cases, halibut fishers avoid the shipping corridor but that fishing in the marine access route would be possible if gear were strategically deployed when the area was clear of vessel traffic. Recreational anglers could be displaced for 15 minutes or less as a carrier passes.

Aboriginal and commercial salmon fishing vessels could be forced to stop fishing and retrieve their gear as result of LNG-related shipping traffic. Consequently, fishing time might be reduced. The Application stated that although unlikely, entanglement of prawn traps, groundfish long lines, and salmon fishing gear with LNG carriers is possible, although calculations using DFO catch statistics reveal that potential average annual losses for commercial or Aboriginal fisheries would be low. The Application stated that with the implementation of the mitigations listed below, no fishing time or revenue would be lost as fishers would be able to plan their fishing activities.

Based on wake studies, the Proponent predicted that Project-related shipping traffic would not generate wake waves that are substantially larger than what occurs naturally along the marine access route and would not pose a safety risk to typical fishing vessels operating in the areas and would not disrupt access to fishing locations.

The Application stated that only a small proportion of clam and seaweed harvesting locations are exposed to wake waves and could potentially be affected by Project-related shipping activities. Interference with shoreline harvesters would only occur when a transit coincided with low tide. Wake waves experienced at the shoreline are predicted to be well within the range of naturally generated wind waves and predicted to not cause a substantial disturbance.

According to the Application, primary research indicates that up to four recreational vessels could be encountered per LNG transit. Most sites used by eco-tourism and guided angling outfitters do not overlap with the shipping corridor; however, some kayaking and recreational boating routes intersect the marine access route. The boats used for eco-tourism or guided angling would generally have sufficient horsepower to pass across the path of an LNG carrier quickly and safely and would not be delayed. Kayakers are expected to be familiar with shipping traffic and the proper procedures for navigation and maneuvering around large vessels.

The Application stated that Project-related shipping traffic is not expected to reduce the number of tourists visiting Kitimat to fish or to pursue eco-tourism activities. Project-related shipping is not expected to negatively impact fish, fish habitat or fish availability. Where ships remain in sight, they would be hard to distinguish from the background after 18-25 minutes of travel.

Following is a summary of the proposed mitigations included in the Proponent's Application:

- Plan LNG carrier's passage route to avoid interference with fishers, where possible, with safety being the primary concern;
- Project-related marine traffic would use the Coast Guard operated Marine Communication and Traffic System (MCTS) to provide notice of planned arrival time at Triple Island;
- Use escorts tugs between Triple Island and Kitimat during LNG carrier transits
- LNG carriers would only be permitted to enter the marine access route if a berth at the terminal would be available and there would be no planned anchoring of the LNG carriers along the marine access route;
- Regular communication on Project activities would occur with marine users, TC and DFO; and
- The Proponent would hold safe-shipping workshops aimed at promoting safe navigation around shipping traffic for mariners prior to operation.

Additional mitigations and detail can be found in the Application and in additional materials submitted during Application review.

### 7.3.2.2 *Effects from the Facility*

According to the Application, there is only the limited potential for the proposed facility to have negative effects on marine transportation and use. The facility would not be located in an area that is heavily-used by water-based recreation and tourism activities, therefore, there would only be minimal impact. Effects on marinas and moorage facilities would also be limited.

The Application stated that the Proponent is considering various options for the disposal of dredged marine sediments resulting from project construction and that depending on the option selected, additional assessment would be undertaken as part of a disposal at sea application to assess potential effects on marine navigation.

In addition to the mitigations above, the Application includes the following proposed mitigations:

- Use of safety zones which specify “no go” areas around the marine terminal for the safety of public marine traffic; and
- Support federal government in installation of any navigational aids determined to be necessary for safety on the new marine terminal where required.

Additional mitigations and detail can be found in the Application, section 7.4 and in additional materials submitted during Application Review.

### 7.3.3 *Potential Project Effects and Proposed Mitigation Identified During Application Review*

During Application Review, additional issues and potential Project effects related to marine transportation and use were raised by Gitga’at First Nation, Gitxaala Nation, Haisla Nation, Kitselas First Nation, Kitsumkalum First Nation, Lax Kw’alaams Band, Metlakatla First Nation, Transport Canada and the general public.

#### *Vessel Speed*

General questions and concerns about LNG carrier speed were raised by Lax Kw’alaams Band, Gitxaala Nation, Kitsumkalum First Nation and the general public. The Proponent clarified that they would endeavour to apply controlled speeds of between 8 and 12 knots for a majority of the access route; however, the Ship’s Master, with advice from the onboard BC Coast Pilot, may choose to increase or reduce speeds for reasons such as weather, oncoming traffic and navigational safety. Such instances would be minimal.

In consideration of the federal laws regarding the safe navigation of vessels and the important role of the Ship Master and BC Coast Pilots, EAO has proposed a condition requiring that the Proponent specify the speed profiles for the LNG carriers.

## *Wake Analysis*

Concerns regarding the potential inadequacy of the Proponent's analysis of wake in the Application were raised by Gitga'at First Nation, Gitxaala Nation, Haisla Nation, Kitselas First Nation, Kitsumkalum First Nation, Lax Kw'alaams Band, Metlakatla First Nation, TC and the general public.

In response to multiple Working Group and public observations that the Application did not include a wake study, at EAO's request, the proponent submitted wake videos (*LNG Carrier Wake*) and a technical study (*Kitimat Ship Wake Study*, December 18, 2014). The purpose of the study was to assess the degree of wave generation that could be expected within the channel. The study modelled wake from multiple vessel types, including an LNG carrier followed by an escort tug. The largest wave height (trough to crest) modelled was 0.9 m, which could be reduced if the escort tug did not follow directly behind the carrier and by reducing vessel speed. The study stated that the waves generated by the ship types under consideration are not overly large relative to the background wave conditions that exist in the regions of interest.

Gitga'at First Nation pointed out that harvesters typically go out to harvest when the weather is calm and unexpected waves, even a wave comparable to a large naturally generate wave, would pose a risk.

The Proponent acknowledged that wake could be disruptive to small vessels (e.g., rowboats, canoes), although it is highly unlikely that Gitga'at First Nation harvesters near shore would encounter vessel-generated waves of that size. EAO proposes a condition that would require the Proponent to develop a marine activities plan with the objective of mitigating and monitoring impacts to marine users. Furthermore, the Proponent would be required to demonstrate that they had made reasonable efforts to engage with Aboriginal Groups in developing and implementing the plan.

Several Aboriginal Groups and the general public expressed concern that the wake analysis was insufficient. Issues raised included concerns from Lax Kw'alaams Band and Kitselas First Nation that the wake generated by two or more passing vessels or a carrier and a pilot tug could produce larger than predicted wake and pose a safety threat.

The Proponent responded that having two vessels passing in Principe Channel could occur at full build out, but would not occur at the narrowest points in the channel and that they would work with other shipping proponents to collaborate on schedules. Following Working Group meetings, the Proponent undertook an additional wake study (*Kitimat Ship Wake Study – Passing Ship Scenarios*, April 10, 2015), which included two scenarios. The first scenario considered the a large LNG carrier and escort tug being passed by another large LNG carrier and escort tug, traveling in the opposite direction. Ship speed was 12 knots for both units. The results of this scenario suggest that the wake waves between the vessels are larger than those on the outside of the vessels. The maximum wave height was

0.458 m at 150 meters from the vessels. The analysis also included a second scenario in which a large LNG carrier and escort tug travelling at 12 knots, are passed by a cruise ship travelling in the opposite direction at a speed of 18 knots. The model results predict a maximum wake wave height of 0.762 meters between the vessels.

Most Aboriginal Groups on the Working Group and TC raised issues regarding the shoreline effects of wake. Concerns were raised that LNG carrier wake posed a potential danger to shoreline harvesters and a threat to small vessels. Additionally, concerns were raised that it is inaccurate to compare carrier wake to that of natural or background waves, as they may be dissimilar with respect to angle and shape, and shoreline characteristic may influence wave effects. Lastly, concerns were raised that the assessment did not adequately account for the location of key harvest sites.

The Proponent responded that the wake would not pose a danger to individuals at or near the shore, as wave height would be greatly reduced with slower vessel speeds and waves diminish in size as they travel away from the point of origin. In response to ongoing Working Group concerns, the Proponent conducted an analysis of Project ship-generated waves on specific shoreline types (*Shoreline Harvesting Sites: Additional Wake Analysis*, April 9, 2015). The analysis predicted that during glass-calm seas, the wake waves generated by a carrier and escort tug at four sample shoreline locations would range from 0.12 m to 0.43 m in height and the duration of wake wave effects ranged from 54 to 86 seconds.

EAO has proposed a condition requiring the Proponent to establish a wake verification plan to collect wake information, identify priority areas and periods and identify mitigation measures to avoid or minimize wake impact.

### *Marine Traffic*

Gitxaala Nation, Metlakatla First Nation, Kitsumkalum First Nation and TC expressed concerns that Project-related marine traffic would have a negative effect on fishing and marine users, including displacing traditional Aboriginal users, where fishing grounds overlap with shipping corridors. A non-exhaustive list of concerns were raised included the following:

- Halibut long-liners cannot simply deploy and retrieve gear when the area is clear of traffic;
- Avoidance of traditional harvesting activities due to unsafe conditions (Gitxaala Nation);
- Harvesters may not be able to schedule their activities to avoid Project-related marine traffic;
- Loss of fishing time due to Project-related marine traffic;
- The negative effects associated with unique events (e.g. multiple LNG Canada vessels, vessel transit during a critical harvesting season, vessel transit during a rare tidal period, harvesting activities occurring along a narrow part of the access

route, etc.) were underestimated and not adequately mitigated (Gitxaala Nation); and

- An ill-timed carrier could limit the ability to exercise Aboriginal rights.

Additionally, Gitxaala Nation requested that the Proponent avoid or minimize transits along narrower parts of the marine access route when harvesting activities are occurring. Gitxaala Nation also suggested that the Proponent take steps to identify when other large vessel transits may take place through the marine access route and avoid or minimize its own transits at those times.

The Proponent responded that in addition to the mitigations included in the Application, they committed to ongoing consultation with Aboriginal Groups to identify additional appropriate mitigations.

TC, Gitxaala Nation, Kitsumkalum First Nation and the general public expressed concern regarding the Proponent's reliance on the MCTS as a communication tool and requested more information on the marine transportation and use communication plan.

The Proponent responded that MCTS would be relied upon because it is mandatory, available 24 hours a day, and can be solicited by anyone at any time. The Proponent also committed to developing a Marine Activities Plan in consultation with regulatory agencies, Aboriginal Groups and stakeholders that would be informed by two planned safe-shipping workshops aimed at promoting safe navigation. When asked for further clarification regarding the format of the safe shipping workshops, the Proponent described the workshops as a forum to share ideas and information, to solicit feedback, and to develop solutions for safely coexisting with other marine uses that occur along the shipping route.

The general public, Kitsumkalum First Nation, Gitga'at First Nation and Gitxaala Nation stated that many smaller vessels would not have a constant radio watch or Automatic Identification System (AIS) tracking system, and that reliance on AIS as a means of communication might not be effective due to the cost of such systems.

The Proponent responded that AIS is not a replacement for the required traditional means of maintaining a proper navigational lookout out by sight, sound and the use of electronic navigation equipment required to be fitted onboard a vessel. LNG carriers would broadcast on VHF, their position and direction when they pass any call in points on route and when talking directly to other marine traffic.

Concerns were also raised by Aboriginal Groups regarding the potential Project-related effects from the increased pilot boat traffic.

The Proponent responded that they are participating with the BC Coastal Pilots studying the feasibility of other methods to transport BC pilots to LNG carriers and that use of helicopters is being considered. The Proponent would engage with the PPA to ensure that the process to embark/disembark pilots is safe and reliable.

Additionally, current planning shows the expected location for pilots to board the LNG carriers bound for the facility is approximately six to eight nautical miles west of the existing pilot boarding station for vessels destined for the Port of Prince Rupert, as seen in Figure 5-3.

Gitxaala Nation raised concerns that important traditional harvesting occurring from February to June and October to December was not captured in the LNG Vessel Survey, which collected data between June and August.

In response, the Proponent noted that vessel surveys are only one of several types of evidence used to support the conclusion made regarding interference with marine fisheries and shoreline harvesting activities and that it is further supported by information obtained from fisheries workshops with Aboriginal Groups, interviews, and government databases.

Gitga'at First Nation expressed concern that the Proponent's calculations assumed that fishing opportunities were uniform throughout the assessment area and that for some fisheries, the shipping corridor may provide better opportunities than elsewhere.

The Proponent responded that in the absence of fine-scale spatial data on the productivity of different fishing areas, a number of assumptions were required to carry out the analysis of potential effects on the salmon fisheries due to LNG shipping traffic. These assumptions were conservative and reasonable given LNG Canada's understanding of marine fisheries in the region, which was based on existing knowledge (e.g., DFO spatial data) and information obtained during fisheries workshops, one-on-one and phone interviews, and reports submitted by Aboriginal Groups.

Working Group members raised several issues that the Proponent said would be addressed through the TERMPOL study, which includes a detailed shipping analysis. These include the following:

- Safety issues where shipping route transects high use areas such as Gil Island;
- Effects of LNG carrier docking on adjacent anchorages;
- Adequacy of available anchorages;
- Underestimation of the potential interactions between project shipping activities and marine navigation; and
- Risks posed by Project-related traffic at areas of high use (e.g., hotspots).

The Proponent stated that they would adhere to TERMPOL recommendations, and that they would continue to work with marine users to develop protocols and procedures for sharing the waterways along the marine access route.

In response to the issues raised during Application review, EAO has proposed a condition requiring the Proponent to develop a marine activities plan that would have the objective of mitigating and monitoring impacts to marine users. The plan would also



specify actions to inform the public, marine user groups, and Aboriginal Groups about the results of the TERMPOL process.

### *Disposal at Sea Dredgeate Pipeline*

TC raised concerns that depending upon the DAS site and method selected, additional analysis of impacts on marine transportation and use may need to be considered.

In an addendum (filed March 27, 2015) the Proponent eliminated two of five potential DAS sites (DAS-2 and DAS-3). Two of the remaining three potential sites (see Appendix 1 Table A-6 Sites DSA-1A and DSA-1C) could require the use of a hydraulic dredger with a floating pipe directly to the disposal site (see Appendix 1 Table A-6). Although limited, the pipeline could have potential effects on marine navigation. Because the Port of Kitimat is an active harbour, there is little recreational use of the area. The Proponent and the primary industrial user of the harbour (RTA) are working closely. Upon final selection of a disposal site, a more detailed assessment of impacts on marine navigation would be included in the proponent's disposal at sea application.

### *Safety Zones*

TC and the public expressed concern regarding the enforceability of the proposed marine terminal safety zones.

The Proponent responded that the Port of Kitimat is to be designated as a Public Port, and as such, the safety zones would be legally enforceable under the *Canada Marine Act*. Vessels entering the safety zone would be advised to leave and if necessary, the intruding vessels would be escorted to a distance outside the safety zone by a harbour vessel. Other means of enforcement could include external notification by both signage and radio communication. LNG Canada terminal security may also monitor the area with a standby tug adjacent to lifting operations, as well as by a terminal patrol vessel.

TC confirmed that the Port of Kitimat may be designated as a public port under the *Canada Marine Act*. To do this, an amendment to the Public Ports and Public Port Facilities Regulations will be required. Regulatory amendments involve extensive public consultation and can take up to two years to complete. TC intends to start the process this year. If the port is designated as a public port, TC could designate enforcement officials to carry out enforcement activities and the extent and details of the safety zones will be at the port's discretion. TC noted that if the port designation does not proceed or is delayed beyond the operational start date of the facility, the Proponent should establish a series of buoys and an outreach education program to the boating public indicating the area where there may be potential hazards and request that they stay clear of these areas.

In response to these and other related issues, EAO proposes a Condition that would require the Proponent to establish marine activities plans for the construction and operations phases. These plans would be developed in consultation with TC and DFO and would describe means by which the marine transportation mitigations would be implemented, and specify actions to inform affected stakeholders and Aboriginal Groups of potential interference with marine navigation as a result of Project-related activities.

### 7.3.4 Characterization of Residual Project Effects

After considering all relevant proposed mitigation measures, EAO concludes that the proposed Project would result in the following residual adverse effects on navigation and marine resource use:

- Interference with marine navigation and marine and shoreline activities due to shipping.

Summarized below is EAO's assessment of the expected residual effects of the proposed Project on navigation and marine resource uses, as well as EAO's level of confidence in the effects determination (including their likelihood and significance).

Criteria	Assessment Rating	Rationale
Context	High resilience	Although there are many important sites for commercial, Aboriginal and recreational fisheries throughout the marine corridor, current marine traffic is below historic levels and there is relatively little structural impediment to marine navigation.
Magnitude	Low	After the implementation of proposed mitigations and conditions, there would be a low level of interaction between marine uses and Project-related shipping. Wake generated by shipping related traffic could negatively affect marine and shoreline fisheries.
Extent	Local	Potential adverse effects of increased marine traffic could be felt throughout the shipping route and the adjacent shoreline.
Duration	Long term	Although adverse effects would occur over the life-time of the project, they would be limited to the time it takes for an LNG carrier to pass (15 minutes or less) and in the case of fishers, the time needed to reset gear.
Reversibility	Reversible	Adverse effects of the proposed Project would be reversible after decommissioning.
Frequency	Regular	The Proponent estimates that on average, one LNG carrier would travel to or from the Port of Kitimat per day.
Likelihood	The likelihood of there being a residual effect on marine transportation and use is moderate.	

Criteria	Assessment Rating	Rationale
Significance		Considering the above analysis and the conditions identified in the TOC (which would become legally binding as a condition of an EAC), EAO is satisfied that the proposed Project would not have significant adverse residual effects on navigation and marine resource use.
Confidence		Moderate level of confidence based on the Proponent's analysis.

### 7.3.5 Cumulative Effects Assessment

Past, present and future project activities within the marine transportation and use RSA include developments of shoreline infrastructure and associated shipping activities have the potential to interact with the Project and to result in cumulative effects on marine use and transportation.

Shipping activities associated with the following Projects and activities were included in the assessment of cumulative effects:

- RTA facility and Kitimat Modernization Project;
- RTA Terminal Expansion Project;
- Kitimat LNG Terminal Project;
- Douglas Channel LNG Terminal Project;
- Enbridge Northern Gateway Project;
- Former Methanex/Cenovus Terminal; and
- Cruise ship traffic using Principe Channel.

If all proposed projects for Douglas Channel are approved, annual vessel visits to the Port of Kitimat via the marine access route from Triple Island could increase from 203 to 737.

During Application Review, Transport Canada and several Aboriginal Groups raised concerns regarding the Proponent's cumulative effects assessment. In responses and in a technical memo (*Cumulative effects from shipping on commercial fishing and recreation and tourism*) the Proponent responded as follows:

- *Commercial fishing* – The memo presented data that showed no correlation between past fluctuations in salmon catches and shipping volumes to Kitimat, suggesting that other factors have a more substantial effect on fishing success; and
- *Tourism and recreation* – Two examples were cited (activities in Burrard Inlet and a 2007 report by GS Gislason and Associates) that demonstrate that marine-based recreation and tourism and commercial shipping are not mutually exclusive and can coincide.

Gitxaala Nation, Metlakatla First Nation, Kitsumkalum First Nation and TC raised concerns regarding the exclusion of Prince Rupert-bound marine traffic from the cumulative effects assessment. There was specific concern regarding the potential effects near Triple Island.

According to the Proponent's response (see Technical Memo: *Potential Cumulative Effects from Prince Rupert Shipping Traffic on Marine Transportation and Use*, February 2015) if all the projects proposed in Prince Rupert are built, 1800 vessels could visit the port annually and travel through the northernmost extent of the RSA, approximately 10 km offshore of Triple Island. The Proponent stated that based on DFO geospatial fishing data, reports submitted by Aboriginal Groups, and information obtained during fisheries workshops, meetings and interviews, most fishers would not be affected because either fishing grounds did not overlap with the shipping route or fishing practices and gear types precluded interactions. Thus, they concluded that Prince Rupert-bound traffic could interact with only a limited number of fisheries occurring in the Triple Island area on halibut, ground fish and salmon fishers. According to the Proponent, literature review, available spatial data, one-on-one and phone interviews, and workshops, and reports submitted by Aboriginal Groups to the Proponent did not identify high use marine recreation or tourism areas in this area. Commercial shipping traffic would travel using a well-established route with regular communication between marine vessels and the MCTS, the PPA and the Prince Rupert Port Authority.

Several Aboriginal Groups indicated dissatisfaction with the Proponent's response. EAO is satisfied with the information provided for the purpose of the EA of the proposed Project.

EAO concludes that there is a moderate likelihood that Project shipping during operation would contribute to moderate adverse cumulative effects on marine transportation and use in Principe and Douglas Channels. Where Project-related shipping and Prince Rupert-bound vessels' routes intersect (adjacent to Triple Island), there is a moderate likelihood of moderate to high adverse effects. EAO recognizes that due to considerable uncertainties regarding construction and timing of projects and potential disruptions caused by commercial marine traffic. Thus, there is a high level of uncertainty regarding the magnitude of potential cumulative effects.

### 7.3.6 Conclusion

Considering the above analysis and having regard to the CPD and the conditions identified in the TOC (which would become legally binding as a condition of an EAC), EAO is satisfied that the proposed Project would not have significant adverse effects on navigation and marine resource use.

## 7.4 Visual Quality

Visual Quality was selected as a VC because construction and operation of the LNG facility and operation of LNG carriers on the marine access route may alter visual quality from a number of identified terrestrial and marine viewpoints, including those identified by potentially affected Aboriginal Groups and stakeholders.

### 7.4.1 Background

The Application's assessment of impacts to visual quality considered a reduction in visual quality related to the proposed LNG facility and LNG carriers along the marine access route.

The facility LSA encompasses all lands with a potential view of the LNG facility in the foreground (0 km to 1 km) and mid-ground (1 km to 8 km). The shipping LSA considers the visual quality related to LNG carriers along the marine access route and encompasses viewpoints that were identified through consultation with Aboriginal Groups.

The facility RSA encompasses the facility LSA plus the land areas beyond 8 km up to the extent of potential visibility (maximum of 20 km). The shipping RSA encompasses marine areas up to a maximum distance of 20 km

### 7.4.2 Potential Project Effects and Proposed Mitigation Described in the Application

According to the Application, both the facility LSA and the shipping LSA have high topographic variation, varied vegetation patterns, and expansive views of water and thereby, are distinct and visually appealing.

#### 7.4.2.1 *Facility Effects on Visual Quality*

The proposed Project would be built on private land in an area zoned for industrial development. Both the Kitimat OCP and the Kalum Land and Resource Management Plan identify the future land use of the site of the Project as industrial. These land use plans provide direction to limit the effects of industry on scenic quality given its importance to quality of life in Kitimat and the potential to attract tourists.

The facility LSA is visually sensitive and has a limited ability to absorb human modifications. The Application stated that the likelihood of reduced visual quality is high for the facility as 50% of the LSA is predicted to have a view of the LNG facility. The facility would introduce new visible industrial modifications and construction, and operation of the Project would alter the topography and vegetation patterns of the proposed facility site and the marine areas in which the terminal would be built.

The Application stated that 35% of the facility LSA is moderately to highly sensitive to visual alteration. Existing landscape disturbances are readily visible, including major

industrial development, recent and historical forest harvesting, waterfront commercial development, and residential development. The degree of disturbance varies depending on the viewpoint being observed.

The LNG facility would be highly visible to residents in Kitimat and Kitamaat Village, to mariners and tourists in Kitimat Arm, and to land-based recreation users along the eastern and western shores of Kitimat Arm. The Application identifies eleven priority viewpoints; of these, seven viewpoints would be affected by the proposed facility. The viewpoints were subsequently broken into 16 visually sensitive units. The Proponent used a 3D computer simulation model to prepare photo simulations that illustrate the potential post-construction conditions from each of the priority viewpoints (see Figure 7-1). *For both* baseline conditions and predicted conditions, the Proponent quantified the level of human disturbance and classified the visual quality for the sixteen visually sensitive units.

The Proponent's models suggest that despite potentially high visibility of the proposed facility, overall visual quality effects would be limited. With mitigation, the facility would result in a decline in visual quality within the facility LSA by an average of 3.15%, causing a change in visual quality conditions. However, there is considerable variation between viewpoints and this decline generally occurs in visually sensitive units in which the baseline visual quality rating is maximum modification or excessive modification.

Five viewpoints would experience limited change in visual quality. Four viewpoints—Robinson Lake Trail Head, Douglas Channel, Hospital Beach, and Maggie Point—would experience enough change in visual quality to exceed their visual quality category.

During nighttime hours, facility and marine terminal lighting and sky glow would be visible at nearby receptor locations. It is anticipated that terrain and vegetation screening may obstruct some of the facility or marine terminal light for more distant receptors within the District of Kitimat.

Five viewpoints (MK Bay Marina, Coghlin Park, Douglas Channel, Hospital Beach and Maggie Point) include a view to both the marine access route and the proposed LNG facility. Therefore, an LNG carrier would be in view from these viewpoints during the time required for berthing, loading and approaching and departing from port.

Following is a summary of the proposed mitigations included in the Application:

- Existing cleared areas would be utilized, where practicable, to limit area of new disturbance;
- Where practicable, a minimum 30 m wide mature riparian vegetation buffer would be maintained between the Project site and the Kitimat River; and
- Where temporary tree and vegetation clearing occurs during construction, revegetation activity would occur as soon as possible.

Additional mitigations and detail can be found in the Proponent's Application and additional materials submitted during Application Review.



View from MK Bay Marina (Viewpoint 1)



View from Robinson Lake Trail (Viewpoint 3)



View from Maggie Point (Viewpoint 27)



View from Douglas Channel (Viewpoint 11)



View from Coghlin Park (Viewpoint 8)



View from Hospital Beach (Viewpoint 15)

**Figure 7-1: Post-Development Photo-Simulations of the Proposed Facility**

#### 7.4.2.2 *Shipping Effects on Visual Quality*

The increased visual presence of industrial shipping traffic may affect cultural and spiritual values and sense of place for Aboriginal communities, as well as tourism and recreational values. The shipping LSA has limited human disturbance, although it does show some recent and historical forest harvesting and human settlement. Marine traffic varies, with views of local fishing boats interspersed with whale watching vessels, cruise ships, ferries and recreational vessels along much of the marine access route; and barges, chemical tankers and aluminum carriers near Kitimat and carriers transporting grain, shipping containers, and coal near Prince Rupert.

At full build out, the Project would result in an increase of approximately 2 LNG carrier movements per day and 700 movements per year; this would result in a change from 141 large vessel movements to 841 large vessel movements in Douglas Channel, and a change from 191 large vessel movements to 891 large vessel movements in Principe Channel.

The Application identifies 17 key viewpoints to assess the effects of shipping on visual quality. This analysis determined that 84% of the lands and waters within an 8 km radius of viewpoints along the marine access route would have potential views of LNG carriers within the foreground or mid-ground viewing distance. During operation, there would be a high probability of viewing a large vessel on any given day.

The predicted duration of individual LNG carrier transits within a 10 km radius of the 17 priority viewpoints ranges from 8 minutes to 67 minutes. The total monthly duration in visibility of the Project's LNG carriers ranges from 7.8 hours to 64.9 hours. On average, LNG carriers would be visible for 33 hours per month (1.1 hours per day), across all viewpoints, resulting in an increase of 483% in the total monthly duration in visibility of large vessel traffic compared with baseline conditions.

This is a substantial increase in the frequency and duration of large vessel movements and the cumulative monthly duration that such vessels would be visible relative to baseline conditions; however, numbers have varied over the past several decades and recent counts of both small and large vessels to the port of Kitimat are much lower than the historical peak.

The lighting system on the LNG carriers would consist of navigational lights and other lights to enable the crew to work and move about the ship safely. Navigation lights and other ship lighting could be visible, at receptor locations along the shipping route, during night transits of the LNG carriers.

Following is a summary of the proposed mitigations included in the Proponent's Application:

- Project-related marine traffic would use the Coast Guard operated MCTS to provide notice of planned arrival time at Triple Island; and
- No planned anchoring for the LNG carriers along the marine access route.



Additional mitigations and detail can be found in the Application and additional materials submitted during Application Review.

#### 7.4.3 Potential Project Effects and Proposed Mitigation Identified During Application Review

During Application Review, the general public raised concerns regarding the visible night glow that would be created by the proposed Project. In response to a request to consider alternative lighting to address potential light pollution, the Proponent replied that the facility engineering design would inform the lighting required for safe operation, and that this work is still underway. The Proponent committed that further information about detailed design information would be shared with the community and stakeholders at such time the information is available.

Haisla Nation expressed concerns about the visual impact of the facility during both daytime and night time. They requested a figure displaying the proposed Project's predicted light emission during night time. A night time rendering was completed from the perspective of Maggie's Point and was provided to Haisla Nation.

Haisla Nation also requested an image showing all structures visible above tree line from a view point of 2 km from site in Kitimat Arm. The Proponent responded that several of the renderings included in the Visual Quality Technical Data Report (Kitimat Arm, Maggie's Point) showed the facility from 2 km.

Members of the public also expressed concern about the visibility of the vapor plume from the cooling towers. The Proponent responded that visible plumes are anticipated to be infrequent and restricted in height and length. The vapor plume from the cooling towers would have minimal effect on visual quality.

Concerns regarding economic effects of changes to visual quality are addressed in section 6 (Economic Conditions)

#### 7.4.4 Characterization of Residual Project Effects

After considering all relevant proposed mitigation measures, EAO concludes that the proposed Project would result in the following residual adverse effects on visual quality:

- Reduced visual quality as a result of vegetation clearing, grading and infrastructure development of the LNG facility; and
- Reduced visual quality due to ongoing shipping activities.

Summarized below is EAO's characterization of the expected residual effects of the proposed Project on visual quality, as well as EAO's level of confidence in the effects determination (including their likelihood and significance).

Criteria	Assessment Rating	Rationale
Context	<b>Facility:</b> Moderate resilience  <b>Shipping:</b> Low resilience	<b>Facility:</b> The facility site and local area has been visually modified by past industrial development but is considered visually sensitive and has limited ability to absorb modifications.  <b>Shipping:</b> The shipping corridor is a relatively pristine environment and current shipping levels are relatively low.
Magnitude	<b>Facility:</b> Low to moderate <b>Shipping:</b> Low	<b>Facility:</b> The proposed facility would result in a moderate change from the baseline conditions.  <b>Shipping:</b> Shipping activity will be limited to two transits (one vessel visit) per day.
Extent	Local	The effects would be limited to areas from which the proposed facility and the shipping corridor are visible.
Duration	Long-term	<b>Facility:</b> The adverse effects of the facility would begin during construction and continue for over 25 years (the estimated duration of operation) and into decommissioning.  <b>Shipping:</b> The adverse effects of LNG carriers would continue for the 25 year life span of the Project.
Reversibility	Reversible	The adverse effects would be reversible after decommissioning and reclamation of the site and after shipping activities end.
Frequency	Continuous	Effects of the facility would be continuous. Vessels would be visible daily, but while in transit, for a maximum of approximately 2 hours per day from any given viewpoint.
Likelihood	While there is a high likelihood of residual effects, visual quality is highly subjective and effects would be interpreted differently by individuals.	
Significance	Considering the above analysis and the conditions identified in the TOC (which would become legally binding as a condition of an EAC), EAO is satisfied that the proposed Project would not have significant adverse residual effects on visual quality.	
Confidence	There is a moderate level of confidence in the analysis undertaken to support the conclusions, particularly in consideration of the effectiveness of mitigation measures and the likelihood of residual effects.	

#### 7.4.5 Cumulative Effects Assessment

Industrial development in Kitimat is expected to expand rapidly in the near future. In addition to growing port developments, the RSA is experiencing new developments in the LNG, pipeline, aggregate, and forestry sectors. The Application identified approximately 25 other projects in the RSA at various stages of development that have the potential to result in cumulative effects on visual quality in the facility RSA and the shipping RSA.

The projects located in the port of Kitimat would contribute to changes in vegetation patterns and topography and would introduce new industrial infrastructure, interacting cumulatively to decrease the visual quality of the harbour. However, there is already a high degree of modification, and the combined effects of projects would exceed any established visual quality objectives.

The Project's LNG carrier traffic, together with traffic from the other operating, approved, and reasonably foreseeable projects, is predicted to result in a fundamental change in the frequency and duration with which large vessels are visible from viewpoints in the shipping RSA. However, the prominence of large vessels travelling in the shipping RSA is predicted to be low to moderate.

In consideration of the above analysis, the mitigation strategies proposed by the Proponent, EAO concludes that the residual adverse cumulative effects on visual quality would not be significant.

#### 7.4.6 Conclusions

Considering the above analysis and having regard to the CPD and the conditions identified in the TOC (which would become legally binding as a condition of an EAC), EAO is satisfied that the proposed Project would not have significant adverse effects on visual quality.

## 8 Heritage Effects

### 8.1 Archaeological and Heritage Resources

#### 8.1.1 Background

Archaeological and Heritage Resources are considered a VC because of the potential for the proposed Project to affect these resources. The Application assessed the potential effects of the proposed Project on heritage values with respect to archeological and heritage sites.

The LSA for archaeological and heritage resources is the area of ground disturbance for the proposed LNG Canada terminal and associated infrastructure, with an approximately 100 m buffer to the west and north and 250 m buffer to the east. The LSA includes pre-construction site clearing of the footprint, as well as the safety zone.

Archaeological sites protected under the *Heritage Conservation Act* (HCA) are provincially regulated by the Archaeology Branch of FLNR, while historic and architectural sites are provincially regulated by the Heritage Branch of FLNR. Historic places may also be formally recognized and protected under the *Local Government Act*, and regulated by local governments. Historic sites are those defined by the BC *Archaeological Assessment Guidelines*, and architectural sites refer to modern (post-1846) sites, although not all post-1846 sites are architectural.

#### 8.1.2 Potential Project Effects and Proposed Mitigation Measures in the Application

The Archaeological Impact Assessment (AIA) fieldwork was carried out from June to November 2013, and in April and May 2014. While there are numerous known archaeological and heritage sites in and around Kitimat Arm, none had previously been identified within the proposed Project footprint. In the course of the AIA fieldwork, one archeological site was identified in addition to some historical artifacts.

The assemblage found at the archaeological site indicated that there had been one or more short-term occupations, and that resources such as fish, terrestrial game, or plant materials, had been processed. According to the Application, ethnic significance is tentatively rated as high, and Haisla Nation would be providing input on the importance of the sites to the Proponent. The Application rates the site as moderate in terms of scientific and public significance, with a low economic significance. The Application stated that Project effects on the archaeological site could not be mitigated through avoidance because of the site location. Thus, Project effects would be mitigated through systematic data recovery and/or archaeological monitoring of construction activities, to standards defined by the Archaeology Branch.

Additionally, historical artifacts were identified within the area of Project pre-construction and construction works. Historical artifacts are not protected under the HCA, although

some of the found artifacts may be of interest to local stakeholders. These would be managed in consultation with the Kitimat Centennial Museum, the Kitimat Historical Society and other key stakeholders. The Proponent has committed that artifacts deemed as important may be collected and curated at the museum.

According to the Application, Gitga'at First Nation, Gitxaala Nation, and Metlakatla First Nation expressed concerns about the potential for Project-related effects on intertidal archaeological or heritage sites. The intertidal zone fronting the terminal footprint was surveyed and no such sites were identified. According to the Application, wake produced by Project shipping traffic would be less severe than wake created naturally by weather. Additionally, archaeological and heritage sites have already been eroded by natural tidal action and storm surges. As a result, no interaction between Project activities and resources along the shoreline is predicted in the Application.

Following is a summary of the proposed mitigations included in the Application:

- Wherever possible, if found, culturally modified trees (CMTs) would be avoided; in situations where CMTs cannot be avoided, mitigation measures would focus on recording them completely and systematically;
- Archaeological sites that were recorded in the LSA would be managed in consultation with the Archaeology Branch and Haisla Nation and in accordance with a Heritage Investigation Permit;
- Management of historic materials identified during AIA fieldwork would be done in consultation with the Kitimat Centennial Museum, the Kitimat Historical Society and other key stakeholders as required;
- A Project-specific archaeological and heritage resources management plan, including a chance find protocol, will be developed and implemented prior to construction.

### 8.1.3 Potential Project Effects during Application Review

Gitxaala Nation expressed concern that the Application failed to address the potential for shipping traffic to negatively impact archaeology sites.

The Proponent responded that information from a number of wake studies conducted in locations around the globe had informed the assessment of wake effects in the Application. Additionally, in response to wake concerns raised in regard to impacts to other VCs, the Proponent commissioned an additional cumulative wake study and a shoreline wake study. Further discussion of wake, including study results, mitigation measures and a proposed condition, can be found in section 7.3 of this report.

FLNR's Archaeology Branch identified the need for ongoing archaeological monitoring, which would be part of the permit under the HCA.

#### 8.1.4 Characterization of Residual Project Effects

The proposed Project would have the following residual effect on heritage resources:

- Alteration or removal of terrestrial archaeological or heritage sites.

Summarized below is EAO's characterization of the expected residual effects of the proposed Project on archaeological and heritage resources, as well as EAO's level of confidence in the effects determination (including their likelihood and significance).

Criteria	Assessment Rating	Rationale
Context	Disturbance varies	Heritage sites are protected under the HCA. Mitigation measures for potentially affected sites would be determined in consultation with the Archaeology Branch, and may take the form of avoidance, systematic data recovery, and/or construction monitoring to avoid or reduce the loss of scientific data resulting from site destruction. Historical artifacts are not protected by the HCA.
Magnitude	Low	Information collection should generally mitigate the impacts to the archaeological site to relatively low or moderate. If previously unidentified archaeological sites or heritage resources are impacted, information collection should generally mitigate these impacts to be relatively low.
Extent	Localized	Generally limited to a site or sites within the Project footprint that would have direct ground disturbance.
Duration	Permanent	Any archaeological findings not collected would likely be permanently destroyed if in the Project footprint.
Reversibility	Irreversible	Any permanent losses would be irreversible
Frequency	Once	Disturbance to archaeological and heritage sites and resources (including CMTs) would occur once (e.g., during construction ground disturbance).
Likelihood	There is high likelihood that terrestrial archaeological sites would be adversely affected.	
Significance	<p>EAO notes that archaeological and heritage resources are protected under the HCA, and the mitigation measures for potentially affected sites would be determined in consultation with the Archaeology Branch and OGC.</p> <p>Considering the above analysis and having regard to the conditions identified in the TOC (which would become legally binding as a condition of an EAC), EAO is satisfied that the proposed Project would not have significant adverse residual archaeological effects.</p>	
Confidence	Confidence in the overall effects assessment is high, given that provincially required mitigation programs would be conducted and would be based on input from Aboriginal communities and regulatory bodies.	

### 8.1.5 Cumulative Effects Assessment

Mitigation of destruction or disturbance of CMTs and archaeological sites are requirements for all projects; therefore, it is assumed that the mitigation implemented for the proposed Project would be similarly implemented for other projects that could potentially have cumulative effects.

Given the localized nature of the potential impacts on archaeological resources, and in consideration of information made available in the Application and during Application Review, EAO does not anticipate any significant cumulative effects to archaeological and heritage resources as a result of effects of the proposed Project interacting with effects of past, present and reasonably foreseeable projects and activities.

### 8.1.6 Conclusions

Considering the above analysis and having regard to the conditions identified in the TOC (which would become legally binding as a condition of an EAC), EAO is satisfied that the proposed Project would not have significant adverse residual effects on archaeological or heritage resources.

## 9 Health Effects

### 9.1 Human Health

#### 9.1.1 Background

Human health is a VC because the proposed Project has the potential to change the chemical composition of the following, which can potentially affect human health:

- Ambient air, from air emissions of CACs;
- Water, from acidification of surface waters from air emissions of CACs;
- Soil, from deposition of air emissions of CACs;
- Sediment, from re-suspension of historically-contaminated sediments during dredging;
- Terrestrial country foods, through changes in ambient air quality; and
- Marine country foods, through the uptake of historically-contaminated sediment by marine species.

Chemicals in the environment can be transferred to humans and other biological receptors through exposure to air, water, soil and marine sediment, or through food sources.

In BC, human health effects are assessed in relation to compliance with the BC *Public Health Act*, which is the responsibility of MOH. Federal guidance for the protection of human health from exposure to chemicals is provided by HC. HC provides guidance on human health risk assessments and evaluates human health issues for major projects regulated under CEAA 2012. HC generally advises on changes to air quality, country foods, noise and drinking water as a result of a project that could impact the health of Aboriginal people.

The Application describes the baseline conditions for air quality, marine water quality, sediment quality and country foods to provide context for the assessment of potential human health effects.

The LSA for the assessment of potential human health effects from degraded air quality is an area of 40 km x 40 km centred on the LNG facility. The RSA is an area of 60 km x 60 km centred on the facility. The RSA for shipping emissions is a 10 km band centered along the marine access route.

The LSA for the assessment of potential human health effects from the consumption of marine country foods is equivalent to the marine resources LSA for the LNG facility. The RSA is the same as the RSA for the marine resources VC.

The Application defines five human health focus areas that are used to assess the potential health risks to human receptors from inhalation exposures to CACs. These



areas are: Kitamaat Village, lower Kitimat, upper Kitimat, north Kitimat and the service area. The Application also lists 29 special receptor locations (eight of which are located outside of the human health focus areas) that are of particular concern to the community; these include daycares, schools, recreational areas, seniors' care facilities and health care facilities.

#### 9.1.2 Potential Project Effects and Proposed Mitigation Described in the Application

The Proponent evaluated the potential exposure pathways of chemical stressors to humans and provided an assessment of the following potential effects to human health from the proposed Project:

- Change in human health risk from degraded air quality;
- Change in human health risk from degraded drinking water quality; and
- Change in human health risk from ingestion of contaminated country foods.

The chemicals of potential concern included SO<sub>2</sub>, NO<sub>2</sub>, CO, particulate matter (PM<sub>2.5</sub>), PAHs and PCDD/Fs. A summary of the characterization of potential human health effects is provided in the following sections.

##### *Change in human health risk from degraded air quality*

The proposed Project would generate emissions of CACs including NO<sub>2</sub>, SO<sub>2</sub>, CO and PM<sub>2.5</sub> which would contribute to degraded air quality in the Kitimat airshed. The Application stated that degraded air quality can potentially affect human health, especially in sensitive populations (i.e., those with pre-existing respiratory concerns). Project activities in the operation phase, including the treatment of natural gas, extraction of liquids, production of LNG and vehicle/rail traffic, are expected to have the greatest effect on air quality and human health.

Air dispersion modelling was used to predict the concentrations of CACs at five human health focus areas and 8 special receptors located outside of these areas. Maximum CAC concentrations were modelled for the Base case, Project-alone case, Application case and Cumulative case. The Base case included anticipated emissions from the RTA modernization project. Refer to section 5.1 of this Report (Air Quality) for additional details on the dispersion modelling.

For all of the cases modelled, the maximum concentrations of NO<sub>2</sub>, CO and PM<sub>2.5</sub> predicted from air dispersion modelling were below the applicable human health-based air quality criteria. The Application concluded that these CACs do not represent a potential concern for human health. Maximum predicted 1-hour and 24-hour concentrations of SO<sub>2</sub>, however, exceeded the applicable human health-based air quality criteria for the Base case and Application case. Further assessment of the potential residual health effects from SO<sub>2</sub> emissions was conducted.

The potential residual health effects from SO<sub>2</sub> emissions were assessed by analysing the range and frequency of exceedances and by refining the exposure scenarios. The

resulting 1-hour and 24-hour weighted average SO<sub>2</sub> concentrations were found to be below the applicable human health-based air quality criteria at each of the five human health focus areas and the 8 special receptor locations. Concentration Ratios (CR) were also calculated to determine whether the predicted maximum concentration represented a potential concern for human health. The CRs were found to be less than 1.0; therefore, the Application indicated that health effects for healthy individuals would likely be acceptable.

5-minute SO<sub>2</sub> Dose-Response Analysis: The Application also assessed the 5-minute exposure scenario to predict the change in respiratory response in people with asthma or chronic obstructive pulmonary disease (COPD), as these people are especially susceptible to respiratory effects from inhalation exposure to SO<sub>2</sub>. The assessment concluded that the proposed Project would not result in SO<sub>2</sub> concentrations that lead to greater health concerns than what may already exist.

Combined Exposure to SO<sub>2</sub> and NO<sub>2</sub>: An assessment of the human health risks associated with combined exposure to SO<sub>2</sub> and NO<sub>2</sub> was also completed. The analysis found that Project-related increases in combined SO<sub>2</sub> and NO<sub>2</sub> exposures were between 5.8% and 35% for the 1-hour maximum combined concentrations and between 0.13% and 8.6% for the 1-hour weighted-average combined concentrations. The Application indicates that the increases in combined SO<sub>2</sub> and NO<sub>2</sub> concentrations between the Base and Application cases are driven by Project-related NO<sub>2</sub> emissions, but that the increases in NO<sub>2</sub> are below the level that could pose a concern for human health. The Application concluded, therefore, that simultaneous exposure to SO<sub>2</sub> and NO<sub>2</sub> is not expected to result in an increase in respiratory events for residents of the Kitimat region. The Human Health Risk Assessment Technical Data report provides further details on the assessment of combined SO<sub>2</sub> and NO<sub>2</sub> exposures.

Emissions from Marine Shipping: The Application stated that marine emissions were incorporated into the overall dispersion modelling for the human health assessment and that emissions from marine shipping activities are not expected to result in human health effects.

Human Health Risk Assessment: The Proponent conducted a Human Health Risk Assessment (HHRA) that focused on evaluating the potential health effects associated with atmospheric emissions from the proposed Project using the air quality modelling information from the air quality assessment. The HHRA assessed the potential residual effects on human health based on an industry standard HHRA approach that is consistent with federal and provincial regulatory guidance. Detailed information on exposure scenarios, assumptions, methods and detailed results of this analysis are presented in the Application's Human Health Risk Assessment Technical Data Report.

Mitigation measures specific to the protection of human health from exposure to CACs were not presented in the Application, however, section 5.2 of the Application (Air Quality) identified a number of measures to mitigate potential Project-related effects on

air quality. These measures would also mitigate the potential residual effects on human health. section 5.1 (Air Quality) of this Report provides a summary of these measures.

*Change in human health from degraded drinking water quality*

Emissions of SO<sub>2</sub> and NO<sub>2</sub> from the proposed Project have the potential to cause acidification of nearby surface waters which can result in the mobilization of metals from sediment and other materials in the water. Section 5.4 of the Application includes an assessment of the potential effects of acidification on surface water quality and concludes that acidification is not expected to alter the metal concentrations in surface water from baseline conditions. Therefore, the Application stated that there is no increased health risk from drinking these surface waters and that mitigation measures specific to drinking water quality are not required.

The Application also stated that groundwater-sourced potable water would not be affected by acidification and, therefore, would not be a concern for human health.

Finally, in areas where municipal drinking water is available, the water would be treated to meet established drinking water quality standards, so there would be no human health risk. Since the source water quality (i.e., the surface water quality) is not expected to change, there would also be no change in the municipal water treatment requirements.

*Change in human health risk from ingestion of contaminated country foods – terrestrial*

Marine and terrestrial country foods are an important part of both Aboriginal and non-Aboriginal cultures. The harvesting and consumption of country foods has particular importance to Aboriginal communities from a cultural, social, spiritual and nutritional perspective. Several Aboriginal Groups raised concerns about how air emissions may affect the health of harvesters who use locations are potentially affected by the proposed Project.

Land-based activities in the construction and operations phase have the potential to generate fugitive dust that could settle on surrounding vegetation which could then be ingested by people who consume this vegetation as country food. The Application stated that road dust is inert and its ingestion with vegetation would result in negligible human health risk. Similarly, terrestrial animals that ingest this vegetation and are hunted as country food would also not present a human health risk, since this pathway would not alter the quality of the animal's tissue. The Application does not present mitigation measures specific to terrestrial country foods. However, section 7.5 of the Application indicates that the Proponent would deliver awareness and information sessions to educate the general public and Aboriginal Groups about the Project to mitigate potential effects related to any perceived change in the quality of country foods.

*Change in human health risk from ingestion of contaminated country foods – marine*

The Application indicates that dredging and pile driving activities associated with the proposed Project have the potential to disturb and re-suspend historically contaminated sediments into the water column. Marine organisms can potentially take up these chemicals through their gills or skin, or could ingest the contaminated suspended sediment particles. The sediment in Kitimat Arm contains PAHs, PCDD/Fs and metals from historic activities and industries in the area. People who harvest and consume local marine country foods could potentially be exposed to contamination in these marine organisms. Commonly harvested marine country foods in the RSA include: eulachon, greenling, rockfish, halibut and cod, herring (including roe), octopus and other invertebrates, all species of salmon, shellfish, shrimps and prawns.

The uptake of PAHs and other contaminants by marine species in Kitimat Arm is a concern that has been investigated in numerous studies since the 1990's. Many of these studies indicate that the contaminants in Kitimat Arm, particularly the PAHs, have low bioavailability and are tightly bound to coarse particulates in the sediment. However, PAHs associated with historical discharges from the former pulp mill (which closed in 2010) were found to accumulate in soft-shell clams. Generally, concentrations of PAHs in Kitimat Arm appear to be in recent decline, especially near the smelter.

Section 5.6 of this Report (Marine Resources) provides additional information on the contaminants present in the sediment in Kitimat Arm, as well as the potential effects on marine resources from disturbance of these sediments.

The Application stated that the disturbance of sediments containing PAHs represents the greatest potential for a change in the quality of marine country foods. During the initial dredge period, the surface sediments (which contain the highest concentrations of industrial pollutants, especially PAHs) would be removed from the marine environment and disposed of appropriately on land. This activity, along with pile driving activities, would result in a temporary increase in PAH concentrations in the water column. For fish, this is not expected to result in long-term changes to the PAH levels in fish tissue since fish metabolize PAH readily, and have low rates of bioaccumulation. The Application further indicates that PAHs have low bioavailability because they are tightly bound to large particulates in the sediment. However, EAO notes that there are uncertainties with respect to bioaccumulation in shellfish, as shellfish may not readily metabolize PAHs and could possibly accumulate PAHs.

Another mechanism by which the quality of marine country foods could be affected is through the re-settling and deposition of marine sediments outside of the dredge zone. This can potentially affect benthic species such as prawns, clams and crabs, since these species would be exposed to the contaminants in the sediments. However, Kitimat Arm is in Area 6 designated by DFO and there is a permanent year-round ban on shellfish harvesting and consumption in this area due to the potential for domoic acid and paralytic shellfish poisoning. However, some harvesting in the area still occurs.

The Application does not propose mitigation measures specific to marine country foods, however, measures would be implemented to reduce the extent of the sediment plume from dredging and its deposition outside of the dredge zone. A summary of these measures, and other measures that are considered protective of marine resources, is presented in section 5.6 of this Report (Marine Resources).

### 9.1.3 Potential Project Effects and Proposed Mitigation Identified During Application Review

During Application Review, the Working Group and members of the public raised concerns about the potential effects of the proposed Project on human health. The key issues and responses of the Proponent and/or EAO are summarized below.

#### *Air Quality – Spatial and Temporal Distribution of Exceedances*

MOE and MOH raised the concern that the Application did not adequately assess the spatial and temporal distribution of NO<sub>2</sub> and SO<sub>2</sub> exceedances and associated potential health effects. MOH expressed concern that the 5-minute SO<sub>2</sub> dose-response analysis was based on a single grid point, instead of a representative distribution of SO<sub>2</sub> concentrations in the region. MOE and MOH also questioned the approach to assessing health effects by grouping concentrations into “bins” and multiplying by the upper bin limit, as this approach had the effect of establishing a higher baseline which then undermined potential impacts from any additional sources. MOE and MOH also expressed disagreement with the Proponent’s use of weighted average concentrations for comparison with the AAQOs and indicated that this is not appropriate. MOE strictly defines how air quality concentrations should be calculated for comparison with the AAQOs (i.e., 99th and 98th percentiles).

There were discrepancies between the RTA STAR and the Application in the predicted increases in respiratory events above background. MOE and MOH determined that these were largely attributable to differences in air dispersion modelling methods and the Application’s use of a single grid point in each geographic area. The RTA STAR predicted 50-500 respiratory events (i.e., respiratory episodes requiring the use of an inhaler) above background, whereas the Application predicted only 26.5 for the same scenario (Base case). MOH further raised the concern that the Proponent’s analysis emphasized the increase in respiratory events above Base case, not background, which dismissed the adverse health effects (increase in respiratory events) under the Base case.

In a technical memo entitled “*Human Health Exposure Point Concentrations*,” the Proponent provided justification for the use of the “binning” approach, as well as the use of the maximum grid point concentration to assess exposures in a given area. Using Human Health Focus Area 3 (the most populated area with the largest percentage of special receptors), the Proponent compared the weighted average 1-hour SO<sub>2</sub> concentrations at the maximum grid point location with that of the special receptors locations. Based on the results, the memo concluded

that the use of data from the maximum concentration location was appropriate for estimating conservative exposure point concentrations for a given human health area. The suitability of the binning approach was also assessed and, although this method was found to slightly underestimate the predicted increases in respiratory responses between the Base and Application cases, the Proponent concluded that this slight difference would not change the determination of significance of human health effects.

At the request of MOE and MOH, the Proponent provided additional analyses of the frequency and distribution of SO<sub>2</sub> exceedances in the five human health study areas in a technical memo entitled, "*Isopleth [Human Health] Technical Memo*." The memo concluded that the results of these analyses are consistent with the existing conclusions and that the emissions from the proposed Project are not expected to cause a significant change in human health risk.

From this memo, MOH noted that the frequency of 1-hour SO<sub>2</sub> concentration exceedances would increase between the Base case and the Application case. The isopleths in the Application case, when compared to the Base case, indicate increased exceedances in areas where exceedances already occur at Base case, as well as exceedances in areas that would otherwise not occur in the absence of the proposed Project. This provides evidence that the proposed Project's contribution of SO<sub>2</sub> to the airshed is not negligible when considered alongside other emitters.

MOH also expressed continued concern regarding the use of the maximum grid point location for estimating health risks and indicated that substantial uncertainties remain in the Proponent's dose-response analysis for SO<sub>2</sub>. While data from the maximum concentration location may present a conservative worst-case scenario in stations where the predicted maximum concentrations fall below the AAQOs, MOH indicated that this approach is not sufficient where the maximum concentrations exceed the AAQOs. As demonstrated in the *Isopleth Technical Memo*, the grid point location at which the maximum concentration is predicted to occur does not necessarily correspond to the location of the highest frequency of predicted exceedances, which is more relevant for characterizing human health risks.

#### *Air Quality – Concentration Ratios and Isopleths*

MOE, MOH and HC raised concerns about the CR thresholds used in the Application to determine the significance of residual effects, particularly where the baseline exposures were already above a CR of 1.0. MOH indicated that Project-only effects should not exceed an absolute incremental increase of 0.2, regardless of background. MOH also indicated that the use of percent increase to determine significance is not appropriate and that the Proponent should evaluate any absolute incremental increases greater than 0.2 (not 20%) between baseline and the Application case.

In response to these concerns, the Proponent issued a technical memo entitled "*Human Health Project Specific Concentration Ratios; Isopleth Figures*" which applied a CR threshold of 0.2 to assess the significance of Project-alone exposures to SO<sub>2</sub> and NO<sub>2</sub>. The incremental increase between the Base case and Application case was examined for situations where the Project-alone CR exceeded 0.2.

A summary of the spatial and temporal distribution of the Project-alone SO<sub>2</sub> and NO<sub>2</sub> exceedances using a CR threshold of 0.2 was depicted in event frequency diagrams. The Proponent concluded that the exceedances of the CR of 0.2 were generally both temporally and spatially separate and suggested that health effects due to inhalation exposures of these CACs are not expected to occur.

In response to additional requests from MOE and MOH, the Proponent provided a follow-up memo entitled "*Isopleth [Human Health] Technical Memo,*" which presented isopleths for the Project-alone case for SO<sub>2</sub> and NO<sub>2</sub> using a CR of 0.2. The memo also provided further analysis of the 1-hour SO<sub>2</sub> and NO<sub>2</sub> concentrations in the five study areas for the Base, Application and Cumulative cases. The results were consistent with the existing conclusions and, therefore, the memo concluded that emissions from the proposed Project are not expected to result in a significant change to human health risk.

MOH expressed continued concern about the proposed Project's contribution to NO<sub>2</sub> emissions in the Kitimat airshed, noting that NO<sub>2</sub> concentrations for the Project-alone case are expected to exceed a CR of 0.2 and that additional emissions of NO<sub>2</sub> from non-point sources (i.e., traffic) are likely to increase with industrial development. MOH also expressed concern that the combined NO<sub>2</sub> and SO<sub>2</sub> emissions could potentially affect respiratory health in the region, since the proposed Project is expected to result in an increase in SO<sub>2</sub> exceedances between the Base and Application case and because the predicted Project-alone emissions of NO<sub>2</sub> represent a substantial proportion of the AAQO.

#### *Air Quality – Workforce Accommodation Centre*

Late in the Application review phase, MOE and MOH raised the concern that the potential health effects on workers living in the work camp due to air quality had not been assessed in the HHRA in the Application. According to WorkSafeBC, "[t]he Occupational Health and Safety Regulation applies to camps to the extent they are workplaces in which workers such as cooks, maintenance people and others work."<sup>8</sup> MOE and MOH indicated that construction workers living at the camp would not be protected by standards associated with the Occupational Health and Safety Regulation, contrary to what the Proponent had understood.

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<sup>8</sup> WorkSafeBC: <http://www2.worksafebc.com/publications/OHSRegulation/Part25.asp>

The proposed Project's workforce accommodation centre would be located adjacent to the RTA facility, where post-modernization levels of SO<sub>2</sub> emissions are projected to increase substantially. The Proponent has noted that the work camp would be present during the construction phase of the proposed Project and is expected to be decommissioned before full build-out. However, given that full build out may not occur for several years (or not at all), it is unclear how long the construction workers would be located at the camp and the air quality to which they would be exposed.

The Proponent provided a limited analysis of the potential health risks to temporary workers living at the workforce accommodation centre, consisting of predicted 1-hour concentrations of SO<sub>2</sub> and NO<sub>2</sub> for three locations along the southern perimeter of the workforce accommodation centre. The predicted concentrations were presented for the Baseline, Project-alone and Application scenarios.

Predicted concentrations of NO<sub>2</sub> were found to be well below the BC interim AAQO. For SO<sub>2</sub>, predicted concentrations for the Baseline case were found to be above the BC interim AAQO. The Proponent indicated that, at these concentrations, there may be inhalation health risks to workers housed at the workforce accommodation centre during periods when SO<sub>2</sub> concentrations are above the BC interim AAQO. These exceedances were predicted to occur for an estimated 59 hours per year. For the Project-alone case, the predicted SO<sub>2</sub> emissions were found to be small in comparison. For the Application case, the predicted 1-hour SO<sub>2</sub> concentrations were found to be greater than the BC interim AAQO for an estimated 63 hours per year.

The Proponent concluded that the incremental increase in SO<sub>2</sub> from Baseline to the Application case was not expected to have a measurable increase in the potential number of SO<sub>2</sub>-associated respiratory responses. However, the Proponent indicated that it planned to undertake a health risk assessment and to consider the air quality data currently being collected by RTA in the vicinity of the workforce accommodation centre in the design of the workforce accommodation centre in order to limit exposure of project workers. Further, the Proponent indicated that it would continue to consult with MOE and MOH on the issue.

EAO proposes a condition that would require the Proponent to consult with MOH, MOE and WorkSafe BC in completing a human health risk assessment regarding the potential effects of air quality on workers residing at the workforce accommodation centre. The Proponent would be required to implement additional mitigation measures as necessary to reduce the risks to human health posed by air emissions.

#### *Marine Country Foods – Bioavailability*

Several Working Group members, including MOE, MOH and HC raised the concern that marine activities such as dredging and DAS could increase the bioavailability of PAHs, PCDD/Fs and metals, which could lead to increased levels of these contaminants in marine country foods. People are made aware not to harvest in this area, but there still may be some harvesting that occurs.



In response to these concerns, the Proponent issued a technical memo entitled, “*LNG Canada Bioavailability Technical Memo*” dated December 10, 2014 to provide additional information on the bioavailability of PAHs and PCDD/Fs. The memo summarized the key findings of several studies that showed PAHs in Kitimat Arm to have consistently low bioavailability to marine wildlife. The Proponent re-iterated that because of this low bioavailability, the uptake of PAHs into marine country foods would be unlikely to occur and the quality of country foods is not expected to change as a result of dredging activities.

The memo also provided a summary of the potential changes in human health risk from PCDD/Fs in marine country foods. The concentrations of PCDD/Fs in Dungeness crab and other species in Kitimat Harbour have been in decline since the implementation of discharge regulations in the 1980’s. Currently, the concentrations of PCDD/Fs in these species are very low and directly correlated to the concentrations in sediment. Since the proposed Project is not expected to discharge any PCDD/Fs, the Proponent concluded that changes to human health risk associated with PCDD/Fs in marine country foods are not anticipated.

MOE and MOH indicated that the technical memo provides useful information on the bioavailability of PAHs and PCDD/Fs under baseline conditions, but that there remain a number of uncertainties, particularly with respect to the post-dredge condition, the concentration of contaminants in marine country foods, and the associated risk to human health. MOE and MOH identified several inconsistencies in the studies cited by the Proponent in the memo and indicated that the memo did not acknowledge or discuss research that suggests re-suspension of contaminated sediment by dredging may increase the bioavailability of PCDD/Fs. MOE and MOH also presented additional information showing PAH and PCDD/F bioavailability under normal conditions and increased bioavailability following the re-suspension of contaminated sediments. Evidence presented by MOE and MOH demonstrated that PCDD/Fs concentrations in crab in Kitimat Arm have been found to exceed health-based guidelines. Overall, MOE and MOH indicated that there was a lack of information to support the assertion that the dredging of contaminated sediments would not increase the bioavailability of contaminants.

To address the outstanding uncertainties in the human health effects assessment, MOE and MOH recommended that further assessment of PCDD/Fs and PAHs be undertaken, including baseline tissue sampling, and that a baseline HHRA of marine country foods is completed prior to dredging. Haisla Nation requested baseline tissue analyses of marine country foods as well. MOE and MOH also recommended that post-dredging sediment and tissue sampling be conducted in order to validate the assessment.

The Proponent provided additional technical information on the baseline health risk from harvesting and consuming marine country foods from the proposed

dredge footprint and a 500 m radius around the footprint in the *Technical Memorandum in Support of the Human Health Risk Assessment*, based on a survey of marine country foods conducted in February 2015. The results of this assessment indicate that the health risk to toddlers, Aboriginal toddlers and Aboriginal adults from consuming Dungeness crab meat harvested from the study area is above the risk threshold based on a hazard quotient threshold of 0.2 for dioxins and furans, copper and zinc. The health risk from consuming flounder fish was also above the threshold for Aboriginal toddlers. However, this analysis assumes a high level of seafood consumption and that all consumption would only occur from the contaminated area. Local Aboriginal groups reported that they currently do not harvest marine country foods in the study area (i.e. 500 m radius of the dredge footprint) or the marine region north of Kitamaat Village. The avoidance of harvesting was due to multiple shellfish harvesting bans, the perception of contamination from various industrial facilities and the availability of nearby harvesting areas south of Kitamaat Village that are perceived to be clean.

Additionally, at the request of MOE and MOH, the Proponent undertook sediment dispersion modelling of the dredgeate to delineate the potential area of impact from re-suspension of contaminated sediments. The analysis showed that sediment plumes with TSS values exceeding the CCME acute threshold level were nearly entirely confined to the immediate dredge area (e.g., within 300 m).

EAO proposes a condition that would require the Proponent to complete tissue sampling of marine species that are harvested in Kitimat Arm and, based on the results, to complete a baseline human health risk assessment. The Proponent would be required to conduct sediment and water quality monitoring, and potentially additional tissue sampling, to validate the assessment. An adaptive management approach would also be required to communicate and remedy any exceedances to the appropriate regulatory authorities, and to remedy or reduce risks to human health.

### *Disposal at Sea*

EC indicated that the assessment of potential human health effects should include consideration of DAS activities and that additional information should be provided to support the conclusions for the potential human health effects from proposed DAS activities.

During Application Review (and in response to requests from various members of the Working Group), the Proponent conducted additional analyses on the five proposed DAS sites. It was determined that only one suitable site would be included in the Proponent's Disposal at Sea Application to EC; a combination of DSA 1c and 1a.

Modelling carried out by the Proponent suggests that the disposal of dredged material at sea has the potential to result in high levels of suspended sediments, which could result in temporary effects to some marine species at or near the disposal site. However, material disposed of at sea would meet the DAS screening criteria and, therefore, contaminants would not likely be available in quantities that would affect the health of marine organisms. Further, the Proponent indicated that the low bioavailability of the contaminants in sediment would not change as a result of disturbance of the sediments during dredging, nor the disposal of these materials at sea. It was, therefore, concluded that the risk to human health was low. The Proponent indicated that a comprehensive assessment of human health risk would be included in the Disposal at Sea Permit application and that additional information was also available in the technical memo entitled, “*LNG Canada Bioavailability Technical Memo*” dated December 10, 2014.

### *Follow-up Monitoring*

A number of Working Group members, including MOE, MOH, HC, Metlakatla First Nation, Haisla Nation and members of the public questioned what follow-up programs or actions the Proponent would undertake to validate the modeling predictions presented in the Application. Concerns included the uncertainties in the predictions modelling, as well as the potential for cumulative effects from other projects and activities in the Kitimat area. There currently may be some harvesting of marine country foods in the area, although people are made aware to not harvest in the area. Information from baseline tissue samples combined with project effects must be made available prior to commenting on the potential effects.

The Proponent responded that a conservative approach was taken for the assessment and that, even under worst-case conditions, the proposed Project is not expected to affect the health of people or the environment. The Proponent indicated that responsible management of air emissions is a key priority in design and operation of the proposed Project.

The Proponent also indicated that air monitoring and compliance reporting would be undertaken during the facility operation phase to verify the model predictions. If exceedances are noted, the Proponent would determine the cause and develop and implement a corrective action plan.

EAO proposes a condition that would require the Proponent to develop and implement an air quality and deposition monitoring program in consultation with MOE, OGC and EAO. The monitoring program would potentially include, air, soil and water monitoring, as well as reporting requirements. The Proponent would also be required to participate in a regional air quality monitoring program, if established by MOE.

With respect to marine country foods, EAO also proposes a condition that would require the Proponent to complete tissue sampling of marine species that are harvested in Kitimat Arm and, based on the results, to complete a baseline human health risk assessment. The Proponent would be required to conduct sediment and water quality monitoring, and potentially additional tissue sampling to validate the assessment. An adaptive management approach would also be required to communicate and remedy any exceedances to the appropriate regulatory authorities, and to remedy or reduce risks to human health.

#### 9.1.4 Characterization of Residual Project Effects

After considering all relevant proposed mitigation measures, EAO concludes that the proposed Project would result in the following residual adverse effects on human health:

- Inhalation exposures to emissions of CACs; and
- Ingestion exposures to PCDD/Fs and PAHs in marine country foods.

Summarized below is EAO’s characterization of the expected residual effects of the proposed Project on human health, as well as EAO’s level of confidence in the effects determination (including their likelihood and significance).

Criteria	Assessment Rating	Rationale
Context	<p><b>Air Quality:</b> Moderate resilience</p> <p><b>Country Foods:</b> Moderate resilience</p>	<p><b>Air Quality:</b> Existing ambient air quality data indicates that the current air quality in Kitimat airshed is generally good; however, air quality is expected to deteriorate (post-Kitimat Modernization Project). Emissions of CACs from industrial sources are expected to result in further degradation of air quality in the region. Sensitive receptors exist in the RSA and the level of baseline disturbance to air quality can be a contributing factor to changes in human health. Given these conditions, the general health of the population is considered to have a moderate to high resilience to changes in air quality.</p> <p><b>Country Foods:</b> Kitimat Arm is in Area 6 designated by DFO for which there is a permanent year-round ban on shellfish harvesting and consumption due to the potential for domoic acid and paralytic shellfish poisoning. However, harvesting and consumption of shellfish and other marine biota not covered under the closure continue to occur in the area and this exposure pathway was considered in the assessment.</p> <p>Sediment within the Project footprint contains historic contaminants, primarily PAHs but also metals and PCDD/Fs. Disturbance of these sediments can potentially result in the uptake of these contaminants by marine species. Studies have shown that the PAHs in Kitimat Arm have low bioavailability to fish and are tightly bound to coarse sediment particles. Short-term exposures are not expected to affect fish health since fish</p>

Criteria	Assessment Rating	Rationale
		have high PAH metabolism and low rates of bioaccumulation. Shellfish, however, may not readily metabolize, and can bioaccumulate PAHs. The levels of PCDD/Fs in the tissue of marine species have been declining in recent years since implementation of discharge regulations in the 1980's.
Magnitude	<p><b>Air Quality:</b> Low to moderate</p> <p><b>Country Foods:</b> Low to moderate</p>	<p><b>Air Quality:</b> There would be an increase in exposure to CACs from existing baseline conditions, but the magnitude of the effect on human health is generally expected to be low. The proposed Project is predicted to contribute to increased frequencies of SO<sub>2</sub> exceedances and would account for much of the increase in NO<sub>2</sub> levels in the area.</p> <p><b>Country Foods:</b> Disturbance of contaminated sediments could result in the uptake of these contaminants into marine tissues. The bioavailability of PAHs in Kitimat Arm to fish is considered low. Shellfish may not readily metabolize PAHs and can bioaccumulate them, and the magnitude may be moderate. Concentrations of PCDD/Fs that would be suspended in any sediment plume is also expected to be low. The magnitude of the resulting change in human health risk for people who consume marine country foods harvested in the area is assessed as low.</p>
Extent	<p><b>Air Quality:</b> Local</p> <p><b>Country Foods:</b> Local</p>	<p><b>Air Quality:</b> The highest exposures to CACs would occur near the LNG facility and on elevated terrain to the west of the facility. Exceedances are predicted in these areas under the Base case and increasing exceedances under the Application case. Areas further away such as the city of Kitimat, would be relatively less affected.</p> <p><b>Country Foods:</b> The extent of the effects on marine country foods would be largely restricted to the vicinity of the dredge pocket. The harvesting of these foods could occur beyond the local area.</p>
Duration	<p><b>Air Quality:</b> Long-term</p> <p><b>Country Foods:</b> Short- to long-term</p>	<p><b>Air Quality:</b> The duration of the effects of the proposed Project on human health would be the life of the proposed Project (approximately 25 years).</p> <p><b>Country Foods:</b> It is anticipated that biological uptake of contamination in marine organisms that are harvested for human consumption could occur on a short-term basis during</p>

Criteria	Assessment Rating	Rationale
		dredging activities. Contaminants may persist in marine foods post-construction. A health effect detected as a result of the consumption of contaminated marine foods may last longer than the physical work or activity.
Reversibility	<p><b>Air Quality:</b> Reversible</p> <p><b>Country Foods:</b> Reversible or irreversible</p>	<p><b>Air Quality:</b> Residual effects of CAC exposure would begin to decrease when project operations cease.</p> <p><b>Country Foods:</b> Some changes to human health may be reversible when the exposure ceases, while others may persist.</p>
Frequency	<p><b>Air Quality:</b> Continuous</p> <p><b>Country Foods:</b> Isolated event to continuous</p>	<p><b>Air Quality:</b> Residual effects of CAC exposure would occur continuously throughout the operations phase, although respiratory events coinciding with periods of high predicted concentrations are expected to occur sporadically.</p> <p><b>Country Foods:</b> Contamination of marine country foods would occur during dredging activities, whereas the consumption of potentially contaminated marine foods could occur over the course of subsequent years. Potential for human health impacts would correspond with harvesting for a period of years following construction, and contaminated organisms could be harvested and consumed at any point during their lifetime.</p>
Likelihood	<p>The likelihood of residual effects on human health from exposure to CACs is considered low due to the moderate resilience of the population and the low to moderate magnitude of the predicted effect.</p> <p>The likelihood of residual effects on human health from consumption of marine country foods is considered low due to the existing contaminants and the shellfish harvesting ban in the area.</p>	
Significance	<p>Considering the above analysis and having regard to the conditions identified in the TOC (which would become legally binding as a condition of an EAC), EAO is satisfied that the proposed Project would not have significant adverse residual effects on human health.</p>	
Confidence	<p>There is a moderate level of confidence in the likelihood and significance determination of residual human health effects based on the uncertainties in the results of the Application noted by Working Group members.</p> <p>To address uncertainties, the EAO proposes the following conditions:</p> <p><b>Air Quality:</b> EAO proposes a condition that would require the Proponent to develop and implement an air quality and deposition monitoring program that would include air, soil and water monitoring, mitigation measures and reporting requirements. The Proponent would also</p>	

Criteria	Assessment Rating	Rationale
		<p>be required to participate in a regional air quality monitoring program, if established by MOE.</p> <p><b>Country Foods:</b> EAO proposes a condition that would require the Proponent to complete tissue sampling of marine species that are harvested in Kitimat Arm and, based on the results, to complete a baseline human health risk assessment. The Proponent would be required to conduct sediment and water quality monitoring, and potentially additional tissue sampling, to validate the assessment. An adaptive management approach would also be required to communicate and remedy any exceedances to the appropriate regulatory authorities, and to remedy or reduce risks to human health.</p>

### 9.1.5 Cumulative Effects Assessment

The Application describes a number of existing and reasonably foreseeable projects and activities that have the potential to act cumulatively with the proposed Project.

#### *Air Quality*

Existing and approved facilities within the RSA include the RTA Facility, including the Kitimat Modernization Project, and the KLNG Project. The greatest potential for cumulative human health effects from CAC emissions lies with the RTA facility/Modernization Project due to its proximity to the proposed Project and its SO<sub>2</sub> and NO<sub>x</sub> emissions.

Air dispersion modelling results presented in the Application indicate that changes in CAC concentrations between the Base and Cumulative cases do not represent a potential human health concern from exposure to PM, CO and NO<sub>2</sub>. However, an incremental increase in SO<sub>2</sub> concentrations is expected between the Base case and the Cumulative case, with a corresponding increase in potential respiratory events of less than 0.01%. The Application concludes that the change in human health risk associated with the predicted incremental increase in SO<sub>2</sub> exposure is considered low.

EAO acknowledges that SO<sub>2</sub> concentrations in the Base case already exceed the health-based guidelines in some areas and at some times, and that the proposed Project would contribute incremental increases in respiratory events. EAO also acknowledges that persons with impaired respiratory systems may be especially sensitive to further increases in respiratory events. EAO is proposing a condition that would require the Proponent to develop an air quality and deposition monitoring plan, which would include air monitoring and an approach for the regular reporting of the effects from air emissions.

During Application Review, it was noted that non-point sources such as traffic would contribute NO<sub>x</sub> emissions to the Kitimat airshed and would likely increase with industrial development. It was also noted that combined NO<sub>2</sub> and SO<sub>2</sub> emissions have the

potential to affect respiratory health in the region. Cumulative respiratory health effects from emissions of these CACs from other sources in the region are possible.

### *Marine Country Foods*

The existing marine sediment contamination levels in Kitimat Arm are a result of the past industrial activities in the area. Reasonably foreseeable future projects having the potential to disturb or otherwise affect these contaminated sediments include dredging for the RTA Terminal A Extension project. The Application indicates that the RTA project is not expected to contribute to cumulative change in fish health because the suspension and re-settling of PAH-contaminated sediments during dredging or DAS activities would be short term and localized. With no change in predicted in fish health, the quality of this country food is also not expected to be changed and, therefore, there would likely be no change in health risk associated with the consumption of this country food. For additional details on the cumulative effects assessment of marine resources, refer to section 5.6 of this Report.

Considering the above analysis, and having regard to the conditions identified in the TOC, and the implementation of mitigation measures for the proposed Project, the cumulative effects on human health from changes in air quality and marine country foods are not likely to be significant.

#### 9.1.6 Conclusions

Considering the above analysis and having regard to the conditions identified in the TOC (which would become legally binding as a condition of the EAC), EAO is satisfied that the proposed Project would not have significant adverse effects on human health.



## 10 Accidents and Malfunctions

During the construction or operation of the proposed Project, unplanned events could arise from accidents or malfunctions associated with Project activities, resulting in impacts to environmental, social, health, heritage or economic values. The Application considered the likelihood and consequence of the occurrence, and considered scenarios for each of the potential accidents or malfunctions, according to the likelihood of the scenario arising and the potential consequence or severity of the scenario arising. The Application also assessed how potential accidents or malfunctions could affect a range of VCs under each scenario.

The potential accidents or malfunctions considered in this assessment include:

- Spills of hazardous materials (not including LNG);
- Loss of containment of LNG at the LNG processing and storage site;
- Emergency LNG facility shutdown;
- Explosion and fire; and
- Marine vessel grounding, and marine vessel collisions (e.g. with the wharf, a non-tug assisted vessel, or a marine mammal), including loss of cargo, where applicable.

Key issues of concern raised during stakeholder and Aboriginal engagement and by the public were related to spill impacts to wildlife (including those resulting from marine vessel accidents), the impact of flaring to birds, and vessel collisions with marine mammals.

The Proponent committed to implementing a health, safety, security and environment policy to prevent accidents or malfunctions. This policy would include a systematic strategy to identify hazards, threats, unwanted events and their potential effects, risk reduction measures and recovery planning in the event of an accident or malfunction. The Proponent would be required to prepare and implement a Project-specific ERP under OGAA's Environmental Emergencies Regulation (1999).

### 10.1 Spills of Hazardous Materials (Facility Related)

This section provides a summary of possible fuel or hazardous material spills (other than of LNG, which is discussed in a separate section) during construction or operations. A summary of implications to the biophysical and human environment of a 'most likely' scenario spill as well as a 'worst-case' spill was assessed.

The most likely scenario is a spill of relatively small amounts (less than a few litres) of lubricating oils, fuels or other equipment fluids which may occur through refueling or leaks from machinery or valves. Such spills are typically highly localized, limited to the required containment areas and the bermed Project footprint, and readily cleaned up by onsite crews using standard equipment and materials.

The credible worst-case scenario for a facility-related hazardous material spill is related to a condensate spill. This is considered highly unlikely to occur, but if it did occur, it would be due to a breach of a tank or equipment failure or leakage during loading operations from the tank to rail cars. Kitselas raised concerns about the risks associated with the transportation of condensate by rail. This concern is discussed in section 20.4.3.

A spill of fuel could potentially affect the atmospheric and visual environment, vegetation, wildlife resources, surface water quality, freshwater and estuarine fish and fish habitat, archaeological resources, and human health. The greatest potential for interaction with the aquatic environment would be a spill of diesel fuel during construction activities, although this is considered unlikely.

The Application predicted that the magnitude of the environmental effect of a spill would likely be localized and that fish and invertebrate populations would be expected to recover from a spill within several months to years depending on the size, location and timing of the spill.

The following key mitigation measures are proposed to reduce the likelihood of a spill occurring:

- Installing engineering controls and protection barriers on facility infrastructure;
- Adopting spill prevention and containment measures, with secondary containment, where required;
- Spill prevention design would be implemented for the fuel storage facilities, LNG processing and storage;
- BMPs would be followed for training workers, including communication regarding the location and safety of hazardous materials stored on-site;
- Storage, refuelling and maintenance areas would be located a minimum of 30 m from any water bodies or sensitive areas;
- BMPs would be implemented for proper equipment maintenance and inspections;
- Spill kits would be located on-site and standard spill response procedures would be implemented; and
- Spill reporting would be conducted under EMA, OGAA and under the requirements of CEPA, 1999 and the *Fisheries Act*.

## 10.2 Loss of Containment of LNG in the LNG Processing Area and Storage Site or Loading Lines

The Application stated that the credible worst-case scenario for loss of containment of LNG would be a rupture in the loading arm or in the loading line immediately upstream of the LNG carrier loading arm emergency shutdown valves. If the emergency shutdown systems failed, LNG could continue to flow into a loading line for a short period of time that would result in an LNG spill, most probably into the marine or estuary environment surrounding the terminal. Given the nature of LNG (e.g., extremely cold liquid that is much lighter than water), any liquid that exits the loading line onto water would spread on the surface and would quickly or immediately vapourize.

The Application stated that the most credible type of release is the result of equipment or system leakage, such as a leaking valve seal or flange gasket. This type of release would typically be small, visible and easily repaired by facility personnel. An LNG spill could cause localized freezing, followed by a vapour cloud extending from the spill (GHG emission), but no soil contamination.

The following key mitigation measures are proposed to reduce the likelihood of an LNG spill occurring:

- LNG storage tanks would be designed, constructed and tested using a primary and secondary containment system to reduce the likelihood of a spill;
- Operational procedures would be implemented to ensure transport, handling and process systems stay within design parameters and ensure safety;
- Facility design and equipment selection would mitigate effects associated with a potential spill;
- LNG transfer procedures would be implemented by properly trained workers; and
- In the event of a spill, an ERP that includes a spill response plan would be implemented.

The Application stated that in a worst-case scenario, an LNG spill could temporarily cause adverse effects to terrestrial or marine habitat, wildlife or vegetation, or human health, but there are no adverse long-term residual effects expected from an LNG release except the increased GHG emissions. There is a potential that an LNG release could temporarily exclude fishing, recreation or marine transportation, and because it would be temporary, it is not anticipated to cause significant economic effects.

### 10.3 Emergency LNG Facility Shutdown

A shutdown and flaring scenario would result in a large flame burning from the flare stack for one hour or less and would release SO<sub>2</sub>, CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O and NO<sub>x</sub> contaminants. Emissions would be below AAQO and, the GHG component would be negligible in the context of overall provincial and national GHG emissions. Some noise and visual disturbance may occur for a short period of time.

The Application stated that an emergency LNG facility shutdown could potentially affect the atmospheric and visual environment, wildlife resources and human health. Birds are attracted to artificial light, including flares, and could either be killed directly by flying into a flare, or ground themselves after being exhausted by circling the flare at night or during adverse weather conditions. The sporadic nature of this interaction, and the rarity of major flaring scenarios occurring at night in conjunction with adverse weather conditions (that could cause birds to be oriented toward the flare), suggest that bird mortality would be a rare event.

Key measures that would be in place to manage the risks and consequences of an emergency facility shutdown include:

- Implementation of a control and emergency shutdown systems which contain protection barriers to safely shut down equipment if required;
- Implementation of a flare design with minimum destruction efficiency of 99.5%, continuously lit pilot lights on all flares; and
- Implementation of administrative controls, including safe work procedures, work permits, and an ERP.

Residual effects of an emergency LNG facility shutdown on air quality, GHG management, the acoustic environment, visual quality and human health are assessed as not significant. Residual effects to wildlife (birds) from flaring associated with emergency shutdown are considered generally low magnitude, but even in a flaring event there would be a low likelihood of bird-flare interaction.

#### 10.4 Explosion and/or Fire

The Application assessed the implications of an explosion or fire occurring at the facility and the LNG carrier. A range of explosion or fire scenarios could possibly occur at the LNG facility given the large volumes of flammable gases onsite. LNG, as a liquid, is not explosive, and is dispersed in the air when at the same temperature. When a natural gas vapour cloud is within its narrow flammability range in air, it would rapidly combust and burn back to the source, but would not explode. Rapid phase transition, where LNG expands explosively into a vapour, can occur if LNG quickly absorbs heat from a water body.

The credible worst-case scenario for a fire or explosion is the uncontrolled release, with an associated ignition source, of gas phase materials that are stored or used within high pressure systems (e.g. gas feed system, refrigerant loop system, propane). Although a fire could also result from an LNG vapour cloud explosion, this scenario is more unlikely because LNG is stored and pumped under low pressure, meaning that an unintended release would be less likely than materials within higher pressure systems. The direct effects of both scenarios would likely be contained within the LNG facility.

The Application stated that an explosion or fire due to the release of natural gas would be confined to the Project footprint and associated safety zone; an explosion or fire on an LNG carrier would not likely extend beyond the immediate vicinity.

In addition to emergency shutdown and emergency depressurizing systems, fire prevention measures would include design of the processing facilities and overall facility layout to promote natural ventilation and dispersion of potential vapour clouds, and siting facilities at a safe distance. Additional fire prevention measures include:

- Adopting fire prevention and protection measures;
- Confinement or diversion measures, like curbs, dikes and trenches, at potential spill sources;
- Systems to prevent or limit releases;
- Area classification guidelines and adequate distance between equipment to control possible ignition sources; and

- Process control and instrument protective systems to provide early warning when normal process parameters are approaching their limits or automatic intervention when parameters are exceeded.

Fires and explosions could also occur on an LNG carrier. Small fires and explosions in the engine room, on deck, or in the accommodation areas would be controlled by suitable fire detection systems and automatic firefighting, in addition to manual firefighting response by trained vessel staff. It would be unlikely that fires and explosions associated with an LNG carrier would be unlikely to lead to loss of containment on the LNG carrier.

Key mitigation measures specific to explosions or fires on LNG carriers would include the following:

- LNG carriers are fully equipped with firefighting equipment, including large, dry chemical systems and sprinkler systems designed to contain a cargo system fire; and
- Employees would receive the appropriate training on operational procedures and environmental emergency response procedures to ensure safe LNG carrier loading and LNG facility operation.

The Application stated that a fire or explosion could potentially affect the atmospheric and visual environment, vegetation resources, wildlife resources, freshwater and estuarine fish and fish habitat, marine resources, infrastructure and services, economic conditions, marine transportation and use, community health and wellbeing, archaeological and heritage resources, and human health.

## 10.5 Vessel Grounding or Collision

The Application assessed the implications of: a LNG vessel grounding; a vessel-to-vessel collision; a vessel-to-marine terminal collision (an event where a vessel strikes a fixed object); and a vessel-to-marine mammal collision. Such incidents could result from human error, mechanical malfunction, or coincidental timing (in the case of a collision between a vessel and marine mammal).

For the vessel grounding, vessel-to-vessel collision, and vessel-to-marine terminal collision, the credible worst-case scenario is a hull breach and containment failure of one LNG tank and one fuel tank for a volume of up to 53,200 m<sup>3</sup> of LNG. Although most vessels use diesel for fuel, it is possible that some vessels would have bunker fuel on board.

The following key mitigation measures are proposed to reduce the likelihood of an LNG tanker spill occurring:

- LNG transport would be via double-hulled ships designed to prevent leakage or rupture in a collision or grounding;

- LNG would be stored in cargo tanks with either a metal membrane containment system (plus secondary barrier and insulation) supported and located within the ship's inner hull or welded aluminum self-supporting spherical tanks that sit inside the ship's double hull; and
- Vessel pilots and tugs would accompany LNG tankers.

The Application stated that vessel grounding or collision with another vessel or marine terminal would primarily result in effects from fuel spills and LNG spills, which could potentially affect air quality, GHG management, wildlife resources, freshwater and estuarine fish and fish habitat, marine resources, economic conditions, marine transportation and use, archaeological and heritage resources and human health.

The magnitude of environmental effects associated with a spill depends on the nature of the product spilled, the volume, location, and timing of the spill, as well as the efficiency of response measures. If bunker fuel is spilled into the marine environment, the fuel oil can float, be suspended in the water column, or sink. A bunker oil spill could result in substantial economic effects on CRA fisheries. For example, a spill of bunker oil could restrict access to fishing grounds, damage gear, increase operational expenses, or reduce the value or marketability of the target species.

If diesel oil is spilled, it would spread a thin film on the water and evaporate or naturally disperse within a few days or less. Bunker oil is known to be persistent and can be transported hundreds of kilometres, whereas LNG and diesel does not. Potential effects associated with a release of LNG are discussed in section 10.2.

The effects of oil spills to wildlife are well established for birds and marine furbearing mammals. Of the 11 key wildlife species identified for the LSA, harlequin duck, marbled murrelet, double-crested cormorant, common goldeneye, and glaucous-winged gull are most likely to be affected by a bunker oil spill. The western sandpiper and the black oystercatcher, both birds which use the intertidal area extensively, are also at risk for indirect impacts.

Humpback whales, which are listed as threatened under SARA, may be the most vulnerable marine mammal species with respect to vessel collisions. In areas of high whale density between the northern end of Campania Island and the southern end of Hawkesbury Island, LNG carriers would travel at speeds no greater than 10 knots from July through October, which is the period of high use by marine mammals. Reduced vessel speeds decrease the probability of a marine mammal-vessel strike and the probability of a lethal injury as a result of a vessel strike.

## 10.6 Cumulative Effects from Accidents or Malfunctions

The Application describes potential cumulative effects of accidents or malfunctions associated with the proposed Project.

Of these, the increase in number of vessels in the marine shipping RSA could result in cumulative effects to marine mammals was considered most likely to occur, and was of greatest concern to stakeholders and Aboriginal Groups. Currently, up to 348 large vessels per year travel within the marine shipping RSA and within Kitimat Arm and Douglas Channel and it is predicted that vessel transits could increase eightfold over the next decade (from 0.5 transits per day to 4.3 transits per day).

Vessel strikes with marine mammals may increase with the proposed increase in cumulative vessel traffic (including that from LNG Canada) in the marine shipping RSA.

Project mitigations include a reduction in vessel speeds in areas of high marine mammal densities within the confined channels of the marine access route. A more detailed discussion of mitigation measures is presented in the Marine Resources section of this report (section 5.6).

## 10.7 Issues and Concerns Raised During Application Review

### *Emergency Response to Spills, Fire or Explosions*

TC, EC, Haisla Nation, Lax Kwala'ams Band, Kitsumkalum First Nation, Gitga'at First Nation, MOE and the District of Kitimat raised concerns related to the emergency response to spills, fire or explosions at the facility and on Project vessels during transit. In response the Proponent clarified that they are undertaking a Facility Risk Assessment which would evaluate and identify appropriate safeguards and control and response measures for these types of events. They would also be required to develop and share an ERP and work with local emergency providers, potentially affected Aboriginal Groups and other stakeholders.

For marine emergency response the Proponent has committed to work with marine users to develop a shared and coordinated marine based response to marine emergencies.

### *Oiling of Seabirds from a Vessel Breach*

In response to concerns raised by Gitxaala Nation, EC and Metlakatla regarding the potential for oiling of wildlife from a bunker oil spill, the Proponent clarified that a component of their EMP would include a wildlife management plan which would detail wildlife protection and clean up in the event of a marine accident. Mitigation measures would include using bird scaring techniques to limit interactions between birds and released hydrocarbons and the collection, cleaning and release of oiled birds. Preventative measures would be implemented to avoid vessel accidents, including speed controls and ongoing collection of marine incident data to adaptively manage safe transit of Project vessels.

### *Impacts to Marine Mammals from Vessel Strikes*

Gitxaala Nation, Gitga'at First Nation, Kitselas First Nation, DFO and members of the public raised concerns about harm or mortality to marine mammals from Project vessel strikes. The mitigation to reduce the risk of marine mammal strikes is to limit vessel speeds in areas and during periods identified as high-use by marine mammals.

### *Impact to Birds from Flaring*

The Proponent confirmed, in response to concerns raised by Gitxaala Nation and EC, the potential mortality or harm to birds from flaring in the event of an emergency shutdown. The Proponent stated that it would be a very rare occasion where weather, visibility and emergency shutdown would occur simultaneously, but if it did occur, it could result in harm and mortality to birds.

### *Effects to Air Navigation*

TC expressed concerns about impacts of flaring on air navigation.

In response, the Proponent stated that air traffic is known to traverse the area over Kitimat at various altitudes and directions. The flare stack will be marked with lighting to warn aircraft in the area. The flare stack and flare are not expected to affect local weather patterns. The flare stack and flare are not expected to affect higher altitude air traffic, including those enroute to the Kitimat-Terrace Regional airport. It is expected that the flare stack and flare would cause lower altitude air traffic to avoid flying directly over the facility (e.g., less than 500 metres above ground).

EAO proposes a condition that prior to the commencement of construction activities, the Proponent would be required to develop an ERP for both land and marine based emergencies to address preparedness, prevention and response to an accident or malfunction associated with the proposed Project throughout the construction and operational phases.

## 10.8 Conclusions

Project design measures and other mitigation would be used to lessen the likelihood and reduce the severity of any accident or malfunction.

Considering the scope of assessment, the combination of the proposed Project design measures, and implementation of mitigation measures including ERPs, EAO is satisfied that risk of accidents or malfunctions are not likely to cause significant adverse effects.



## **11 Assessment of the Environment's Effects on the Project**

During construction or operation of the proposed Project, unplanned environmental events or processes could occur which could result in potential effects to environmental, social, health, heritage or economic values. The potential occurrence of unplanned events was assessed in the Application by defining the potential sensitivities, determining the baseline, describing the effects mechanism, outlining the mitigation options, and then describing the potential effects of the environmental factor on the Project.

During Application Review, Working Group members were actively engaged in considering questions related to potential risks and unplanned events associated with the proposed Project. Responses and clarifications to these concerns were provided by the Proponent during meetings and also through written response to questions in the Working Group tracking table.

Members of the public raised concerns regarding possible impacts of climate change on water supply, and how the Proponent would ensure that operations would continue if there were extended dry periods.

Environmental processes assessed with respect to their potential to affect the proposed Project and result in effects to VCs included:

- Climate change (temperature and precipitation, and sea level rise);
- Extreme weather events (temperature, precipitation and flooding, and wind and waves);
- Seismic activity; and
- Forest fires.

### **11.1 Climate Change**

The Application stated that the effects of rising temperature and/or increased rainfall amounts from climate change would not affect the proposed Project.

Depending on the climate change scenario, global sea level rise is projected for Prince Rupert in the range of 0.95 m to 1.16 m by the year 2100. Rising sea level can affect coastal infrastructure, such as marine facilities, and can compromise the ability of the marine terminal to operate if sea level rises above planned design specifications. The proposed Project's design would allow for normal operation under the sea-level rise extents expected to occur within the service life of the facility. Sea level rise would be mitigated by incorporating regulated best practices, latest design standards, and codes that aim to limit the effect of the environment on infrastructure.

## 11.2 Extreme Weather Events

Severe weather events include temperature, precipitation and flooding, and wind and waves. These events are normally short in duration and could occur in the proposed Project region.

The potential adverse effects from extreme weather events include:

- Limiting the function of infrastructure that compromise the normal operations of the facility onshore and offshore;
- Pose hazardous working conditions that delay or temporarily close normal Project operations;
- Damage onshore and/or offshore infrastructure and vessels;
- Cause flooding to the floodplain the proposed Project is located on;
- Extreme rainfall could have effects on the facility's drainage infrastructure;
- Wind and sea conditions could make offshore working conditions hazardous, including shipping;
- Elevated temperatures would increase energy demands for cooling, higher potential for heat-related illness for workers, and changes in vegetation in the operating environment; and
- Cold temperatures could lead to icing on ships, at the marine terminal, or the LNG processing and storage site.

The Proponent stated that based on the planned Project, and with the adoption of the mitigation actions outlined in the Application, the sensitivity of the proposed Project to extreme weather events would be negligible to low.

## 11.3 Seismic Activity

There is a moderate level of seismic risk for the northern part of the BC coast. Associated risks of seismic activity are:

- The possible generation of tsunamis, either directly from the earthquake, or indirectly triggered through submarine landslides; and
- Soil losing its integrity and liquefying due to strong earthquakes and ground shaking.

Landslide susceptibility around Kitimat Arm is ranked high with Kitimat Arm experiencing landslide generated tsunamis in the recent past. Potential effects to the proposed Project are:

- Damage to infrastructure through shaking and vibration;
- Damage to infrastructure foundation, which could lead to a LNG leak or spill; and
- Inundation of marine facilities and damage to infrastructure from tsunamis.

The Application stated that all facilities are designed in accordance with applicable standards, codes and practices for seismic hazard. The tanks and associated systems

must be designed so that they do not collapse or lose containment in an earthquake. The LNG facility itself is assumed to be safe from a tsunami because it would be located farther inland and protected by a bund that is higher than the maximum modelled tsunami crest elevation.

#### 11.4 Forest Fires

Forest fires could temporarily suspend activities during all Project phases. In the case of a large fire, infrastructure could be damaged and the ability to operate could be impaired or stopped. Forest fires occurring close to the area surrounding the LNG facility could pose a risk and potentially result in a release of LNG to the environment.

The Application stated that the LNG facility would be equipped with an extensive firefighting system. The LNG facility would be built from non-combustible materials, and there would be exclusion zones that would reduce the risk of being affected by a forest fire. A forest fire may cause activities to be suspended if the area is considered unsafe.

#### 11.5 Issues and Concerns Raised During Application Review

Gitxaala Nation raised concerns that with climate change there is the possibility of extended periods of temperatures significantly lower than average, and that this could result in freezing rain resulting in icing of LNG carriers and affecting ship stability. The Proponent stated that all LNG carriers are required to have stability information on board which is used constantly by ship's staff in making decisions to minimize risks, including the risks from ice accumulation. The master of the vessel is required to be aware of the stability of the vessel at all times and must take appropriate actions to ensure that the vessel maintains a safe level of stability at all times.

Gitxaala Nation wanted to know if the LNG facility was designed for a megathrust earthquake. The Proponent stated that the facility would be designed in accordance with applicable standards for seismic hazards of the region, and that seismic design of LNG storage tanks in Canada is governed by the CSA Z276-11.

NRCan was interested to understand what sediment types were used for the liquefaction assessment, considering that different sediments behave differently during an earthquake and the possibility of nearby fault sources contributing to seismic hazards. The Proponent stated that they had carried out an extensive soil sampling program during 2013/2014, and the liquefaction assessment was based on the results of that sampling program.

With regards to nearby fault sources, the Proponent responded that a number of major and minor bedrock faults exist within several kilometers of the LNG Canada facility at Kitimat. Based on analysis, any seismic activity from local faults would have a negligible effect on the ground response and thus liquefaction.

## 11.6 Conclusions

The Application stated that all parts of the facility would 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. The Application stated that the implementation of the strategies and mitigation measures would allow Project infrastructure to withstand potential adverse effects due to environmental conditions. The Application stated that the Project is unlikely to be severely affected by the environmental factors addressed in this section.

Based on the combination of Project design measures, implementation of the EMP and associated plans, and having regard to the conditions identified in the TOC (which would become legally binding as a condition of an EAC), EAO is satisfied that effects of the environment on the proposed Project are not significant.

## 12 Summary of Environmental Management Plans and Follow-up Programs

EMPs would be required for phases of the proposed Project to minimize adverse environmental effects throughout the proposed Project's lifespan. The plans provide a framework to communicate and implement mitigation measures and BMPs, and to support compliance with applicable legislation, terms and conditions of permits, and approvals and authorizations issued in relation to the proposed Project, including an EAC, if issued.

These plans would be an important part of the Proponent's strategy for avoiding or mitigating adverse effects from the construction, operation, decommissioning and potentially refurbishment of the proposed Project. A decommissioning environmental management program would be initiated following the end of operations, and would comply with the laws, regulations and standards in effect at that time.

Management plans will be developed in consultation with appropriate regulatory agencies, Aboriginal Groups, or key stakeholders, as required. The Application outlined the following stand-alone plans that would be developed before the start of construction works:

- *Air Quality Management Plan* – This plan identifies sources of air emissions and prescribes the implementation of mitigation measures for adverse effects to air quality.
- *Archaeological and Heritage Resources Management Plan* – This plan provides a guideline for management of archaeological and heritage resources and describes measures and BMPs to mitigate adverse effects to these resources which may be in conflict with the proposed Project. The plan includes a Chance Find Protocol for previously unidentified archaeological finds discovered during construction.
- *Emergency Response Plan* – This plan provides guidance in the event of a hazardous material spill or emergency scenario during construction and operations, including those described under Accidents and Malfunctions and those resulting from natural events such as tsunamis and seismic events.
- *Erosion and Sediment Control Plan* – This plan provides management direction during construction to avoid or reduce the potential for adverse environmental effects on water quality and aquatic habitat associated with erosion and sediment runoff from construction activities.
- *Fish Habitat Offsetting Plan* – Developed in consultation with DFO and Haisla Nation, this plan describes measures to offset serious harm to fish through creation, restoration or enhancement of fish habitat.
- *Greenhouse Gas Management Plan* – This plan outlines the mitigation measures being undertaken to reduce effects to GHGs during operations of the proposed Project.

- *Health and Safety Management Plan* – This plan provides direction for the protection of project personnel and the public during construction and operation by promoting safety awareness, and establishing safety measures to mitigate risks to health and safety.
- *Invasive Plant Management Plan* – This plan outlines the procedures to identify, prevent, control and monitor the introduction or spread of undesirable and invasive plant species in the Project footprint during construction and operations.
- *Marine Activities Plan* – This plan describes measures to mitigate potential adverse effects of Project activities on marine biota and habitats during construction of the marine terminal and during operation shipping activities.
- *Noise Management Plan* – This plan describes measures to avoid or mitigate noise from Project activities during construction and operation.
- *Social Management Plan* – This plan identifies goals and objectives to manage potential adverse social effects, including a framework for communicating engagement efforts and results with Aboriginal Groups, local communities, governments and other stakeholders.
- *Surface Water Management Plan* – This plan provides mitigation and BMP direction for protection of water quality and aquatic habitat during construction and operation.
- *Traffic Management Plan* – This plan describes mitigation and control measures to protect wildlife, personnel and the public from vehicle interactions due to increased traffic resulting from Project activities during construction and operation.
- *Waste Management Plan* – This plan describes measures to manage hazardous and non-hazardous wastes generated by Project activities during construction and operation by identifying waste streams and prescribing handling, storing, and disposal protocols.
- *Wastewater Management Plan* – This plan describes measures to mitigate potential adverse effects of Project activities associated with wastewater on water quality and aquatic habitat during construction and operation. The plan also describes how wastewater (including effluent such as cooling water) and sanitary sewage will be collected, treated, tested, and discharged as well as any monitoring requirements.
- *Wetland Compensation Plan* – This plan is developed in consultation with EC and Haisla Nation, and describes mitigation measures required to offset Project-related loss of wetland function.
- *Wildlife Management Plan* – This plan describes measures to protect wildlife (including birds, raptors and marbled murrelets) and Project personnel to manage the potential for human-wildlife conflicts during construction and operation.

## 13 CEAA 2012 Requirements

Subsection 19(1) of CEAA 2012 identifies the factors which must be taken into account in a CEAA 2012 EA. These factors have been addressed by the EAO in the appropriate sections of this report. In addition to the factors that are considered as part of the assessment of individual VCs (e.g. fish and fish habitat), the following factors are considered in separate sections of this report: alternative means of undertaking the project in section 2.2.4; the purpose of the project in section 2.3.1; accidents and malfunctions in section 10; and effects of the environment on the project in section 11.

In conducting a substituted EA, under the provisions of CEAA 2012, EAO is required to consider the environmental effects identified in subsections 5(1) and 5(2) of CEAA 2012. This section discusses the assessment for each of the subsections and references other relevant parts of this report where additional details are presented.

### 13.1 Environmental Effects Related to CEAA 2012 5(1)(a)

CEAA 2012 paragraph 5(1)(a) requires an assessment of changes the project may cause to the following federal areas of responsibility:

- (i) fish and fish habitat as defined in subsection 2(1) of the *Fisheries Act*,
- (ii) aquatic species as defined in subsection 2(1) of the *Species at Risk Act*; and
- (iii) migratory birds as defined in subsection 2(1) of the *Migratory Birds Convention Act, 1994*.

The assessments of these effects are included within the assessments of various valued components assessed earlier in this report. Table 13-1 highlights the linkages to the relevant section of this report and key mitigation measures.

**Table 13-1: Summary of Effects Related to CEAA 2012 5(1)(a)**

CEAA 2012 s.5(1)	Effects Assessment	Key Mitigation Identified by EAO	EAO's Significance Conclusion
Fish and fish habitat as defined in subsection 2(1) of the <i>Fisheries Act</i>	<p>The assessment in the Freshwater and Estuarine Fish and Fish Habitat and the Marine Resources sections of this assessment report directly assess fish and fish habitat, as defined in subsection 2(1) of the <i>Fisheries Act</i>. Refer to sections 5.4 and 5.5 for these effects assessments.</p> <p>Potential effects of the proposed Project on fish and fish habitat are:</p> <ul style="list-style-type: none"> <li>• Loss of freshwater, estuarine, and</li> </ul>	The key mitigation measures that are discussed in sections 5.4 and 5.5 of this report mitigate the effects of the proposed Project on fish and fish habitat.	<p>Context – M            Magnitude – L            Extent – Lo            Duration – ST            Reversibility – R            Frequency – S            Likelihood – H</p> <p>Significance – Not significant</p>

CEAA 2012 s.5(1)	Effects Assessment	Key Mitigation Identified by EAO	EAO's Significance Conclusion
	<p>marine fish habitat during project construction</p> <ul style="list-style-type: none"> <li>Physical injury or mortality to fish from habitat isolation, or pressure waves during construction</li> <li>Physical injury or mortality from water intake during operations.</li> <li>Change in behavior of fish or marine mammals due to underwater noise or pressure waves during construction and operations</li> <li>Change in fish health as a result of toxicity from dredging</li> </ul>		
<p>Aquatic species as defined in subsection 2(1) of the <i>Species at Risk Act</i></p>	<p>Aquatic species include fish and marine plants.</p> <p>This assessment of effects to fish is summarized in the row above.</p> <p>Marine plants are assessed in section 5.5 of this report. Marine construction would result in the alteration or destruction of intertidal and subtidal marine plants. More detail on the habitat types affected can be found in section 5.5 of this report.</p>	<p>Key mitigation measures from the Application include: development and implementation of a Fish Habitat Offsetting Plan that would include the creation of salt marsh habitat and the creation of intertidal rock reefs where algae can attach.</p> <p>If and where quay walls/slopes are required, materials would be used that promote post-construction colonization of marine algae.</p>	<p>Context – M Magnitude – L Extent – Lo Duration – ST Reversibility – R Frequency – MI Likelihood – H</p> <p>Significance – Not significant</p>
<p>Migratory Birds as defined in <i>Migratory Birds Convention Act, 1994</i></p>	<p>Migratory birds are assessed as part of the wildlife resources assessment. Refer to section 5.8 for a description of effects specifically for migratory birds.</p> <p>The potential residual effects to migratory birds are determined through the assessment of effects on wildlife key indicators. The key indicators represent habitat requirements for the 42 migratory bird families that have the potential to occur in the Project area.</p> <p>Potential effects of the proposed Project on migratory birds are a loss</p>	<p>Key mitigation measures from the Application include:</p> <ul style="list-style-type: none"> <li>Construction activities would account for applicable bird breeding periods</li> <li>Develop and implement a Wetland Compensation Plan to address loss of wetland habitat function for breeding and foraging terrestrial mammals, amphibians, and birds</li> <li>Construction activities would account for applicable breeding bird periods. Clearing activities that need to occur during bird breeding periods would incorporate measures to protect birds and their eggs as per federal and provincial regulations.</li> </ul>	<p>Context – M Magnitude M – for habitat loss L – for sensory disturbance L – for mortality risk Extent – Lo Duration P – for habitat loss LT – for sensory disturbance LT – for mortality risk Reversibility I – for habitat loss R – for sensory disturbance and mortality risk</p>



CEAA 2012 s.5(1)	Effects Assessment	Key Mitigation Identified by EAO	EAO's Significance Conclusion
	or change in suitable habitat, risk of injury or mortality, and sensory disturbance or behavioural alterations	<ul style="list-style-type: none"> <li>Measures to reduce bird strikes on vessels, including alerting supervisory staff on berthed vessels of high-risk periods for bird strikes caused by deck lighting, reporting bird collisions, and providing vessel personnel with information on how to treat and release marine birds that have been grounded on vessel decks.</li> </ul>	Frequency – S – for habitat loss MI – for sensory disturbance MR – mortality risk Likelihood – H  Significance – Not significant

**Note:** Residual Effects Ratings: Context (L – Low resilience, low capacity to recover, M – Moderate resilience, moderate capacity to recover, H – High resilience, high capacity to recover); Magnitude (N – Negligible, L – Low, M – Moderate, H – High); Geographic Extent (PF – Project footprint, Lo – Local, Re – Regional); Duration (ST – Short-term, MT – Medium-term, LT – Long-term); Frequency (S – Single event, MI – Multiple irregular event, MR – Multiple regular event, C – Continuous); Reversibility (R – Reversible, I – Irreversible); Likelihood (L – Low, low likelihood, M – Moderate likelihood, H – High likelihood)

### 13.2 Environmental Effects Related to CEAA 2012 5(1)(b)

CEAA 2012 5(1)(b) requires an assessment of a change that may be caused to the environment by the Project that may arise on:

- (i) on federal lands,
- (ii) in a province other than the one in which the act or thing is done or where the physical activity, the designated project or the project is being carried out, or
- (iii) outside Canada.

As discussed in section 5.2 of this report, EAO concludes that there would be a significant residual adverse effect of the proposed Project related to GHG emissions. The effect is considered significant because of the existing context of global greenhouse gas emissions and the magnitude of the proposed Project's emissions, which would have a notable impact on BC's emissions reduction targets. Given that the geographic extent of the proposed Project's GHG emissions would be global, EAO concludes that the proposed Project would have a significant adverse effect on GHG emissions in the context of CEAA 2012 5(1)(b).

The effects of the environment on federal lands were assessed because of the proximity of federal lands to the proposed Project, and the potential effects of the proposed Project on federal lands. The federal lands that are potentially affected are particularly the Indian Reserves in closest proximity to the project site (Kitamaat 1, Henderson's Ranch 11, Jugwees 2, Kitamaat 2, Walth 3) (Figure 13-1), and numerous Indian Reserves along the marine shipping route (Figure 13-2).



**Figure 13-1: Location of Federal Lands in Close Proximity to the Facility**





These effects are summarized in Table 13-2, including the significance conclusions related to the effects to federal lands by VC. These VCs are fully assessed in other sections of this report, and the environmental effects to federal lands are a subset of the full VC assessments. See the relevant VC sections for the underlying analysis.

**Table 13-2: Summary of Effects Related to CEAA 2012 5(1)(b)(i), Federal Lands**

Valued Component	Effects Assessment	Key Mitigation Identified by EAO	EAO's Significance Conclusion
Air Quality	<p>Change in ambient air quality in the Kitimat region from facility works and activities during construction and operations. Residual effects would cause an increase in CACs relative to baseline, as well as exceedances of the AAQOs beyond the boundaries of the proposed Project.</p> <p>Indian Reserves that are potentially affected by air quality from the facility are: Kitamaat 1, Jugwees 5, Henderson's Ranch 11, Kitamaat 2, Walth 3, Bees 6, Kitasa 7, Kuaste 8.</p> <p>An exceedance of AAQOs in Kitamaat 1 (Kitamaat Village) was identified through the assessment of the application case where the AAQO for SO<sub>2</sub> is exceeded. The residual effects are assessed as moderate since the proposed Project is not responsible, either singly or in combination with other sources, for causing these exceedances.</p> <p>Change in ambient air quality from shipping along the shipping route during construction and operations. Assessed effects would be within normal variability of baseline conditions.</p> <p>Indian Reserves that are potentially affected by air quality from shipping are: Kitamaat 2, Henderson's Ranch 11, Bees 6, Turtle Point 12, and Kunhunoan 13.</p>	<p>Key mitigation measures from the Application include:</p> <ul style="list-style-type: none"> <li>Prohibit the open burning (or incineration) of accumulated waste materials from the workforce accommodation centre.</li> <li>Construction vessels, supporting tugs, and LNG carriers and assist tugs would use low sulfur fuel in compliance with applicable marine emission standards.</li> </ul> <p>The air quality mitigation measures proposed would adequately address the potential effects that may arise on federal lands; no other federal land-specific mitigation is required.</p>	<p>Context            Facility – MR            Shipping – HR            Magnitude – L            Extent – Lo            Duration – LT            Reversibility – R            Frequency – MR            Likelihood – H</p> <p>Significance – Not significant</p> <p>The mitigation measures proposed to address the potential effects that may arise on federal lands are sufficient to avoid significant effects on federal lands and, therefore, no other mitigation required</p>
Acoustic Environment	<p>Increase in overall noise levels and increase in low-frequency noise from facility works and activities during construction and operation.</p> <p>Indian Reserves that are potentially affected by noise from the facility are: Kitamaat 1, Henderson's Ranch 11, Kitamaat 2, Jugwees 5</p> <p>Noise during construction and operations is predicted to be within Health Canada's MNL guideline and the <i>OGC Noise Control Best</i></p>	<p>Key mitigation measures from the Application include:</p> <ul style="list-style-type: none"> <li>Develop a notification protocol with input from the local community and other stakeholders for advance notification of planned substantial noise-causing activities at the LNG facility.</li> <li>Ensure that project related noise generated during operation</li> </ul>	<p>Context – MR            Magnitude – L            Extent – Lo            Duration – LT            Reversibility – R            Frequency            Construction – MI            Operations – C            Shipping – MR            Likelihood – H</p>

Valued Component	Effects Assessment	Key Mitigation Identified by EAO	EAO's Significance Conclusion
	<p><i>Practices Guideline.</i> Kitamaat 2 (Kitamaat Village) is the only sensitive receptor.</p> <p>There is potential for an increase in overall noise levels and increase in low-frequency noise from shipping activities during operation. The modelled acoustic results for shipping activities indicated that the combined sound levels (daytime and nighttime) at all residential receptors in the shipping RSA were within the OGC guideline.</p> <p>Indian Reserves that are potentially affected by noise from shipping are: Kitamaat 2, Henderson's Ranch 11, Bees 6, Turtle Point 12, Kunhunoan 13. There is a sensitive receptor on Gil Island (Turtle Point 12 and Kunhunoan 13), but there was no measurable change perceptible.</p>	<p>complies with the OGC Noise Control Best Practices Guidelines at sensitive receptor locations.</p> <p>The acoustic environment mitigation measures would adequately address the potential effects that may arise on federal lands and no other federal land-specific mitigation is required.</p>	<p>Significance – Not significant</p>
Vegetation Resources	<p>Change in native vegetation health and diversity due to emissions from the facility. None of the potential air emissions effects on vegetation resources extend onto federal lands.</p>	<p>The vegetation resources mitigation measures would adequately address the potential effects that may arise on federal lands are sufficient, and no other federal land-specific mitigation is required.</p>	<p>No residual effect to vegetation on federal lands.</p>
Wildlife Resources	<p>The only potential effect on wildlife habitat that might extend onto federal lands is indirect and limited to a small section on the western side of the Kitamaat 1 IR. Specifically, effective grizzly bear spring and summer foraging habitat and Pacific marten and western screech-owl breeding habitat on federal lands may be indirectly affected by potential noise and activity, based on a zone of influence from Project operations.</p>	<p>Key mitigation measures from the Application include:</p> <ul style="list-style-type: none"> <li>• Construction activities will account for applicable bird breeding periods.</li> <li>• Wildlife movement through the estuary would be maintained during construction and operation of the LNG loading line, where practicable.</li> </ul> <p>The wildlife resources mitigation measures would adequately address the potential effects that may arise on federal lands are sufficient, and no other federal land-specific mitigation is required.</p>	<p>Context – MR Magnitude – L Extent – Lo Duration – LT Reversibility – R Frequency – MI Likelihood – H</p> <p>Significance – Not significant</p>
Surface Water Quality	<p>A measurable effect on lakes and streams is expected to occur over the operations of the proposed Project due to the deposition of</p>	<p>The surface water quality mitigation measures would adequately address the potential effects that may arise</p>	<p>No residual effect to surface water quality on federal</p>

Valued Component	Effects Assessment	Key Mitigation Identified by EAO	EAO's Significance Conclusion
	materials from air emissions resulting in potential acidification. No acidification of surface water is predicted on federal lands.	on federal lands are sufficient, and no other federal land-specific mitigation is required.	lands.

### 13.3 Effects of Change to Environment on Aboriginal Peoples Related to CEAA 2012 5(1)(c)

CEAA 2012 5(1)(c) requires the assessment of any change to the environment caused by the Project on Aboriginal peoples:

- (i) health and socio-economic conditions;
- (ii) physical and cultural heritage;
- (iii) the current use of lands and resources for traditional purposes; or
- (iv) any structure, site or thing that is of historical, archaeological, paleontological or architectural significance.

Aboriginal people live and use the area impacted by the proposed Project. The effects on Aboriginal peoples have been considered and assessed in other sections of this report, including the assessments of social, economic, heritage and health VCs in Part B, as well as the assessment of impacts of Aboriginal Interests in Part C.

Direct facility footprint-related effects occur within an area used primarily by Haisla Nation. Air quality-related facility effects are primarily within the area used by Haisla Nation, but also include the areas used by Kitselas First Nation, Kitsumkalum First Nation, Metlakatla First Nation, and Lax Kw'alaams Band. Shipping-related effects cover a broader area which is also used by Gitxaala Nation, Gitga'at First Nation, Metlakatla First Nation, Lax Kw'alaams Band, Kitselas First Nation, and Kitsumkalum First Nation. There are Métis peoples who also reside in the area and use land and resources.

#### 13.3.1 Effects on the Health and Socio-Economic Conditions of Aboriginal Peoples Related to CEAA 2012 5(1)(c)(i)

In relation to CEAA 2012 5(1)(c)(i), the effects of the proposed Project on the health and socio-economic conditions of Aboriginal peoples, along with an overall conclusion, are summarized in Table 13-3.

**Table 13-3: Summary of Effects Related to CEEA 2012 5(1)(c)(i), the Health and Socio-Economic Conditions of Aboriginal Peoples**

VC/Topic	Effects Assessment	Potentially Impacted Aboriginal Peoples	Key Mitigation Identified by EAO	EAO's Significance Conclusion
Human Health (due to air quality)	<p>The proposed Project has the potential to impact human health impacts to air quality. A summary is provided below, and more detail can be found in section 9.1 of this report.</p> <p>There would be a slight increase in exposure to CACs from existing baseline conditions. The predicted maximum concentrations of NO<sub>2</sub>, SO<sub>2</sub> and PM<sub>2.5</sub> from dispersion modelling were below the applicable human health-based air quality criteria.</p>	<p>Potential effects would largely be in Haisla Nation asserted traditional territory. Minor effects would occur in the asserted traditional territories of Kitsumkalum First Nation, Kitselas First Nation, Metlakatla First Nation, and Lax Kw'alaams Band. Métis peoples reside in the area.</p>	<p>Key mitigation measures from the Application regarding human health due to air quality are:</p> <ul style="list-style-type: none"> <li>• Measures to manage facility emissions in a manner that meets air quality objectives and regulatory requirements ;</li> <li>• Construction vessels, supporting tugs, and LNG carriers and assist tugs would use low sulfur fuel in compliance with applicable marine emission standards</li> </ul>	<p>The residual effects to the health of Aboriginal peoples do not vary from the residual effects identified in section 9.1 of this report.</p>
Human Health (due to marine contaminants)	<p>The proposed Project has the potential to impact human health impacts to contaminant levels in country foods. A summary is provided below, and more detail can be found in section 9.1 of this report.</p> <p>There is the potential for historical contaminants to become bioavailable during dredging activities in the marine terminal area. All contaminated sediment would be disposed upland at appropriate facilities. There is very little marine harvesting activity in the potentially impacted area.</p>	<p>Potential effects would solely be in Haisla asserted traditional territory. Métis peoples reside in the area.</p>	<p>Key mitigation measures from the Application regarding human health due to marine contaminants are:</p> <ul style="list-style-type: none"> <li>• Optimization of sediment containment would be considered when selecting dredging and sediment disposal methods/equipment;</li> <li>• Complete a pre- and post-construction human health risk assessment on the consumption of marine foods, and monitor and exceedances of water quality guidelines during construction activity.</li> </ul>	<p>The residual effects to the health of Aboriginal peoples do not vary from the residual effects identified in section 9.1 of this report.</p>
Acoustics (Facility)	<p>The assessment of effects of noise is presented in Section 5.2 of this report. The Application found that sound levels are expected to increase, although the magnitude of those changes would be lower or equal to Health Canada criteria during construction, and during operations sound levels from the</p>	<p>Potential effects would solely be in Haisla Nation asserted traditional territory. Métis peoples reside in the area.</p>	<p>Key mitigation measures from the Application regarding acoustics are:</p> <ul style="list-style-type: none"> <li>• Develop a notification protocol with input from the local community and other stakeholders for advance notification of planned substantial noise-causing activities at the</li> </ul>	<p>The residual effects from changes in noise effects do not vary from the assessment of effects identified in section 5.2 of this report.</p> <p>The magnitude of</p>

VC/Topic	Effects Assessment	Potentially Impacted Aboriginal Peoples	Key Mitigation Identified by EAO	EAO's Significance Conclusion
	project would be below levels in OGC's <i>Noise Control Best Practices Guideline</i> and barely perceptible at all receptors.		LNG facility. <ul style="list-style-type: none"> <li>Ensure that project related noise generated during operation complies with the OGC Noise Control Best Practices Guidelines at sensitive receptor locations.</li> </ul>	changes related to noise affects for all receptors, including Aboriginal people, would be low and highly localized.
Acoustics (Shipping)	The Application found that noise effects from marine shipping activities would comply with federal and provincial noise guidelines	Potential effects would occur in the asserted traditional territories of Haisla Nation, Gitga'at First Nation, Gitxaala Nation, Metlakatla First Nation, Lax Kw'alaams Band, Kitsumkalum First Nation, and Kitselas First Nation. Métis peoples reside in the area.	No mitigation required.	The residual effects from changes in noise effects do not vary from the assessment of effects identified in section 5.2 of this report.  The magnitude of changes related to noise affects for all receptors, including Aboriginal people, would be low and highly localized.
Visual Quality	The Project may alter visual quality from terrestrial and marine viewpoints with views of the LNG facility and LNG carriers travelling along the marine access route.  The LNG facility would remove forest cover, but is within an industrialized area.  During operation, there would be a high probability of viewing an LNG carrier, on any given day, at a low to moderate visual prominence. The average increase in visual duration is 1.4 hours per day.	Potential effects would be in Haisla Nation asserted traditional territory for visual quality effects from the facility. Métis peoples reside in the area.  Shipping related effects would occur in the asserted traditional territories of Haisla Nation, Gitga'at First Nation, Gitxaala Nation, Metlakatla First Nation, Lax Kw'alaams Band, Kitsumkalum First Nation, and Kitselas First Nation. Métis peoples reside in the	Key mitigation measures from the Proponent regarding visual quality are: <ul style="list-style-type: none"> <li>Project-related marine traffic including LNG carriers would use the Coast Guard MCTS to provide notice of planned arrival time at Triple Island, and encourage Aboriginal Groups and stakeholders to use the system to plan their routing and scheduling.</li> <li>No planned anchoring for the LNG carriers along the marine access route (unless directed to do so by BC Coast Pilots due to weather or other unplanned conditions); LNG carriers would only</li> </ul>	The residual effects from changes in visual quality to the socio-economic conditions of Aboriginal peoples do not vary from the assessment of effects identified in section 7.4 of this report.



VC/Topic	Effects Assessment	Potentially Impacted Aboriginal Peoples	Key Mitigation Identified by EAO	EAO's Significance Conclusion
		area.	be permitted to enter the marine access route if a berth at the terminal would be available.	
Marine Transportation and Use	<p>Marine transportation has the potential to interfere with marine fisheries and shoreline harvesting conducted by Aboriginal people, which could adversely affect the Aboriginal social and economic systems that rely on harvesting activity or Aboriginal businesses involved in those activities, leading to adverse economic effects in Aboriginal communities.</p> <p>While Project shipping activities are predicted to increase traffic by two transits per day, the majority of fishing grounds do not overlap with the marine access route and fishers use gear that precludes interference. Effects would occur on set schedules up to twice per day during the operation phase along a corridor used for shipping since the 1950s. The Project would not cause persistent interference to marine navigation.</p>	Shipping related effects would occur in the asserted traditional territories of Haisla Nation, Gitga'at First Nation, Gitxaala Nation, Metlakatla First Nation, Lax Kw'alaams Band, Kitsumkalum First Nation, and Kitselas First Nation. Métis peoples reside in the area.	<p>Key mitigation measures from the Application regarding marine transportation and use are:</p> <ul style="list-style-type: none"> <li>• Project-related marine traffic including LNG carriers would use the Coast Guard MCTS to provide notice of planned arrival time at Triple Island, and encourage Aboriginal Groups and stakeholders to use the system to plan their routing and scheduling;</li> <li>• Monitor the wake at key locations and during key periods, and adaptively management effects on marine and shoreline users, as required.</li> </ul>	The residual effects from changes in marine transportation and use to the socio-economic conditions of Aboriginal peoples do not vary from the assessment of effects identified in section 7.1 of this report.
Non-Marine Harvesting	Effects on vegetation and wildlife resources could potentially affect traditional harvesting of country foods and Aboriginal Groups' socio-economic conditions by: 1) adversely affecting traditional harvesting activities that depend on those species and the Aboriginal social and economic systems that are based on that traditional harvesting activity, and 2) reducing consumption of country foods among Aboriginal people, resulting in increased consumption of less nutritious market food alternatives and changes in diet and nutrition within Aboriginal communities.	Effects in the vicinity of the facility would solely be in Haisla Nation asserted traditional territory. Métis peoples reside in the area.	<p>Key mitigation regarding particular species are in the relevant sections of this report, while key mitigation regarding Aboriginal Groups use of traditional harvesting areas are discussed in Part C of this report.</p> <p>The Proponent's Application includes additional mitigation measures.</p>	<p>Context – MR  Magnitude – L  Extent – Lo  Duration – ST-LT  Reversibility – R  Frequency – MR  Likelihood – H</p> <p>Significance – Not significant</p>

VC/Topic	Effects Assessment	Potentially Impacted Aboriginal Peoples	Key Mitigation Identified by EAO	EAO's Significance Conclusion
	The majority of effects would take place within the vicinity of the facility, and primarily on the traditional use plants and plant harvesting locations within the Project footprint. Certain effects on marine species may extend the length of the shipping route. Effects to species are discussed in more detail in the relevant sections of this report. Assessment of Aboriginal Group's harvesting activities is in Part C of this report.			

**Overall Conclusion**

Based on the analysis conducted by the EAO, the combined effects of the above VCs from the proposed Project on Aboriginal, including Métis, peoples' health and socio-economic conditions are expected to be of low magnitude. Facility-related effects, which occur within an area used primarily by the Haisla Nation, would be long term and quite localized. Shipping-related effects would cover a broader area which is also used by the Gitxaala Nation, Gitga'at First Nation, Metlakatla First Nation, Lax Kw'alaams Band, Kitselas First Nation, and Kitsumkalum First Nation; the effects at any one time will be localized and while the frequency of effects will be regular (i.e. daily), they will be relatively short-term. Métis peoples also reside in the area and use land and resources and the effects would be negligible.

Considering the above analysis and with the implementation of key mitigation measures identified by EAO, EAO is satisfied that the proposed Project would not likely have significant adverse environmental effects on the health and socio-economic conditions of Aboriginal peoples.

**13.3.2 Effects on Aboriginal Peoples' Physical and Cultural Heritage Related to CEAA 2012 5(1)(c)(ii)**

In relation to CEAA 2012 5(1)(c)(ii), the effects of the proposed Project on Aboriginal peoples' physical and cultural heritage, along with an overall conclusion, are summarized in Table 13-4.

**Table 13-4: Summary of Effects Related to CEAA 2012 5(1)(c)(ii), Aboriginal Physical and Cultural Heritage**

VC/Topic	Effects Assessment	Potentially Impacted Aboriginal Peoples	Key Mitigation Identified by EAO	EAO's Significance Conclusion
Visual Quality	The Project may alter visual quality from terrestrial and marine viewpoints with views of the LNG facility and LNG	Potential effects would be in Haisla Nation asserted traditional territory for visual quality effects from the	Key mitigation measures from the Proponent regarding visual quality are: <ul style="list-style-type: none"> <li>• Project-related marine traffic</li> </ul>	The residual effects from changes in visual quality to the socio-economic conditions of

	<p>carriers travelling along the marine access route.</p> <p>The LNG facility would remove forest cover, but is within an industrialized area.</p> <p>During operation, there would be a high probability of viewing an LNG carrier, on any given day, at a low to moderate visual prominence. The average increase in visual duration is 1.4 hours per day.</p>	<p>facility. Métis peoples reside in the area.</p> <p>Shipping related effects would occur in the asserted traditional territories of Haisla Nation, Gitga'at First Nation, Gitxaala Nation, Metlakatla First Nation, Lax Kw'alaams Band, Kitsumkalum First Nation, and Kitselas First Nation. Métis peoples reside in the area.</p>	<p>including LNG carriers would use the Coast Guard MCTS to provide notice of planned arrival time at Triple Island, and encourage Aboriginal Groups and stakeholders to use the system to plan their routing and scheduling.</p> <ul style="list-style-type: none"> <li>• No planned anchoring for the LNG carriers along the marine access route (unless directed to do so by BC Coast Pilots due to weather or other unplanned conditions); LNG carriers would only be permitted to enter the marine access route if a berth at the terminal would be available.</li> </ul>	<p>Aboriginal peoples do not vary from the assessment of effects identified in section 7.4 of this report.</p>
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**Overall Conclusions**

Based on the analysis conducted by the EAO, the effects of the proposed Project on Aboriginal, including Métis, peoples' physical and cultural heritage significance are expected to be of negligible magnitude.

Considering the above analysis and with the implementation of key mitigation measures identified by EAO, EAO is satisfied that the proposed Project would not likely have significant adverse environmental effects on aboriginal physical and cultural heritage of Aboriginal people.

**13.3.3 Effects on Aboriginal Peoples' Current Use of Lands and Resources for Traditional Purposes Related to CEAA 2012 5(1)(c)(iii)**

In relation to CEAA 2012 5(1)(c)(iii) the effects of the proposed Project on the Aboriginal peoples' current use of land and resources for traditional purposes, along with an overall conclusion, are summarized in Table 13-5.

Current uses of lands and resources by Aboriginal peoples for traditional purposes were identified based on information from Aboriginal Groups through effects harvesting, effects on the aesthetic experience of land and marine use, and effects on sites, landforms and natural features associated with ritual or spiritual use. Part C includes more in-depth discussion of current land and resource use for each Aboriginal Group.

**Table 13-5: Summary of Effects Related to CEAA 2012 5(1)(c)(iii), Aboriginal Peoples' Current Use of Lands and Resources for Traditional Purposes**

VC/Topic	Effects Assessment	Potentially Impacted Aboriginal Peoples	Key Mitigation Identified by EAO	EAO's Significance Conclusion
<p>Traditional Harvesting (including fishing)</p>	<p>The total project footprint area of 430 ha would no longer be available for traditional harvesting. Other potential harvesting areas that are immediately surrounding the Project footprint are largely unaffected.</p> <p>Vessel wake from LNG vessels along the shipping route could potentially have effects on water safety, shoreline safety, and could potentially cause erosion of shoreline habitats.</p> <p>Effects to species are discussed in more detail in the relevant sections of this report. Assessment of impacts to each Aboriginal Group's harvesting activities is in Part C of this report.</p>	<p>Potential effects would be in Haisla Nation asserted traditional territory for traditional harvesting effects from the facility.</p> <p>Shipping related effects would occur in the asserted traditional territories of Haisla Nation, Gitga'at First Nation, Gitxaala Nation, Metlakatla First Nation, Lax Kw'alaams Band, Kitsumkalum First Nation, and Kitselas First Nation. Métis peoples reside in the area.</p>	<p>Key mitigation regarding particular species are in the relevant sections of this report, while key mitigation regarding Aboriginal Group's use of traditional harvesting areas are discussed in Part C of this report.</p>	<p>Context – MR Magnitude – L Extent – Lo Duration – ST-LT Reversibility – R Frequency – MR Likelihood – H</p> <p>Significance – Not significant</p>
<p>Sacred and culturally important sites</p>	<p>The proposed Project is unlikely to limit the use of sacred and culturally important sites and landscape features, or impose "undue" hardship, or deny Aboriginal people their preferred means of using these areas.</p> <p>Vessel wake from LNG vessels along the shipping route could potentially cause erosion of shoreline habitats, and potentially any sites in the foreshore or nearshore area. No specific sites were identified in the</p>	<p>Potential effects would be in Haisla Nation asserted traditional territory for effects to sacred and culturally important sites. Métis peoples reside in the area, but no sacred or culturally important sites were identified.</p> <p>Shipping related effects would occur in the asserted traditional territories of Haisla Nation, Gitga'at First Nation, Gitxaala Nation, Metlakatla First Nation,</p>	<p>Key mitigation regarding Aboriginal Group's sacred and culturally important sites are discussed in Part C of this report, as well as in section 8 (Heritage) of this report.</p>	<p>No residual effects were identified that would deny Aboriginal people access to, or use of, sacred and culturally important sites.</p>

VC/Topic	Effects Assessment	Potentially Impacted Aboriginal Peoples	Key Mitigation Identified by EAO	EAO's Significance Conclusion
	assessment.	Lax Kw'alaams Band, Kitsumkalum First Nation, and Kitselas First Nation. Métis peoples reside in the area.		
<b>Overall Conclusions</b>				
<p>Based on the analysis conducted by the EAO, the combined effects of the above VCs from the proposed Project on Aboriginal, including Métis, peoples' current use of lands and resources for traditional purposes are expected to be of low magnitude. Facility-related effects will be long term and quite localized. Shipping-related effects will cover a broader area, but the effects at any one time will be localized and while the frequency of effects will be regular (i.e. daily), they will be relatively short-term.</p> <p>Considering the above analysis and with the implementation of key mitigation measures identified by EAO, EAO is satisfied that the proposed Project would not likely have significant adverse environmental effects on current use of lands and resources for traditional purposes of Aboriginal people.</p>				

### 13.3.4 Effects on Structures, Sites, or Things that are of Historical, Archaeological, Paleontological, or Architectural Significance to Aboriginal Peoples Related to CEAA 2012 5(1)(c)(iv)

In relation to CEAA 2012 5(1)(c)(iv) the effects of the proposed Project on Aboriginal peoples' any structure, site or thing that is of historical, archaeological, paleontological or architectural significance, along with an overall conclusion, are summarized in Table 13-6.

**Table 13-6: Summary of Effects Related to CEAA 2012 5(1)(c)(iv), Structures, Sites or Things that are of Historical, Archaeological, Paleontological or Architectural Significance to Aboriginal Peoples**

VC/Topic	Effects Assessment	Potentially Impacted Aboriginal Peoples	Key Mitigation Identified by EAO	EAO's Significance Conclusion
Archaeological and heritage resources	<p>Culturally modified trees: No CMTs were identified in the study area.</p> <p>Archaeological Sites: One terrestrial archaeological site that cannot be avoided and would be affected during LNG facility construction. Some Aboriginal groups expressed concern about how ship wake may impact (unidentified) intertidal sites.</p>	Potential effects would be in Haisla Nation asserted traditional territory. Métis peoples reside in the area, but no archaeological or heritage resources were identified.	Key mitigation measures regarding heritage and archaeological resources are discussed in section 8.1 of this report.	The residual effects to the heritage and archaeological resources of Aboriginal peoples do not vary from the assessment of effects identified in section 8.1 of this report.
<b>Overall Conclusions</b>				

VC/Topic	Effects Assessment	Potentially Impacted Aboriginal Peoples	Key Mitigation Identified by EAO	EAO's Significance Conclusion
Based on the analysis conducted by the EAO, the effects of the proposed Project on any structure, site or thing that is of historical, archaeological, paleontological or architectural significance to Aboriginal, including Métis, peoples is expected to be negligible.				
Considering the above analysis and with the implementation of key mitigation measures identified by EAO, EAO is satisfied that the proposed Project would not likely have significant adverse environmental effects on historical, archaeological, paleontological or architectural to Aboriginal people.				

### 13.4 CEAA 2012 5(2) Requirements

CEAA 2012 5(2)(a) requires an assessment of changes to the environment that are directly linked or necessarily incidental to the exercise of a power or performance of duty or function by a federal authority. Paragraph 5(2)(b) requires an assessment of changes to any associated effects on health, socio-economic conditions, matters of historical, archaeological, paleontological or architectural interest, or other matters of physical or cultural heritage not already considered in under paragraph 5(1)(c).

The following federal authorizations are anticipated to be required by this proposed Project:

1. Permit for disposal at sea under subsection 127(1) of the *Canadian Environmental Protection Act, 1999*;
2. Authorization to carry on a proposed work, undertaking or activity causing serious harm to fish under paragraph 35(2)(b) of the *Fisheries Act*;
3. Approval under subsections 6(1) and 9(1) of the *Navigation Protection Act* for works in and about navigable water;

The assessments required for CEAA 2012 5(2)(a) are summarized in Table 13-7, and the assessments required for CEAA 2012 5(2)(b) are summarized in Table 13-8. The table only includes effects to VCs that were not previously assessed in the CEAA 2012 5(1) sections above.

**Table 13-7: Summary of Effects Related to CEAA 2012 5(2)(a)**

Valued Component	Effects Assessment	Key Mitigation Identified by EAO	EAO's Significance Conclusion
<b>Disposal at sea – <i>Canadian Environmental Protection Act, 1999</i> ss. 127(1)</b>			
<b>Air Quality</b>	Assessment of construction vessel and equipment emissions is included in air quality assessment.  In the Kitimat airshed, the atmospheric effects from activities would be managed to acceptable levels through the application of mitigation and best management practices.	No additional key mitigation measures are identified beyond those identified for the purposes of CEAA 2012 ss. 5(1).	No residual effect.

<b>Acoustic Environment</b>	Construction vessel and equipment acoustic effects are included in the acoustic section of this report.  Disposal at sea would result in a relatively minor change in overall noise levels.	No additional key mitigation measures are identified beyond those identified for the purposes of CEAA 2012 ss. 5(1).	Context – M Magnitude – N-L Extent – Lo Duration – MT Reversibility – R Frequency – MI Likelihood – M  Significance – Not significant
<b>Serious harm to fish – Fisheries Act para. 35(2)(b)</b>			
<b>Air Quality</b>	Air emissions from construction activities would be negligible.	No additional key mitigation measures are identified beyond those identified for the purposes of CEAA 2012 ss. 5(1).	No residual effect
<b>Vegetation</b>	The creation of habitat offsets may require some minor vegetation clearing.	No additional key mitigation measures are identified beyond those identified for the purposes of CEAA 2012 ss. 5(1).	Context – M Magnitude – N Extent – Lo Duration – ST Reversibility – R Frequency – S Likelihood – M  Significance – Not significant
<b>Wildlife</b>	The creation of habitat offsets may create some minor loss or change in habitat or sensory disturbance to wildlife resources.	No additional key mitigation measures are identified beyond those identified for the purposes of CEAA 2012 ss. 5(1).	Context – M Magnitude – N Extent – Lo Duration – ST Reversibility – R Frequency – S Likelihood – L-M  Significance – Not significant
<b>Works in and about navigable water – Navigation Protection Act, ss. 6(1) and 9(1)</b>			
<b>Air Quality</b>	Construction of the marine terminal, by modifying the existing RTA wharf “B” to accommodate two LNG carriers and a MOF, have the potential to affect air quality. This effect is included in the air quality section of this report.	No additional key mitigation measures are identified beyond those identified for the purposes of CEAA 2012 ss. 5(1).	Context – M Magnitude – N Extent – Lo Duration – MT Reversibility – R Frequency – C Likelihood – M  Significance – Not significant
<b>Acoustic Environment</b>	Construction of the marine terminal, by modifying the existing RTA wharf “B” to	No additional key mitigation measures are identified	Context – M Magnitude – L

	accommodate two LNG carriers and a materials offloading facility (MOF), have the potential to affect the acoustic environment. This effect is included in the acoustic section of this report.	beyond those identified for the purposes of CEAA 2012 ss. 5(1).	Extent – Lo Duration – MT Reversibility – R Frequency – MI Likelihood – H  Significance – Not significant
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**Table 13-8: Summary of Effects Related to CEAA 2012 5(2)(b)**

<b>Valued Component</b>	<b>Effects Assessment</b>	<b>Key Mitigation Identified by EAO</b>	<b>EAO's Significance Conclusion</b>
<b>Disposal at sea – Canadian Environmental Protection Act, 1999 ss. 127(1)</b>			
<b>Visual Quality</b>	Effects of disposal at sea on visual quality are assessed in the visual quality section of this report.	None	Context – HR Magnitude – N-L Extent – Lo Duration – MT Reversibility – R Frequency – C Likelihood – H  Significance – Not significant
<b>Marine Transportation and Use</b>	Disposal at sea has the potential to interfere with recreational boating, commercial and recreational fishing, and marine navigation. These effects are assessed in the marine transportation and use section of this report.	No additional key mitigation measures are identified beyond those identified for the purposes of CEAA 2012 ss. 5(1).	Context – MR Magnitude – L Extent – Lo Duration – MT Reversibility – R Frequency – C Likelihood – M  Significance – Not significant
<b>Serious harm to fish – Fisheries Act s. 35(2)(b)</b>			
<b>Heritage</b>	The creation of habitat offsets has the potential to result in effects to heritage and archaeological resources.	No additional key mitigation measures are identified beyond those identified for the purposes of CEAA 2012 ss. 5(1).	Context – H Magnitude – N Extent – Lo Duration – LT Reversibility – I Frequency – S Likelihood – L  Significance – Not significant
<b>Works in and about navigable water – Navigation Protection Act, s. 6(1) and 9(1)</b>			
<b>Visual Quality</b>	Construction of the marine terminal, by modifying the existing RTA wharf "B" to	None	Context – H Magnitude – N-L



	accommodate two LNG carriers and a materials offloading facility (MOF), have the potential to affect the visual environment. This effect is included in the visual quality section of this report.		Extent – Lo Duration – MT Reversibility – R Frequency – C Likelihood – H  Significance – Not significant
<b>Marine Transportation and Use</b>	Assessment of interference with recreational boating and commercial and recreational fishing and marine navigation from construction activities assessed in marine transportation and use section of this report.	No additional key mitigation measures are identified beyond those identified for the purposes of CEAA 2012 ss. 5(1).	Context – M Magnitude – L-M Extent – Lo Duration – MT Reversibility – R Frequency – C Likelihood – M  Significance – Not significant

### 13.5 Species At Risk Act 79(2) Requirements

SARA 79(2) requires the identification of adverse effects of the proposed Project on the SARA listed wildlife species and its critical habitat and, if the project is carried out, must ensure that measures are taken to avoid or lessen those effects and to monitor them.

The assessments required for SARA 79(2) are summarized in Table 13-9.

**Table 13-9: Summary of Effects Related to SARA 79(2)**

SARA Species	Effects Assessment	Key Mitigation Identified by EAO	EAO's Significance Conclusion
<b>Marine Resources VC</b>			
Blunt nose sixgill shark (special concern)	Potential effects of the proposed Project are:  Change in behavior due to underwater noise or pressure waves during construction and from shipping during operations	Key mitigation measures from the Application include:  <ul style="list-style-type: none"> <li>A Fish Habitat Offsetting Plan would be developed and implemented to offset unavoidable permanent alteration or destruction of fish habitat from Project activities and works; and</li> </ul>	Context – M - H Magnitude – L Extent – Lo Duration – ST - LT Reversibility – R Frequency – MI - MR Likelihood – H  Significance – Not significant
Green sturgeon (special concern)	Potential effects of the proposed Project are:  Change in marine habitat  Change in behavior due to underwater noise or pressure waves during construction and	<ul style="list-style-type: none"> <li>Measures to address potential effects from dredge activities and pile installation, including a marine mammal exclusion zone, soft start procedures and consideration of sound dampening technologies;</li> </ul>	Context – M - H Magnitude – L Extent – Lo Duration – ST - LT Reversibility – R Frequency – MI - MR Likelihood – H

SARA Species	Effects Assessment	Key Mitigation Identified by EAO	EAO's Significance Conclusion
Yelloweye rockfish (special concern)	<p>from shipping during operations</p> <p>Potential effects of the proposed Project are:</p> <p>Change in marine habitat</p> <p>Harm during construction</p> <p>Change in behavior due to underwater noise or pressure waves during construction and from shipping during operations</p>	<ul style="list-style-type: none"> <li>Use of timing windows and mitigations developed in consultation with DFO at the permitting stage, and would consider the location and timing of sensitive life stages specific to CRA fishery species. In-water marine construction, dredging, and sediment disposal activities would be conducted throughout the year; for the periods outside the timing windows of least risk, additional mitigation measures would be implemented to protect sensitive species and life stages as appropriate;</li> <li>Manage pile installation with noise measurement and active monitoring of marine mammal exclusion zones. Additional sound dampening methods and/or alternative pile installation methods would be investigated and applied if necessary, to prevent the exposure of marine mammals to underwater noise exceeding defined thresholds; and</li> <li>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 would travel at speeds of 8 to 10 knots from July through October (the predicted periods of high use by marine mammals).</li> </ul>	<p>Significance – Not significant</p> <p>Context – M - H Magnitude – L Extent – Lo Duration – ST - LT Reversibility – R Frequency – MI - MR Likelihood – H</p> <p>Significance – Not significant</p>
Longspine thornyhead (special concern)	<p>Potential effects of the proposed Project are:</p> <p>Change in behavior due to underwater noise or pressure waves from shipping during operations</p>	<p>Key mitigation measures from the Application include:</p> <ul style="list-style-type: none"> <li>Subject to navigational safety needs, in areas of high whale density between the northern</li> </ul>	<p>Context – M - H Magnitude – L Extent – Lo Duration – LT Reversibility – R Frequency – MR Likelihood – H</p>

SARA Species	Effects Assessment	Key Mitigation Identified by EAO	EAO's Significance Conclusion
		end of Campania Island and the southern end of Hawkesbury Island, LNG carriers would travel at speeds of 8 to 10 knots from July through October (the predicted periods of high use by marine mammals).	Significance – Not significant
Rougheye rockfish (special concern)	Potential effects of the proposed Project are:  Change in behavior due to underwater noise or pressure waves from shipping during operations		Context – M - H Magnitude – L Extent – Lo Duration – LT Reversibility – R Frequency – MR Likelihood – H  Significance – Not significant
Tope (special concern)	Potential effects of the proposed Project are:  Change in behavior due to underwater noise or pressure waves from shipping during operations		Context – M - H Magnitude – L Extent – Lo Duration – LT Reversibility – R Frequency – MR Likelihood – H  Significance – Not significant
Northern abalone (endangered)	No effects		
Olympia oyster (special concern)	No effects		
Humpback whale (threatened)	Potential effects of the proposed Project are:  Harm during construction  Change in behavior due to underwater noise or pressure waves during construction and operations	Key mitigation measures from the Application include:  <ul style="list-style-type: none"> <li>Measures to address potential effects from dredge activities and pile installation, including a marine mammal exclusion zone, soft start procedures and consideration of sound dampening technologies;</li> <li>Manage pile installation with noise measurement and active monitoring of marine mammal exclusion zones. Additional sound dampening methods and/or alternative pile installation methods would be investigated and applied if necessary, to prevent the exposure of marine mammals</li> </ul>	Context – M Magnitude – M Extent – Lo to R Duration – ST - LT Reversibility – R Frequency – MI - MR Likelihood – H  Significance – Not significant
Fin whale (threatened)	Potential effects of the proposed Project are:  Change in behavior due to underwater noise or pressure waves during construction and from shipping during operations		Context – M Magnitude – M Extent – Lo to R Duration – ST - LT Reversibility – R Frequency – MI - MR Likelihood – H  Significance – Not significant
Grey whale	Potential effects of the		Context – M

SARA Species	Effects Assessment	Key Mitigation Identified by EAO	EAO's Significance Conclusion
(special concern)	<p>proposed Project are:</p> <p>Change in behavior due to underwater noise or pressure waves from shipping during operations</p>	<p>to underwater noise exceeding defined thresholds; and</p> <ul style="list-style-type: none"> <li>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 would travel at speeds of 8 to 10 knots from July through October (the predicted periods of high use by marine mammals).</li> </ul>	<p>Magnitude – M Extent – Lo to R Duration –LT Reversibility – R Frequency – MR Likelihood – H</p> <p>Significance – Not significant</p>
<p>Northern resident killer whale (threatened)</p>	<p>Potential effects of the proposed Project are:</p> <p>Harm during construction</p> <p>Change in behavior due to underwater noise or pressure waves during construction and from shipping during operations</p>		<p>Context – M Magnitude – M Extent – Lo to R Duration – ST - LT Reversibility – R Frequency – MI - MR Likelihood – H</p> <p>Significance – Not significant</p>
<p>Bigg's killer whale (threatened)</p>	<p>Potential effects of the proposed Project are:</p> <p>Harm during construction</p> <p>Change in behavior due to underwater noise or pressure waves during construction and operations</p>		<p>Context – M Magnitude – M Extent – Lo to R Duration – ST - LT Reversibility – R Frequency – MI - MR Likelihood – H</p> <p>Significance – Not significant</p>
<p>Harbour porpoise (special concern)</p>	<p>Potential effects of the proposed Project are:</p> <p>Harm during construction</p> <p>Change in behavior due to underwater noise or pressure waves during construction and from shipping during operations</p>		<p>Context – M Magnitude – M Extent – Lo to R Duration – ST - LT Reversibility – R Frequency – MI - MR Likelihood – H</p> <p>Significance – Not significant</p>
<p>Steller sea lion (special concern)</p>	<p>Potential effects of the proposed Project are:</p> <p>Harm during construction</p> <p>Change in behavior due to underwater noise or pressure waves during construction and from shipping during operations</p>		<p>Context – M Magnitude – M Extent – Lo to R Duration – ST - LT Reversibility – R Frequency – MI - MR Likelihood – H</p> <p>Significance – Not significant</p>

SARA Species	Effects Assessment	Key Mitigation Identified by EAO	EAO's Significance Conclusion
Sea otter (special concern)	<p>Potential effects of the proposed Project are:</p> <p>Change in behavior due to underwater noise or pressure waves from shipping during operations</p>		<p>Context – M  Magnitude – M  Extent – Lo to R  Duration – ST - LT  Reversibility – R  Frequency – MI - MR  Likelihood – H</p> <p>Significance – Not significant</p>
<b>Wildlife</b>			
Coastal tailed frog (special concern)	<p>Potential effects of the proposed Project are:</p> <p>Increased risk of injury or mortality</p>	<p>Key mitigation measures from the Application include:</p> <ul style="list-style-type: none"> <li>• Wildlife movement through the estuary would be maintained during construction and operation of the LNG loading line, where practicable.</li> <li>• Develop and implement a Wetland Compensation Plan to address loss of wetland habitat function for breeding and foraging terrestrial mammals, amphibians, and birds</li> </ul>	<p>Context – M  Magnitude – L  Extent – Lo  Duration:  LT – for habitat  MT – LT – for mortality  Reversibility:  I – for habitat  R – for sensory  R – for mortality  Frequency:  S – for habitat  MI, MR, C – for sensory  MI - MR – for mortality  Likelihood – H</p> <p>Significance – Not significant</p>
Western Toad (special concern)	<p>Potential effects of the proposed Project are:</p> <p>Loss or change in habitat</p> <p>Increased risk of injury or mortality</p>		<p>Context – M  Magnitude – M  Extent – Lo  Duration:  LT – for habitat  MT – LT – for mortality  Reversibility:  I – for habitat  R – for sensory  R – for mortality  Frequency:  S – for habitat  MI, MR, C – for sensory  MI - MR – for mortality  Likelihood – H</p> <p>Significance – Not significant</p>
Marbled murrelet (threatened)	<p>Potential effects of the proposed Project are:</p>	<p>Key mitigation measures from the Application are:</p>	<p>Context – M  Magnitude – L</p>

SARA Species	Effects Assessment	Key Mitigation Identified by EAO	EAO's Significance Conclusion
	<p>Loss or change in habitat</p> <p>Sensory disturbance or behavioral alterations</p> <p>Increased risk of injury or mortality</p>	<ul style="list-style-type: none"> <li>• Construction activities would account for applicable bird breeding periods</li> <li>• Develop and implement a Wetland Compensation Plan to address loss of wetland habitat function for breeding and foraging terrestrial mammals, amphibians, and birds</li> <li>• Construction activities would account for applicable breeding bird periods. Clearing activities that need to occur during bird breeding periods would incorporate measures to protect birds and their eggs as per federal and provincial regulations.</li> <li>• Measures to reduce bird strikes on vessels, including alerting supervisory staff on berthed vessels of high-risk periods for bird strikes caused by deck lighting, reporting bird collisions, and providing vessel personnel with information on how to treat and release marine birds that have been grounded on vessel decks.</li> </ul>	<p>Extent – Lo</p> <p>Duration:            LT – for habitat            LT - for sensory            MT – LT – for mortality</p> <p>Reversibility:            I – for habitat            R – for sensory            R – for mortality</p> <p>Frequency:            S – for habitat            MI, MR, C – for sensory            MI – MR – for mortality</p> <p>Likelihood – H</p> <p>Significance – Not significant</p>
<p>Pink-footed shearwater (threatened)</p>	<p>Potential effects of the proposed Project are:</p> <p>Sensory disturbance or behavioral alterations</p> <p>Increased risk of injury or mortality</p>	<p>Key mitigation measures from the Application are:</p> <ul style="list-style-type: none"> <li>• Measures to reduce bird strikes on vessels, including alerting supervisory staff on berthed vessels of high-risk periods for bird strikes caused by deck lighting, reporting bird collisions, and providing vessel personnel with information on how to treat and release marine birds that have been grounded on vessel decks.</li> </ul>	<p>Context – M</p> <p>Magnitude – L</p> <p>Extent – Lo</p> <p>Duration:            LT – for habitat            LT - for sensory            MT – LT – for mortality</p> <p>Reversibility:            I – for habitat            R – for sensory            R – for mortality</p> <p>Frequency:            S – for habitat            MI, MR, C – for sensory            MI – MR – for mortality</p>

SARA Species	Effects Assessment	Key Mitigation Identified by EAO	EAO's Significance Conclusion
			Likelihood – H  Significance – Not significant
Great blue heron (special concern)	Potential effects of the proposed Project are:  Loss or change in habitat  Sensory disturbance or behavioral alterations  Increased risk of injury or mortality	Key mitigation measures from the Application are:  <ul style="list-style-type: none"> <li>• Construction activities would account for applicable bird breeding periods</li> <li>• Develop and implement a Wetland Compensation Plan to address loss of wetland habitat function for breeding and foraging terrestrial mammals, amphibians, and birds</li> <li>• Construction activities would account for applicable breeding bird periods. Clearing activities that need to occur during bird breeding periods would incorporate measures to protect birds and their eggs as per federal and provincial regulations.</li> <li>• Measures to reduce bird strikes on vessels, including alerting supervisory staff on berthed vessels of high-risk periods for bird strikes caused by deck lighting, reporting bird collisions, and providing vessel personnel with information on how to treat and release marine birds that have been grounded on vessel decks.</li> </ul>	Context – M Magnitude – L Extent – Lo Duration: LT – for habitat LT - for sensory MT – LT – for mortality Reversibility: I – for habitat R – for sensory R – for mortality Frequency: S – for habitat MI, MR, C – for sensory MI – MR – for mortality Likelihood – H  Significance – Not significant
Band-tailed pigeon (special concern)	Potential effects of the proposed Project are:  Loss or change in habitat  Sensory disturbance or behavioral alterations  Increased risk of injury or mortality	<ul style="list-style-type: none"> <li>• Measures to reduce bird strikes on vessels, including alerting supervisory staff on berthed vessels of high-risk periods for bird strikes caused by deck lighting, reporting bird collisions, and providing vessel personnel with information on how to treat and release marine birds that have been grounded on vessel decks.</li> </ul>	Context – M Magnitude – L Extent – Lo Duration: LT – for habitat LT - for sensory MT – LT – for mortality Reversibility: I – for habitat R – for sensory R – for mortality Frequency: S – for habitat MI, MR, C – for sensory MI – MR – for mortality Likelihood – H  Significance – Not significant
Common nighthawk (threatened)	Potential effects of the proposed Project are:  Sensory disturbance or behavioral alterations  Increased risk of injury or		Context – M Magnitude – L Extent – Lo Duration: LT – for habitat MT – LT – for mortality Reversibility:

SARA Species	Effects Assessment	Key Mitigation Identified by EAO	EAO's Significance Conclusion
	mortality		I – for habitat R – for sensory R – for mortality Frequency: S – for habitat MI, MR, C – for sensory MI - MR – for mortality Likelihood – H  Significance – Not significant
Olive-sided flycatcher (threatened)	Potential effects of the proposed Project are:  Loss or change in habitat  Sensory disturbance or behavioral alterations  Increased risk of injury or mortality		Context – M Magnitude – L Extent – Lo Duration: LT – for habitat LT - for sensory MT – LT – for mortality Reversibility: I – for habitat R – for sensory R – for mortality Frequency: S – for habitat MI, MR, C – for sensory MI – MR – for mortality Likelihood – H  Significance – Not significant
Rusty blackbird (special concern)	Potential effects of the proposed Project are:  Loss or change in habitat  Sensory disturbance or behavioral alterations  Increased risk of injury or mortality		Context – M Magnitude – L Extent – Lo Duration: LT – for habitat LT - for sensory MT – LT – for mortality Reversibility: I – for habitat R – for sensory R – for mortality Frequency: S – for habitat MI, MR, C – for sensory MI – MR – for mortality Likelihood – H  Significance – Not significant



SARA Species	Effects Assessment	Key Mitigation Identified by EAO	EAO's Significance Conclusion
Red knot (threatened)	<p>Potential effects of the proposed Project are:</p> <p>Loss or change in habitat</p> <p>Sensory disturbance or behavioral alterations</p> <p>Increased risk of injury or mortality</p>		<p>Context – M Magnitude – L Extent – Lo Duration: LT – for habitat LT - for sensory MT – LT – for mortality Reversibility: I – for habitat R – for sensory R – for mortality Frequency: S – for habitat MI, MR, C – for sensory MI – MR – for mortality Likelihood – H</p> <p>Significance – Not significant</p>
Northern goshawk (threatened)	<p>Potential effects of the proposed Project are:</p> <p>Loss or change in habitat</p> <p>Sensory disturbance or behavioral alterations</p> <p>Increased risk of injury or mortality</p>	<p>Key mitigation measures from the Application are:</p> <ul style="list-style-type: none"> <li>• Construction activities would account for applicable bird breeding periods</li> <li>• Develop and implement a Wetland Compensation Plan to address loss of wetland habitat function for breeding and foraging terrestrial mammals, amphibians, and birds</li> <li>• Construction activities would account for applicable breeding bird periods. Clearing activities that need to occur during bird breeding periods would incorporate measures to protect birds and their eggs as per federal and provincial regulations.</li> </ul>	<p>Context – M Magnitude – L Extent – Lo Duration: LT – for habitat LT - for sensory MT – LT – for mortality Reversibility: I – for habitat R – for sensory R – for mortality Frequency: S – for habitat MI, MR, C – for sensory MI – MR – for mortality Likelihood – H</p> <p>Significance – Not significant</p>
Peregrine falcon (special concern)	<p>Potential effects of the proposed Project are:</p> <p>Loss or change in habitat</p> <p>Sensory disturbance or behavioral alterations</p> <p>Increased risk of injury or mortality</p>	<ul style="list-style-type: none"> <li>• Measures to reduce bird strikes on vessels, including alerting supervisory staff on berthed vessels of high-risk periods for bird strikes caused by deck lighting, reporting bird collisions, and providing</li> </ul>	<p>Context – M Magnitude – L Extent – Lo Duration: LT – for habitat LT - for sensory MT – LT – for mortality Reversibility: I – for habitat R – for sensory R – for mortality</p>

SARA Species	Effects Assessment	Key Mitigation Identified by EAO	EAO's Significance Conclusion
		vessel personnel with information on how to treat and release marine birds that have been grounded on vessel decks.	Frequency: S – for habitat MI, MR, C – for sensory MI – MR – for mortality Likelihood – H  Significance – Not significant
Western screech-owl (special concern)	Potential effects of the proposed Project are:  Loss or change in habitat  Sensory disturbance or behavioral alterations  Increased risk of injury or mortality		Context – M Magnitude – L Extent – Lo Duration: LT – for habitat LT - for sensory MT – LT – for mortality Reversibility: I – for habitat R – for sensory R – for mortality Frequency: S – for habitat MI, MR, C – for sensory MI – MR – for mortality Likelihood – H  Significance – Not significant

## **PART C – CONSULTATION WITH ABORIGINAL GROUPS**

### **14 EAO Consultation Process Overview**

The Governments of BC and Canada are legally obligated to consult and, if necessary, accommodate asserted or established Aboriginal rights including title, or treaty rights (“Aboriginal Interests”) that may be impacted by government decisions. In *Haida Nation v. British Columbia (Minister of Forests), 2004 SCC 73 (Haida)*, the Supreme Court of Canada established that the Crown is required to consult with Aboriginal Groups with respect to Crown-authorized activities that might affect Aboriginal Interests, and that the extent (or level) of the consultation is proportionate to preliminary assessments of the following factors:

- Strength of the case for the claimed Aboriginal rights (including title) that may be adversely affected; and
- Seriousness of potential impact of contemplated Crown action or activity to adversely impact Aboriginal Interests.

EAO and the Agency worked together to identify which Aboriginal Groups could potentially be impacted by the proposed Project based on the two factors.

The extent (or level) of the Crown’s obligation to consult is described in the *Haida* case as lying on a spectrum from notification to deep consultation. An EA is not a process to determine Aboriginal rights or title. Instead, a key objective of an EA is to identify potential adverse effects of proposed projects on Aboriginal Interests and explore measures to avoid, mitigate or otherwise appropriately address such effects.

On June 6, 2013, EAO issued a Section 11 Order which specified the consultation activities that both EAO and the Proponent would undertake with all Aboriginal Groups potentially affected by the proposed Project. EAO relied primarily on the overlap of the proposed Project facility and proposed shipping route within an Aboriginal Group’s asserted traditional territory to determine the level of consultation it would undertake with Aboriginal Groups.

On May 21, 2013 the federal Minister of Environment issued a notice of commencement and approved BC’s request to substitute the provincial EA process for the CEAA 2012 EA for the proposed Project. Sections 1 and 13 of this report contain additional information on the substitution process and the CEAA 2012 requirements.

Aboriginal Groups in Schedules B and C of the Section 11 Order were consulted at the deeper end of the consultation spectrum and were provided the following opportunities:

- Participation in the Working Group;

- Participation in meetings to identify and discuss both Aboriginal Interests that may be affected by the proposed Project, and potential measures to avoid, mitigate, address or otherwise accommodate impacts;
- Review and comment on key documents, including the draft Section 11 Order, draft VC document, draft AIR, the Proponent's Application for an EAC, and EAO's draft Assessment Report, including the Consultation with Aboriginal Groups (Part C of this report), and the Proponent's Aboriginal Consultation Reports; and
- Submission of a document outlining the Aboriginal Group's views on the Assessment Report to be included in the package of materials sent to Ministers when the proposed Project is referred for decision.

The Section 11 Order also required the Proponent to develop and implement an Aboriginal Consultation Plan and subsequent Aboriginal Consultation Reports with respect to the Aboriginal Groups in Schedules B and C, to the satisfaction of EAO.

As part of the substituted EA process, EAO consulted all the Aboriginal Groups listed on Schedules B and C of the Section 11 Order on behalf of the federal government.

In order to meet CEAA 2012 requirements for the substituted EA process, on August 7, 2013 EAO issued a Section 13 Order to clarify the nature of the Province's consultation activities with the Métis Nation British Columbia (MNBC), an Aboriginal Group listed on Schedule D of the Section 11 Order. BC consulted the MNBC on behalf of the Government of Canada pursuant to the *Memorandum of Understanding on Substitution of Environmental Assessments* (CEAA, EAO 2013). Consultation with the MNBC is not an acknowledgement on the part of BC that it owes a duty of consultation or accommodation to Métis in BC under section 35 of the Constitution Act, 1982. MNBC was provided the following consultation opportunities:

- Notification of key milestones – such as the issuance of the Application Information Requirements, acceptance of the Application for review, timing of public comment periods (including open houses), when the final Assessment Report is referred to Ministers and the resulting decision;
- Invitation to meet with EAO to discuss any Aboriginal Interests in the proposed Project area; and
- Invitation to review and comment on EAO's draft Assessment Report.

EAO has considered all comments received from Aboriginal Groups throughout the EA process, including relevant information provided by Aboriginal Groups during the Application Review. During all stages of the EA, issues, comments and concerns raised by Aboriginal Groups submitted via correspondence or raised directly at meetings or in working groups in relation to the proposed Project were forwarded to the Proponent for tracking and response, as required. Input from Aboriginal Groups was received through

participation in Working Group meetings, teleconferences, direct meetings with EAO and/or the Proponent and written correspondence (letters or emails).

EAO has reviewed the adequacy of the Proponent's responses to all comments received from Aboriginal Group representatives in the Working Group and recorded in the Working Group Issues Tracking Table. EAO required the Proponent to update the Working Group Issues Tracking Table and supporting Technical Memos as appropriate and EAO considered the comments and issues in the development of this report. In addition, EAO arranged specific Working Group meetings and offered to meet with Aboriginal Groups to discuss any outstanding concerns. Prior to referring the Application to Ministers, EAO will provide the final tracking tables to Aboriginal Groups on Schedules B and C and other Working Group members.

A draft of this report was provided to Aboriginal Groups participating in the Working Group on March 30, 2015 to demonstrate how EAO had considered all Aboriginal Groups' comments received to date. A draft was also provided to MNBC on March 30 for its review and comment. Comments and feedback from Aboriginal Groups were requested by April 17, 2015, and all submitted prior to May 6, 2015 were consider in the final version of this report.

## **15 Aboriginal Groups Consulted**

EAO consulted the following Aboriginal Groups listed in the Section 11 Order:

- Haisla Nation
- Gitga'at First Nation
- Kitselas First Nation
- Kitsumkalum First Nation
- Gitxaala Nation
- Lax Kw'alaams Band<sup>9</sup>
- Metlakatla First Nation
- Métis Nation British Columbia<sup>10</sup>

### **15.1 Tsimshian**

There are six Aboriginal groups potentially affected by the proposed Project that are part of what is termed collectively as the Tsimshian culture, which has been identified

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<sup>9</sup> Lax Kw'alaams Band was identified in the Section 11 Order as "Lax Kw'alaams First Nation". For the purposes of this Report, "Lax Kw'alaams Band" will be used.

<sup>10</sup> British Columbia consulted MNBC on behalf of the Government of Canada pursuant to the Memorandum of Understanding on Substitution of Environmental Assessments (CEAA, EAO 2013). Consultation with MNBC is not an acknowledgement on the part of BC that it owes a duty of consultation or accommodation to Métis in BC under Section 35 of the *Constitution Act, 1982*.

ethnographically and linguistically as consisting of the Nine Allied Tsimshian Tribes, the Interior (Canyon) Tsimshian, and Gitxaala Nation.

Key socio-political entities of the Tsimshian include the house (*wa.lp*), clan, tribe and nation. Interweaving these entities are the linkages of common ancestry and kinship ties developed through marriage, trade and intertribal alliances.

Traditionally, the Tsimshian lived in large, semi-permanent winter villages consisting of multiple related groups known as “houses,” “house-groups” or *wa.lps* (singular: *wa.lp*). A *wa.lp* is described by anthropologists as a corporate lineage that held exclusive ownership rights to specific places and tracts of land, and the associated rights to access and harvest resources at those locations. A *wa.lp* is an independent socioeconomic unit of traditional Tsimshian social and political life and each house has an individual leader (*Sm'oogyet*) who inherits both a name and associated rights of the house's territory.

The leader of the most powerful house in a tribal village usually had leadership responsibilities for the community, with the authority derived from the status of the house-group. Each *wa.lp* is part of a network of *wa.lps* that shares a matrilineal connection to a common ancestral group. These affiliated matrilineal groups are called clans, crest-groups or *Bupdeex* (singular: *pdeex*), and traditionally formed the organizing structure of village residence. A Tsimshian person belonged (and belongs today) to one of four clans:

- Ganhada (raven);
- Gispwudwada (killer whale);
- Laxsgiik (eagle); or
- Laxgibuu (wolf).

Each *wa.lp* owned its own hunting and fishing grounds, and the combined territories of the *wa.lps* in its composite, constituted the tribal territory. The territory held by a *wa.lp* was understood in Tsimshian culture to be owned in a proprietary sense, a concept that was at the foundation of the Tsimshian geopolitical system. The traditional legal system that provides validation to the ownership and rights, acquired or inherited, of *wa.lp* territories, and which regulates rights of access and resource use is described in *adawx*, the oral histories of each *wa.lp*.

For most Tsimshian groups, life before contact with European explorers, traders and settlers revolved around the harvesting of seasonally available food. Each house left its winter village during the spring to occupy small seasonal camps sites, collecting different resources as they became available and returning to the same winter village in the late fall or early winter. This seasonal movement is often described as a “seasonal round” by anthropologists. In the late winter and early spring, Tsimshian families would collect and process eulachon along the Nass River. Eulachon grease was (and remains) a highly prized and nutrient-rich commodity that was traded along the Nass and Skeena Rivers and into the BC Interior via well-established trade routes that are commonly referred to as “grease-trails.”

From May through late August fishing was the primary activity, beginning in May with halibut and cod fishing. Seals and sea lions were also hunted during this time, and women gathered as many as 20 different varieties of seaweed, along with herring spawn on kelp and hemlock, and cedar bark for winter weaving. In June, the eggs of marine birds such as sea gulls and oyster catchers were gathered, along with shellfish such as abalone, cockles and clams during the low summer tides.

By early summer, Tsimshian moved to their seasonal camps at traditional fishing sites as salmon gathered at the river mouths to begin their spawning migration. These sites were strictly controlled by individual *wa.lps* and managed by chiefs. The harvesting of the five species of salmon that spawn in the Skeena River and its tributaries represented the main economic activity within the Tsimshian's seasonal round. Summer was also a time for gathering edible plants and berries which were dried or stored in grease for winter consumption.

Salmon fishing, processing and storage occupied the Tsimshian until October, at which time the tribes returned to their winter villages. Fall was the season when men hunted deer, bear, mountain goat, moose, ducks and geese.

From November to February the winter was spent in the permanent winter villages of each tribe. Fairly intensive subsistence activities included the gathering of marine invertebrates, fishing, trapping of fur-bearers and game hunting of both terrestrial and marine mammals. Winter was the season for the culturally important ceremonial feasts, marriages and for the validating of *adawx*.

The combined territories of the *wa.lps* that composed a tribe typically encompassed a watershed or similarly defined geographic areas. Among the Tsimshian, these regions and associated territories are generally described as: the nine Allied Tsimshian Tribes whose territories include the lower Skeena River and mainland coast from the mouth of the Skeena River to the mouth of the Nass River; the Gitxaala Nation, whose territories span the archipelago of islands south of the Skeena River and several watersheds along the Douglas Channel; the Gitga'at First Nation whose territory includes watersheds in the Douglas and Grenville channels and extends south through Squally Channel and Whale Channel; the Kitsumkalum First Nation, whose territory centred on Kitsumkalum Lake, including the Kitsumkalum River watershed; and, the Kitsealas First Nation, whose territory is centred on Kitselas Canyon, extending along the Skeena from Terrace to Lorne Creek.

#### 15.1.1 Nine Allied Tsimshian Tribes

Before the time of contact, ten Tsimshian groups relocated their winter villages on the Skeena River, below the canyon, to village sites in the Prince Rupert Harbour. Nine of these Tsimshian survived: Giluts'aaw, Ginandoiks, Ginaxangiik, Gispaxlo'ots, Gitando, Gitlaan, Gits'iis, Gitwilgyoots, and Gitzaxlaal. These tribes had their winter villages in the vicinity of Prince Rupert Harbour, and continued visiting their traditional territories on the Skeena River for fishing and hunting each summer and fall, and their eulachon fishing stations on the Nass River each spring. They possessed a number of regular

seasonal villages and camping sites in these areas as well. The Lax Kw'alaams Band and Metlakatla First Nation are understood to have descended from these nine tribes, each of which had their own individual territories, harvesting areas and villages.

#### 15.1.2 Interior Tsimshian

Kitselas and Kitsumkalum First Nations are identified as two of the 12 tribes of the Coast Tsimshian cultural-linguistic group, and are generally referred to in the ethnographic literature as the Canyon or Interior Tsimshian Tribes. While the surviving nine Allied Tsimshian Tribes with Prince Rupert winter villages became increasingly consolidated after contact, it is understood that Kitsumkalum and Kitselas First Nations remained separate tribes. Their ancestors travelled to the coast to trade and socialize, and to harvest eulachon at the Nass River (at Red Bluff) each spring, and their winter villages and resource harvesting areas were located around the Kitselas Canyon and Kitsumkalum River drainage. They spoke a distinct dialect of the Tsimshian language. In these ways, they are distinguished from the Nine Allied Tsimshian Tribes.

#### 15.1.3 Southern Tsimshian

The Gitxaala Nation, along with Gitga'at First Nation and Gidestsu Nation are classified by ethnographers as Southern Tsimshian, distinguished from the Nine Allied Tsimshian Tribes by dialect and the territories occupied by the Southern Tsimshian *wa.lps*. Southern Tsimshian spoke a distinct dialect, *Sguuks* or *Sguumxs*, which was nearly extinct by the 1970s.

Both Gitxaala Nation and Gitga'at First Nation challenged the linguistic distinctions noted by most ethnographers and linguists such that the "Coast Tsimshian" term has been used by different linguists and ethnohistorians in different way to include different groups. EAO has revised its Assessment Report to avoid the confusion caused by using the term "Coast Tsimshian" based on comments received from Gitxaala Nation and Gitga'at First Nation.

The core of the Gitxaala Nation's traditional territory is concentrated in the coastal archipelago south of the Skeena River.

The core of Gitga'at First Nation's traditional territory extends from the Douglas Channel up to the Grenville Channel, and south encompassing Squally and Whale Channel. Unlike the Nine Allied Tsimshian Tribes of the lower Skeena River and Prince Rupert Harbour, Gitga'at First Nation did not relocate to Fort Simpson in the 1830s, but they did move to William Duncan's model village of Metlakatla in the 1860s-80s. Subsequently the tribe established a new winter village at Hartley Bay in 1887.

## 15.2 Haisla Nation

The Haisla Nation is understood to be a composite of two traditional groups: the Haisla people of the Douglas Channel known as the Kitamaat and the Henaaksiala people of



Gardner Canal known as the Kitlope. At the time of first contact in 1793, the Haisla followed a seasonal pattern of land and resource use which was organized primarily around salmon and eulachon runs.

Haisla are understood to have a society organized according to territorial stewardship structures called *wa'wais* or watershed areas. These areas are described as being communally held by a clan under the oversight of a single clan member. Traditional use areas, including village sites and resource harvesting areas, were located within the *wa'wais*. Fishing, gathering, trapping and hunting activities occurred in each territory according to the rights and responsibilities associated with the *wa'wais*. There are five Haisla clans and 54 Haisla *wa'wais*.

### 15.3 Métis Nation British Columbia

The Métis are recognized as Aboriginal peoples, distinct from Indian and Inuit, as noted in section 35(2) of the *Constitution Act, 1982*. The Métis are originally the descendants of eighteenth-century unions between European men (explorers, fur traders and pioneers) and Indian women, mainly on the Canadian plains (Manitoba, Saskatchewan and Alberta). Within a few generations the descendants of these unions developed a culture distinct from their European and Indian forebears. In early times, the Métis were mostly nomadic. Later, they established permanent settlements centred on hunting, trading and agriculture. The test for evaluating whether an individual can be considered a Métis was set out by the Supreme Court of Canada in the 2003 case *R. v. Powely*. The MNBC has six geographical divisions with 35 chartered communities and provides services to Métis across BC. The Northwest BC Métis Association is the local chartered community located in Terrace (MNBC 2013).

## **16 EAO-Led Consultation Activities with Aboriginal Groups**

This section provides an overview of consultation activities undertaken by EAO.

### 16.1 Capacity Funding

Capacity funding was provided by EAO to Aboriginal Groups in Schedules B and C of the Section 11 Order to assist with their participation in consultation discussions and Working Group meetings during both the Pre-Application and Application Review phases of the EA. The Agency provided capacity funding to each Aboriginal Group listed on Schedules B, C and D of the Section 11 Order.

In addition, the Proponent offered and provided capacity funding to all Aboriginal Groups listed in Schedules B and C of the Section 11 Order, to assist with their participation in regulatory processes, gather Project-based traditional use information to inform the Application, and to understand the impacts to Aboriginal Interests posed by the proposed Project.

## 16.2 Working Group Activities

Aboriginal Groups on Schedules B and C were invited to participate in Working Group meetings, comment on EA documents, and meet with EAO staff as outlined below.

- EAO invited the seven Aboriginal Groups identified in Schedules B and C of the Section 11 Order to participate in the Working Group.

During the Pre-Application phase of the EA, EAO held three Working Group meetings:

- June 18-19, 2013 – Held in Kitimat to review EA processes, Working Group roles and responsibilities, and initial proposed VCs;
- September 4-5, 2013 – Held in Terrace and Kitimat to present and discuss the draft AIR; and,
- June 3-4, 2014 – Held in Kitimat and Terrace to present and discuss the Proponent's results to date, prior to the Proponent completing their Application, and to ask questions and seek information from subject matter experts, provincial and federal regulators, and the Proponent.

During Application Review, EAO held one set of full Working Group meetings:

- January 20-22, 2015 – Held in Vancouver to discuss Proponent's Application, initial supplemental information, and responses to the first round of comments from Working Group members.

EAO held additional technical meetings focussed on specific issues (e.g. disposal at sea, wake), and invited any Aboriginal Groups that would be directly impacted by the proposed issue.

EAO provided Aboriginal Groups with an opportunity to review and provide comments on key documents of the EA, including meeting summaries from Working Group meetings.

During the Pre-Application phase, which began in April 2013 and ended on November 6, 2014, EAO provided the following documents for comment:

- Draft Section 11 Order;
- The draft AIR; and
- The Application submitted for screening.

During the Application Review phase, which began on November 7, 2014 and ended on May 6, 2015, EAO provided the following documents for review and comment:

- The Application and supplemental information submitted during Application Review;
- Working Group Issues Tracking Table and the Proponent's responses (twice);
- Draft TOC and CPD; and
- EAO's draft Assessment Report, including the Aboriginal Consultation Report.

Comments on the Application from Aboriginal Groups were considered by EAO and the Proponent, and incorporated into this report as appropriate. Detailed comments from Aboriginal Groups, Proponent's responses, and EAO's comments on these are contained in the Working Group Issues Tracking Table, which was updated and shared with the Working Group throughout the EA.

### 16.3 Government-to-Government Consultation

EAO provided the opportunity for government-to-government consultation to all Aboriginal Groups listed in Schedules B, C and D of the Section 11 Order to discuss their views on potential impacts of the proposed Project on their Aboriginal Interests. The sections below provide an overview of meetings with specific Aboriginal Groups. Key issues of concern raised by Aboriginal Groups related to Aboriginal Interests are discussed below, and concerns related to specific VCs are discussed in the VC-specific sections.

## **17 Proponent-Led Consultation Activities with Aboriginal Groups**

As part of the Section 11 Order, EAO directed the Proponent to undertake procedural aspects of consultation during the EA with Aboriginal Groups listed on Schedules B and C. The Section 11 Order issued by EAO required the Proponent to develop and share drafts of an Aboriginal Consultation Plan and three Aboriginal Consultation Reports with the specified Aboriginal Groups at prescribed milestones during the EA. These documents were reviewed by Aboriginal Groups prior to being submitted to EAO, to enable updates in light of input received and concerns expressed by Aboriginal Groups. The intent of these documents was to enable EAO to understand the Proponent's consultation efforts and the perspectives of the specified Aboriginal Groups related to those efforts, and to evaluate the Proponent's consultation plan for subsequent activities with these Aboriginal Groups during Application Review.

From 2013 to 2015, the Proponent used a number of communication and information sharing methods, including: meetings with elected Chiefs and Councils, Hereditary Chiefs and band staff; a project newsletter; iPads with key documents; site visits; a tour of an existing Shell-owned LNG facility in Sur, Oman; telephone calls and written communication; as well as a comprehensive project website. The Proponent-led activities involved:

- Discussion of potential adverse effects on Aboriginal Interests, and possible mitigations;
- Information sharing on the proposed Project regarding terrestrial (vegetation/reclamation, wildlife), aquatic (water quality and fish), air quality (dust management and GHG emissions), heritage (palaeontology and archaeology), and cumulative effects impacts;
- Engagement on socio-economic issues, including studies;
- Agreements for capacity funding to support ongoing engagement and involvement in the regulatory process;

- Traditional use studies (TUS), or similar studies; and
- Engagement on economic benefits, contracting, education and training opportunities.

In addition, the Proponent participated in the majority of Working Group activities, including making presentations on the proposed Project, participating in discussions at Working Group meetings, and tracking and responding to comments from Aboriginal Groups on the draft AIR and the Application.

The Proponent negotiated capacity funding agreements with Aboriginal Groups listed on Schedules B and C of the Section 11 Order to assist participation in studies and field programs and to support the preparation and review of documents, reports and technical information throughout the EA process.

The Proponent has indicated that they are actively engaged with the Aboriginal Groups listed on Schedules B and C of the Section 11 Order to ensure that Aboriginal communities benefit directly from the proposed Project. These benefits could include opportunities related to employment, training and contracting. The Proponent views this as part of their overall commitment to ongoing engagement with local Aboriginal Groups. The Proponent has entered into benefits agreements with Haisla Nation and Gitga’at First Nation.

## 18 Common Concerns Raised by Aboriginal Groups

The table below summarizes common concerns raised by Aboriginal Groups throughout the EA process.

**Table 18-1: Common Concerns Raised by Aboriginal Groups**

Issue	Aboriginal Group	EAO Response
Cumulative effects of multiple projects	Metlakatla First Nation Gitxaala Nation Lax Kw’alaams Band Gitga’at First Nation Kitselas First Nation Kitsumkalum First Nation Haisla Nation	EAO considered the potential cumulative impacts of multiple proposed projects, along with past, current and reasonably foreseeable future projects (listed in the Proponent’s Application), on Aboriginal Interests when assessing the seriousness of impacts on Aboriginal Interests. EAO drew on relevant information provided by the Proponent regarding the cumulative effects assessment of VCs, as well the potential impacts of a proposed Project on Aboriginal Interests. Cumulative effects are examined and assessed in each VC section of this report.
Effects of vessel wake on marine and shoreline users	Metlakatla First Nation Gitxaala Nation Lax Kw’alaams Band Gitga’at First Nation Kitselas First Nation Kitsumkalum First Nation	EAO proposes a condition that would require the Proponent to develop a wake verification plan for project operations. This would include the requirement to determine the accuracy of the results of the EA, to address impacts to marine and shoreline users. Should wake effects be greater than predicted, the Proponent

Issue	Aboriginal Group	EAO Response
	Haisla Nation	would be required to implement an approach to adaptive management.
Economic development, business and employment opportunities, and training	Kitselas First Nation Gitga'at First Nation Kitsumkalum First Nation Haisla Nation Gitxaala Nation	Economic effects are considered in section 6. To support increased opportunities for participation, EAO proposes a condition that would require the Proponent to design and deliver programs to support local and Aboriginal employment and contracting opportunities, skills training and education.
Economic effects including, labour availability and wage inflation	Gitga'at First Nation Haisla Nation Kitselas First Nation Kitsumkalum First Nation	Economic effects are considered in section 6.
Social effects, including housing availability and affordability.  Impacts to community infrastructure, healthcare, emergency response.	Metlakatla First Nation Gitxaala Nation Lax Kw'alaams Band Gitga'at First Nation Haisla Nation Kitselas First Nation Kitsumkalum First Nation	Social effects are considered in section 7, in particular the assessment of infrastructure and services, and community health and wellbeing.  EAO proposes a condition that would require the Proponent to develop a plan to manage socio-economic effects that particularly that focuses on infrastructure and services and would include on-going monitoring, adaptive management and reporting. The Proponent would be required to engage with Aboriginal Groups in developing and implementing the plan.  EAO also proposes a condition requiring the Proponent to develop a health and medical services plan.
Air quality effects	Gitxaala Nation Kitselas First Nation Kitsumkalum First Nation Metlakatla First Nation Gitga'at First Nation Haisla Nation	Effects of air quality are considered in section 5.1.  EAO proposes a condition that would require the Proponent to develop an air quality management plan and an air quality and deposition monitoring plan.
GHGs and impacts to climate	Kitsumkalum First Nation Kitselas First Nation Metlakatla First Nation Gitga'at First Nation	Effects of GHGs are considered in section 5.2.  EAO proposes a condition that would require the Proponent to develop a GHG management plan.
Aboriginal Interests <ul style="list-style-type: none"> <li>• Monitoring potential effects</li> <li>• Loss of knowledge, traditional skills</li> <li>• Loss of resources</li> <li>• Traditional foods</li> </ul>	Metlakatla First Nation Gitxaala Nation Lax Kw'alaams Band Gitga'at First Nation Kitselas First Nation Haisla Nation Kitsumkalum First Nation	For the purposes of determining the appropriateness of the information in the Application, EAO was satisfied that the Proponent's Application contained the information as set out in the AIR.  Any additional TUS/TEK information provided by Aboriginal Groups would also be considered by the

Issue	Aboriginal Group	EAO Response
<ul style="list-style-type: none"> <li>Inadequate consideration of TUS/TEK</li> </ul>		<p>Proponent to help inform the development of plans, and any additional site-specific mitigation required by subsequent permitting decisions.</p>
<p>Accidents or Malfunctions</p> <ul style="list-style-type: none"> <li>Hull breach/Grounding</li> <li>Vessel spills (leading to contamination of shellfish)</li> <li>Spill response plan</li> <li>Accidents at the facility</li> </ul>	<p>Metlakatla First Nation Gitxaala Nation Lax Kw'alaams Band Gitga'at First Nation Haisla Nation Kitselas First Nation Kitsumkalum First Nation</p>	<p>Accidents or malfunctions are considered in section 10.</p> <p>The Proponent committed to implementing a Health, Safety, Security and Environment policy to prevent accidents or malfunctions.</p> <p>The Proponent would be required to prepare and implement Project-specific ERPs under OGAA and for TC. Based on the combination of the proposed Project design measures, implementation of ERPs, EAO is satisfied that neither accidents nor malfunctions are likely to pose significant risk VCs.</p>
<p>Consultation</p> <ul style="list-style-type: none"> <li>Adequacy</li> <li>Determining who to consult</li> <li>What constitutes consultation</li> <li>After certificate issued</li> <li>Meaningful opportunity to provide input</li> </ul>	<p>Metlakatla First Nation Gitxaala Nation Lax Kw'alaams Band Gitga'at First Nation Kitsumkalum First Nation</p>	<p>The extent (or level) of the Crown's obligation to consult is described in the <i>Haida</i> case as lying on a spectrum from notification to deep consultation. The extent (or level) of the consultation is proportionate to preliminary assessments of the following factors:</p> <ul style="list-style-type: none"> <li>Strength of the case for the claimed Aboriginal rights (including title) that may be adversely affected; and</li> <li>Seriousness of potential impact of contemplated Crown action or activity to adversely impact Aboriginal Interests.</li> </ul> <p>The EA process is not a rights determining process of claimed Aboriginal Interests. Instead, a key objective of the EA process is to identify potential adverse effects of proposed projects on Aboriginal Interests and explore measures to avoid, mitigate or otherwise appropriately address such effects.</p>
<p>Human health concerns</p> <ul style="list-style-type: none"> <li>Air emissions</li> <li>Impact on water source</li> <li>Risk of contamination of country foods</li> <li>Cumulative effects</li> </ul>	<p>Metlakatla First Nation Gitxaala Nation Lax Kw'alaams Band Gitga'at First Nation Kitselas First Nation Haisla Nation</p>	<p>Human health is considered in section 9.</p> <p>Some groups expressed concern about the potential indirect impacts of air emissions on wildlife, specifically, the possibility of wildlife becoming unsafe for human consumption after ingesting vegetation that has become hazardous from effects of air emissions. Air emissions from the proposed Project would not present a risk of contamination to country foods.</p> <p>EAO proposes a number of conditions regarding air quality and protection of country foods.</p>
<p>EA methodology re baseline information and VC selection</p>	<p>Metlakatla First Nation Gitxaala Nation Lax Kw'alaams Band</p>	<p>The adequacy of baseline information for a particular VC has been examined in EAO's assessment in each VC section of this report. Concerns raised by Aboriginal</p>

Issue	Aboriginal Group	EAO Response
<ul style="list-style-type: none"> <li>• Gaps and level of detail in baseline info.</li> <li>• Residual effects not applied consistently</li> <li>• EA scoping</li> <li>• Spatial extent</li> </ul>	Gitga'at First Nation Haisla Nation	<p>Groups relating to EA methodology and VC selection were considered by EAO during Pre-Application.</p> <p>If an EAC is issued and the proposed Project proceeds to permitting, the Proponent would be required to complete additional baseline and field studies to fulfill permitting requirements.</p> <p>EAO proposes a number of conditions that would entail additional study prior to permitting. In addition, EAO proposes a condition requiring the Proponent to continue to engage with Aboriginal Groups in the development of the EMP, various off-setting plans and conditions.</p>
Effects on marine mammals	Haisla Nation Kitselas First Nation Kitsumkalum First Nation Gitxaala Nation Gitga'at First Nation Metlakatla First Nation Lax Kw'alaams Band	<p>Effects on marine mammals are considered in section 5.6. Accidents or malfunctions are considered in section 10.</p> <p>EAO proposes a condition that would require the Proponent to develop marine mammal management and monitoring plans applicable during construction that would identify where and when sensory disturbance or injury to marine mammals from shipping may occur, and to support the mitigation of any effects to marine mammals.</p>
EMPs, follow up monitoring and reporting	Gitga'at First Nation Gitxaala Nation Haisla Nation Metlakatla First Nation	<p>EAO proposes a condition that would require the Proponent to develop and implement Construction and Operations EMPs in accordance with section 12 of the Application, and the condition requires the Proponent to engage Aboriginal Groups in the plans' development and implementation.</p>

## 19 Potential Impacts of the Proposed Project on Aboriginal Interests

EAO sought input from each Aboriginal Group on the nature and scope of their Aboriginal Interests and how they might be impacted by the proposed Project. A summary of the potential impacts is provided in the sections below. Responses to the full set of potential impacts, as well as other project-specific concerns, are described in the Working Group Issues Tracking Table, as well as in each Aboriginal Group's section of this report (section 20).

With respect to assessing the seriousness of potential impacts on Aboriginal Interests, EAO considered relevant factors, including:

- The location of each Aboriginal Group's traditional territory;

- Past, present, and anticipated future Aboriginal uses of the proposed Project area and its surroundings, including the frequency and timing of such uses by each Aboriginal Group;
- The baseline conditions of selected VCs, including those associated with the exercise of Aboriginal Interests, incorporating consideration of other development in the local or regional area that may contribute to the baseline conditions;
- The impact of the proposed Project on the current exercise of Aboriginal Interests;
- Mitigation measures proposed to avoid or minimize adverse effects to corresponding Aboriginal Interests;
- Residual and cumulative effects of the proposed Project on VCs associated with the exercise of Aboriginal Interests (e.g. fish and fish habitat, vegetation);
- The extent to which the proposed Project could affect each Aboriginal Group's access to, and use of the proposed Project area to exercise Aboriginal Interests;
- The relative importance of the proposed Project area and its surroundings to the exercise of each Aboriginal Group's Aboriginal Interests, including any special characteristics or unique features of that area; and
- The relative availability of other areas in reasonable proximity, within the traditional territory of each Aboriginal Groups, where the meaningful exercise of Aboriginal Interests could reasonably occur.

EAO recognizes that areas within the asserted traditional territory of each Aboriginal Group, including areas within the vicinity of the proposed Project, may be particularly important and valuable for specific qualities associated with traditional harvesting sites (e.g., hunting, fishing and gathering in areas with specific resource values or cultural importance), and that some areas may be associated with traditional harvesting activities of a specific Aboriginal Group's individual members or families.

Potential impacts from the proposed Project on Aboriginal Interests related to traditional harvesting activities include:

- Quantitative and qualitative changes in preferred harvested species;
- Changes in, or restrictions on, preferred harvesting methods;
- Quantity and quality of identified traditional use locations and access corridors.
- Temporary or permanent restrictions in access to harvesting areas via trails and marine travelways;
- Quantitative change in production levels of traditional foods; and
- Changes in the quality of traditional foods.

The Proponent's Application includes an assessment of potential effects on environmental, social, economic, heritage and health VCs with interactions and effects on Aboriginal Interests related to harvesting activities.

In addition to specific mitigations proposed in the Proponent's Application to avoid and minimize potential adverse effects to VCs, EAO also considered the Proponent's consultation with specified Aboriginal Groups, and efforts to identify and modify the



proposed Project footprint and shipping route in key areas of concern to avoid or minimize potential impacts on Aboriginal Interests.

### 19.1 Hunting

Aboriginal Groups identified a number of wildlife species that are traditionally important food sources to their communities that may be impacted by the proposed Project. Knowledge of species distribution, use, and importance was refined based on information obtained from Aboriginal Groups, and the identified species of interest were considered in the development of the key indicators for the wildlife VC during the Pre-Application phase.

Aboriginal Groups identified commonly hunted species in the terrestrial environment to be deer, elk, moose, black bear and grizzly bear, wolf, mountain goat, mountain sheep, duck, and geese. Commonly hunted species in the marine environment include seals, sea lions, sea otter, duck, and other marine birds.

Facility construction, operation, and/or decommissioning could potentially adversely affect hunting through:

- Changes in the abundance, availability, and diversity of wildlife and marine birds;
- Loss of wildlife habitat;
- Sensory disturbance or change in behaviour of wildlife;
- Interference with preferred traditional harvesting methods;
- Limiting or eliminating the use of, or access to, identified valued traditional use locations, and adversely affecting the experience of Aboriginal Groups' members who use land and marine areas affected by proposed Project activities;
- Harm (defined as physical injury or mortality) to terrestrial wildlife and marine mammals; and
- Change in behaviour of marine mammals due to pressure waves or underwater noise.

Some of the specific issues related to the facility identified by Aboriginal Groups included:

- Disturbance of wildlife movement in the estuary and in other areas;
- Direct loss of wildlife habitat at the facility site, and impacts to wildlife habitat from air emissions; and
- Impacts to birds due to flaring during commissioning and operations.

Section 5.8 of this report includes a detailed discussion of impacts of the proposed Project on terrestrial wildlife and birds, and summarizes the key questions and concerns raised by Aboriginal Groups and other members of the Working Group during the course of Application Review.

Shipping related to the proposed Project has the potential to affect Aboriginal Interests associated with hunting in the marine environment through:

- Inhibiting Aboriginal Groups' access to lands and waterways where hunting of marine mammals and birds occur;
  - Interference with Aboriginal Groups' ability to access marine mammal hunting sites due to LNG shipping and exclusion/safety zones;
  - Interference by vessel traffic during construction phase and LNG shipping during operation phase;
- Changes to behaviour of marine mammals from LNG carriers and tugs, underwater noise and direct mortality to marine mammals from ship strikes;
- Impacts of vessel wake on marine mammals; and
- Decrease (real and perceived) in safety when accessing resource gathering areas.

Some of the specific issues related to shipping identified by Aboriginal Groups included:

- Acoustic effects on marine mammal behaviour along the shipping route;
- Direct marine mammal mortality;
- Disturbance to marine hunting practices;
- Cumulative effects to marine use and resources along the shipping route and in the Triple Island and Prince Rupert area; and
- Impacts to birds, particularly during migration periods and near seabird colonies.

Sections 5.6 and 7.3 of this report include detailed discussions of impacts of the proposed Project on marine resources and marine transportation and use, and summarize the key questions and concerns raised by Aboriginal Groups and other members of the Working Group during the course of Application Review.

#### *EAO response*

EAO considered the following key factors in assessing the potential impacts of the proposed Project on an Aboriginal Group's Aboriginal Interest associated with hunting:

- The assessment of potential effect of the proposed Project on Aboriginal Groups' Aboriginal Interests associated with hunting is informed by the analysis of potential residual effects on relevant VCs. Residual effects are predicted for the terrestrial wildlife and marine birds VC and are characterized in section 5.8 of this report. Residual effects are predicted for the marine resources (including marine mammals) VC and are characterized in section 5.6 of this report;
- EAO understands that an Aboriginal Group's hunting activities depend, in part, on the status of wildlife populations within their area of traditional use;
- The nature and extent of effects would depend on the inherent sensitivity of each wildlife species and habitat type, the nature and timing of the disturbances, and the effectiveness of mitigation;
- The primary effects of the proposed Project on wildlife and wildlife habitat in the terrestrial and marine environments are expected to be caused by:
  - The change in habitat as part of proposed Project construction and operation resulting in direct habitat loss, habitat fragmentation, sensory disturbance and changes to wildlife movement;

- Increased risk of injury or mortality during vegetation clearing stage of site preparation; and
  - Sensory disturbance or behavioural change from noise and the presence of ships;
- The magnitude of the residual effect on key indicator species is expected to be low to moderate, following implementation of proposed mitigation;
- The residual effects to wildlife and marine species are not expected to be significant;
- Terrestrial habitat disturbance from the proposed Project would be restricted to the facility footprint. The ability to hunt terrestrial species within the facility footprint would be seriously diminished due to habitat loss and access restrictions. The facility footprint is located on fee simple land, most of which has been zoned for industrial use, with approximately 10% of the area previously developed for methanol production and shipment, and for condensate shipment;
- Key hunting sites identified by an Aboriginal Group that overlap or are in proximity to the proposed Project were considered in relation to past, present and anticipated future use of the area for hunting. Multiple hunting sites identified by an Aboriginal Group that overlap or are in proximity to the proposed Project footprint and shipping route could indicate a greater potential effect on that Aboriginal Group's Aboriginal Interest associated with hunting;
- The Proponent revised the location of the proposed shipping route such that as it travels between Browning Entrance and Triple Island it moves further offshore by approximately 8 to 10 km. This revision was made as a result of input received from Aboriginal Groups about potential interactions with marine mammals, potential impacts from the pilot vessels in the vicinity of Triple Island and interactions with vessels bound for Prince Rupert, and is consistent with the TERMPOLE submission;
- Additionally, the Proponent proposed mitigation to avoid and minimize potential effects to terrestrial wildlife and marine birds, and marine resources. A list of proposed mitigations can be found in sections 5.6 and 5.8 of this report. EAO considers the effectiveness of the proposed mitigation to avoid and reduce potential effects to terrestrial wildlife and marine birds, and marine resources to be moderate to high. Key mitigations proposed which relate to the Aboriginal Interest associated with hunting include, but are not limited to, the following:
  - Develop and implement a wetland compensation plan to address loss of wetland habitat function for breeding and foraging terrestrial mammals, amphibians, and birds;
  - Clearly delineate vegetation clearing limits to avoid damage to important wildlife habitat features (e.g., large boulders, nurse logs, raptor nests, mammal dens, ungulate mineral licks) in the facility LSA but outside of the proposed Project footprint or the areas of temporary construction disturbance. Major game trails will be cleared of equipment, brush piles, and felled trees to maintain their use as movement corridors for wildlife, where practicable;
  - Develop and implement a marine activities plan in accordance with applicable federal and provincial legislation and regulations. The marine

- activities plan will include measures to address potential effects from dredge activities, pile installation (including marine mammal exclusion zone, soft start procedures and consideration of sound dampening technologies) and shipping; and
- 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 would travel at speeds of 8 to 10 knots from July through October (the predicted periods of high use by marine mammals);
  - Proposed conditions of the EAC that relate to Aboriginal Interests associated with hunting include, but are not limited to, the following:
    - The development and implementation of a wildlife management plan which sets out a monitoring and follow-up program with respect to impacts to wildlife within the Certified Project Area during construction;
    - The development and implementation of a human-wildlife conflict plan to avoid or minimize direct wildlife mortalities as a result of construction or operations;
    - The development of a marine mammal management and monitoring plan during both construction and operation to prevent sensory disturbance or injury to marine mammals;
    - The marine mammal management and monitoring plan must specify the speed profiles to prevent or reduce the risks of collisions between the Proponent's LNG carriers and marine mammals.
    - The development and implementation of construction and operations environmental management plans in consultation with regulatory agencies and Aboriginal Groups;
    - The retention of an Environmental Monitor, who would have full authority to cease construction activities that are inconsistent with the proposed EAC;
    - Continued implementation of the Aboriginal Consultation Plan (dated August 2013); and
    - The opportunity for Aboriginal Groups to participate in monitoring.

The potential impact of the proposed Project on Aboriginal Interests associated with hunting for each Aboriginal Group is described in section 20 of this report.

## 19.2 Fishing

All Aboriginal Groups consulted expressed concerns related to the potential adverse effects of the proposed Project on Aboriginal Interests associated with fishing. Aboriginal Groups identified several fish species that are an important part of their traditional culture, an important source of food, or important to Aboriginal Groups for spiritual reasons. Fish species harvested by Aboriginal Groups include all five species of salmon, trout, eulachon, herring, rockfish, halibut, cod, and other ground fish such as snapper, flounder and sole.

Facility construction and commissioning, operation, and/or decommissioning could potentially adversely affect fishing within and in proximity to the facility footprint through:

- Changes in the abundance, availability, diversity, health and safety for human consumption of fish;
- Changes in fish habitat (i.e., permanent alteration to or destruction of freshwater or estuarine fish habitat, including changes in habitat quality and quantity);
- 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 proposed Project activities;
- Harm (defined as physical injury or mortality) to culturally important fish species (e.g., salmon, eulachon); and
- Change in behaviour of fish due to pressure waves or underwater noise.

Some of the specific issues identified by Aboriginal Groups included:

- Impacts to marine ecosystems and fish and fish habitat (estuary);
- Access to preferred fishing locations by preferred means, and at preferred times;
- Impacts on fish life cycles, migration and fish habitat (species of specific interest include salmon, eulachon, and ground fish);
- Change in behaviour of fish;
- Dredging, including toxicity of disturbed sediments;
- Disposal at sea, including toxicity of disturbed sediments;
- Effluent discharge;
- Adverse changes in sediment or water quality affecting Aboriginal diet;
- Direct injury or mortality to fish from construction activities;
- Cumulative effects on fish;
- Impacts on fish and fish habitat that could affect food security and food quality;
- Interference with Aboriginal fishing vessels and activities by vessel traffic during construction phase and LNG shipping during operation phase; and
- Effectiveness of proposed marine habitat offset measures.

Aboriginal Groups expressed concerns regarding the potential adverse effects on their ability to access preferred marine resource harvesting locations during the construction of the proposed Project, and how vessels and barges employed to construct the marine terminal may restrict movement and safe navigation throughout Douglas Channel.

Aboriginal Groups raised concerns with the water withdrawal from the Kitimat River and adverse effects on the amount of water flowing downstream, especially during the summer. Several Aboriginal Groups were concerned that the removal of water from the Kitimat River could have an adverse impact on species that frequent the Kitimat River and aquatic ecosystems.

During Application Review, several Aboriginal Groups expressed concern about air emissions causing acidification and eutrophication of freshwater systems which would in turn adversely affect fish and fish habitat.

Section 5.5 of this report includes a detailed discussion of impacts of the proposed Project on freshwater and estuarine fish and fish habitat, and summarizes the key questions and concerns raised by Aboriginal Groups and other members of the Working Group during the course of Application Review.

Shipping related to the proposed Project has the potential to affect Aboriginal Interests associated with fishing in the marine environment through:

- Inhibiting Aboriginal Groups' access to preferred fishing locations due to LNG shipping and exclusion/safety zones around the marine terminal;
- Interference by vessel traffic during construction phase and LNG shipping during operation phase;
- Impacts of vessel wake on fish and fish habitat, smaller fishing vessels, and Aboriginal harvesters;
- Decrease (real and perceived) in safety when accessing fishing areas;
- Potential impacts to the health and abundance of fish; and
- Accidents and malfunctions, including potential spills from LNG carriers, tugs and other project-related vessels.

All Aboriginal Groups expressed concerns surrounding vessel wake and the potential impacts of wake on Aboriginal fishing activities.

Vessel traffic associated with the proposed Project during construction and operation has the potential to affect harvesting-related Aboriginal Interests due to temporary restrictions in marine navigation and access to specific harvesting locations. Increased vessel traffic may adversely affect preferred harvesting methods, timing, use or access to important harvesting locations and traditional use activities identified by Aboriginal Groups along the proposed Project's shipping route, including near the Triple Island Pilot Station.

Sections 5.6 and 7.3 of this report include detailed discussions of impacts of the proposed Project on marine resources and marine transportation and use, and summarize the key questions and concerns raised by Aboriginal Groups and other members of the Working Group during the course of Application Review.

### *EAO response*

EAO understands that an Aboriginal Group's fishing activities depend, in part, on the status of fish populations within their area of traditional use, and the extent to which the proposed Project could affect an Aboriginal Group's access to, and use of the area. EAO has considered the potential interactions and effects on fish and fish habitat in the marine and freshwater environment in assessing potential impacts of the proposed Project on Aboriginal Interests related to fishing.

The following key factors were considered by EAO in assessing potential impacts of the proposed Project on an Aboriginal Group's Aboriginal Interest associated with fishing:

- To address Haisla Nation's concerns regarding loss of fish habitat and loss of potential future eulachon habitat, the Proponent agreed to reroute sections of Beaver Creek and the Kitimat side channel to avoid such impacts and, where possible, create new habitat for eulachon spawning, and to maintain the migration routes to upstream spawning habitats;
- The Proponent revised the location of the proposed shipping route such that as it travels between Browning Entrance and Triple Island it moves further offshore by approximately 8 to 10 km. This revision was made as a result of input received from Aboriginal Groups about potential interactions with marine mammals, potential impacts from the pilot vessels in the vicinity of Triple Island and interactions with vessels bound for Prince Rupert, and is consistent with the TERMPOL submission;
- The analysis of potential residual effects on relevant VCs, in particular, freshwater and estuarine fish and fish habitat, and marine resources – characterized in sections 5.5, and 5.6 respectively of this report – are low magnitude, and are not expected to be significant;
- Sediment that does not meet the disposal at sea screening criteria would not be disposed of at sea, and therefore is not anticipated to affect fish health. EAO found no residual effect relating to contaminated sediment in the marine environment;
- Key fishing sites identified by an Aboriginal Group that overlap or are in proximity to the proposed Project and shipping route were considered in relation to past, present and anticipated future use of the area for fishing;
- Where overlap between fishing locations and the route taken by marine traffic might occur, potential interactions are expected to cause negligible interference. Transits of vessels would be relatively brief in duration. Commercial shipping traffic would travel using a well-established route with regular communication between marine vessels and the MCTS, the PPA, and the Prince Rupert Port Authority;
- No endangered or threatened fish species at risk are expected to be injured or killed due to noise or pressure waves during pile installation;
- Harm to fish by way of physical injury or mortality is not anticipated because all areas proposed for in-stream works would be isolated from fish, and any fish present would be removed before beginning in-stream works. Effects on eulachon and Pacific salmon habitat and access to fishing location are specifically considered in mitigation measures, in particular in design of the realignments of Beaver Creek and the Kitimat River side channel, and in the water withdrawal practices in Kitimat River. Water withdrawal is discussed in more detail in section 5.4 of this report;
- The Proponent modelled proposed Project contributions to surface water acidification, and indicated only one additional lake (End Lake) would have critical load exceedances for acidification, but would still be below the biological effect threshold, and therefore no adverse effects are expected to occur. For all

other lakes and streams, there would be no changes to critical load exceedances. Surface water quality is discussed in more detail in section 5.4 of this report;

- The Proponent modelled proposed Project contributions to wake. To help validate the models used, the Proponents also modelled wake expected for a variety of existing vessel traffic in the area, including cruise ships, ferries, and other small and large vessels. The Proponent also provided videos showing wake from LNG carriers currently operating in other areas of the world to provide context;
- The Proponent has proposed mitigation to avoid and minimize potential effects to surface water, freshwater and estuarine fish and fish habitat, and marine resources. A list of proposed mitigations can be found in sections 5.4, 5.5 and 5.6 of this report. EAO considers the effectiveness of the proposed mitigation to avoid and reduce potential effects to freshwater and estuarine fish and fish habitat and marine resources, and other concerns raised by Aboriginal Groups with regard to fishing to be moderate to high. Key mitigations proposed by the Proponent which relate to the Aboriginal Interest associated with fishing include, but are not limited to, the following:
  - Rerouting sections of Beaver Creek and the Kitimat side channel to maintain migration routes to upstream spawning habitats and avoid impacts on fish habitat and loss of potential future eulachon habitat, in response to Haisla Nation's concerns;
  - A Fish Habitat Offsetting Plan would be developed and implemented to offset unavoidable permanent alteration or destruction of fish habitat from Project activities and works;
  - Develop and implement a marine activities plan in accordance with applicable federal and provincial legislation and regulations. The plan will include measures to address potential effects from dredge activities, pile installation (including marine mammal exclusion zone, soft start procedures and consideration of sound dampening technologies) and shipping;
  - Instream works will occur within the relevant reduced risk work windows, where practicable. Where Project activities need to occur outside the reduced risk work windows, measures to protect fish and fish habitat will be developed in consultation with appropriate regulatory bodies, including DFO; and
  - If isolating freshwater habitats during instream works occurs, fish would be salvaged and relocated to unaffected habitats.

Proposed conditions of the EAC that relate to Aboriginal Interests associated with fishing include, but are not limited to, the following:

- The development of a fish management and monitoring plan which describes measures to avoid or mitigate impacts to fish and fish habitat and specifies a process for adaptive management;
- The development and implementation of a marine water quality management and monitoring plan for construction for the Certified Dredge Area;



- The development and implementation of a wake verification plan during project operations;
- The development and implementation of a wetland compensation plan;
- The development and implementation of construction and operations EMPs in consultation with regulatory agencies and Aboriginal Groups;
- The retention of an Environmental Monitor, who would have full authority to cease construction activities that are inconsistent with the proposed EAC;
- Continued implementation of the Aboriginal Consultation Plan (dated August 2013); and
- The opportunity for Aboriginal Groups to participate in monitoring opportunities.

The potential impact of the proposed Project on Aboriginal Interests associated with fishing for each Aboriginal Group is described in section 20 of this report.

### 19.3 Trapping

Aboriginal Groups identified a number of furbearers and other mammals commonly trapped, including beaver, Pacific marten, fisher, mink, otter, weasel, and muskrat. General trapping locations include the Kitimat arm, Kitimat River, Kitsumkalum River, and in and around the Lakelse watershed.

Facility construction, operation, and decommissioning could potentially adversely affect Aboriginal Interests associated with trapping through:

- Changes in the abundance, availability, and diversity of wildlife;
- Loss of wildlife habitat;
- 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
- Harm (defined as physical injury or mortality) to terrestrial wildlife.

Many of the concerns expressed by Aboriginal Groups with respect to hunting in section 19.1 apply to Aboriginal Interests associated with trapping.

The primary effect of the proposed Project on Pacific marten year round living habitat is the removal of high suitability old-growth coniferous forest within the facility footprint.

Section 5.8 of this report includes a detailed discussion of impacts of the proposed Project on terrestrial wildlife and birds, and summarizes the key questions and concerns raised by Aboriginal Groups and other members of the Working Group during the course of Application Review.

## *EAO response*

EAO understands that an Aboriginal Group's trapping activities depend, in part, on the status of furbearer populations within their area of traditional use. The Proponent's assessment of the effects of the proposed Project on terrestrial wildlife is detailed in section 5 of the Application and section 5.8 of this report.

EAO considered the following key factors in assessing the potential impacts of the proposed Project on an Aboriginal Group's Aboriginal Interest associated with trapping:

- The analysis of potential residual effects on relevant VCs, in particular, the terrestrial wildlife and marine birds VC, is characterized in section 5.8 of this report;
- The nature and extent of effects would depend on the inherent sensitivity of each wildlife species and habitat type, the nature and timing of the disturbances, and the effectiveness of mitigation;
- The permitting process may require additional mitigation measures if an EAC is issued;
- Terrestrial habitat disturbance from the proposed Project would be restricted to the Project footprint. The facility footprint represents a very small portion of regionally available habitat for Pacific marten and other trapped species.
- Key trapping sites identified by an Aboriginal Group that overlap or are in proximity to the proposed Project were considered in relation to past, present and anticipated future use of the area for trapping. Multiple trapping sites or traplines identified by an Aboriginal Group that overlap or are in proximity to the proposed Project footprint could indicate a greater potential effect on that Aboriginal Group's Aboriginal Interest associated with trapping;
- The Proponent has proposed mitigation to avoid and minimize potential effects to terrestrial wildlife (including trapped species), which can be found in section 5.8 of this report. EAO considers the effectiveness of the proposed mitigation to avoid and reduce potential effects on terrestrial wildlife to be moderate to high. Key mitigations proposed which relate to the Aboriginal Interest associated with trapping include, but are not limited to, the following:
  - Develop and implement a wetland compensation plan to address loss of wetland habitat function for breeding and foraging terrestrial mammals, amphibians, and birds; and
  - Clearly delineate vegetation clearing limits to avoid damage to important wildlife habitat features (e.g., large boulders, nurse logs, raptor nests, mammal dens, ungulate mineral licks) in the facility LSA but outside of the proposed Project footprint or the areas of temporary construction disturbance. Major game trails will be cleared of equipment, brush piles, and felled trees to maintain their use as movement corridors for wildlife, where practicable.
- Proposed conditions of the EAC that relate to Aboriginal Interests associated with trapping are similar to those discussed in section 19.1.

The potential impact of the proposed Project on Aboriginal Interests associated with trapping for each Aboriginal Group is described in section 20 of this report.

#### 19.4 Gathering

Aboriginal Groups identified a number of plants that they gather from the terrestrial environment for subsistence and medicinal purposes that may be impacted by the proposed Project facility footprint and air emissions. Gathering from the marine environment is discussed in section 19.5 of this report.

Food and medicinal plants harvested by Aboriginal Groups include: wild rice, licorice fern root, hemlock bark, jackpine sap and needles, fireweed, various berries (e.g., bunchberry, cloudberry, crabapple, cranberry, crowberry, black and red currant, elderberry, black gooseberry, huckleberry, raspberry, soapberry, salal, saskatoon, strawberry, thimbleberry), and other species such as hazelnuts, lily of the valley, devil's club, springbank, clover, fireweed, lichen, licorice, pacific silverweed, rice-root, wild onions, common juniper, cinquefoil, copperbush, cow parsnip, Indian hellebore, Labrador tea, lupine, skunk, cabbage, Sylvan goat's beard, wild rose, tubers, and roots. Medicinal plants included black hawthorn and bog and oval-leafed blueberry.

Facility construction, operation, and decommissioning could potentially adversely affect Aboriginal Interests associated with vegetation gathering through:

- Change in abundance of plant species of interests (including traditional use species);
- Change in abundance or condition of ecological communities of interests;
- Interference with preferred traditional harvesting methods;
- Limiting or eliminating the use of, or access to, identified valued traditional use locations; and
- Adversely affecting the experience of Aboriginal Groups who use these traditional use locations.

Aboriginal Groups expressed concerns with direct vegetation loss and the possible effect of air emissions on traditionally harvested vegetation resources and human consumption.

Clearing of vegetation within the facility footprint during the construction phase would result in the removal of 25 traditional use plant species.

Air emissions from the proposed Project could result in adverse effects on Aboriginal gathering through potential adverse effects on the abundance, availability, diversity, and health of harvested traditional plant species. Vegetation communities potentially affected by air emissions from the proposed Project would continue to persist within the LSA, although their growth rate or vigor may be reduced within the areas where there are exceedances of critical load thresholds during operations.

Section 5.7 of this report includes a detailed discussion of impacts of the proposed Project on vegetation and wetland resources, and summarizes the key questions and concerns raised by Aboriginal Groups and other members of the Working Group during the course of Application Review.

Aboriginal Groups also commented on the sensitivity of human receptors to experiential effects of air quality stating that human receptors (in particular, Aboriginal harvesters) have a high sensitivity to changes in air quality, and any changes would affect the harvesters' experience on the land. Air quality, as it relates to human health, is discussed in section 9 of this report.

### *EAO response*

EAO understands that an Aboriginal Groups' gathering activities depend, in part, on the abundance and condition of preferred plant species within their area of traditional use. The Proponent's assessment of the effects of the proposed Project on vegetation and wetland resources is detailed in section 5 of the Application and section 5.7 of this report.

The effects to vegetation would primarily be confined to the proposed Project footprint and would consist of the clearing of vegetation in preparation of site-specific infrastructure during construction. EAO determined that the proposed Project would not have significant adverse effects on vegetation or wetlands.

EAO assessed the magnitude of residual adverse effects on plant species of concern as low to moderate, depending on the plant species, its relative abundance, the extent of its occurrence, and the feasibility and effectiveness of mitigations. EAO assessed the magnitude of residual adverse effects to most ecological communities of concern as low to moderate.

The following key factors were considered by EAO in assessing the potential impacts of the proposed Project on Aboriginal Interests associated with gathering:

- The analysis of potential residual effects on relevant VCs, in particular, vegetation and wetlands – characterized in section 5.7 of this report – are low to moderate magnitude, and are not expected to be significant;
- Key gathering sites identified by an Aboriginal Group that overlap or are in proximity to the proposed Project were considered in relation to past, present and anticipated future use of the area for gathering. Multiple gathering sites identified by an Aboriginal Group that overlap or are in proximity to the proposed Project footprint could indicate a greater potential effect on the Aboriginal Group's Aboriginal Interest associated with gathering;
- The effects of sulphur dioxide fumigation, nitrogen deposition and acid deposition from the proposed Project on vegetation communities is only expected to exceed critical loads in approximately 4 ha of vegetated communities immediately adjacent to the facility;

- Terrestrial habitat disturbance from the proposed Project would be restricted to the facility footprint;
- The Application states that the plant species affected by construction within the facility footprint are common and occur in equal or greater abundance throughout the terrestrial RSA. Vegetation and wetland resources are discussed in detail in section 5.6 of this report;
- The Proponent has proposed mitigation to avoid and minimize potential effects to terrestrial vegetation, traditional land use and other concerns associated with gathering activities raised by Aboriginal Groups. A list of proposed mitigations can be found in section 5.6 of this report. EAO considers the effectiveness of the proposed mitigation to avoid and reduce potential effects to vegetation and wetland resources to be moderate. Key mitigations proposed by the Proponent related to Aboriginal Interests associated with gathering include, but are not limited to, the following:
  - Incorporate traditional use plants, where appropriate and technically feasible, in wetland compensation measures and reclamation of temporary construction areas; Any temporary workspace would be reclaimed as soon as practicable as per measures stated in the EMPs; and
  - The approved clearing boundaries would be clearly delineated prior to site preparation to keep clearing activities within the designated Project footprint.

Monitoring, compliance, and enforcement would be conducted by regulatory agencies during and following construction to ensure that mitigation is implemented and is effective.

Proposed conditions of the EAC that relate to Aboriginal Interests associated with gathering include, but are not limited to, the following:

- The development and implementation of a vegetation management and monitoring plan for construction;
- The development and implementation of a wetland compensation plan;
- The development and implementation of construction and operations EMPs in consultation with regulatory agencies and Aboriginal Groups;
- The retention of an Environmental Monitor, who would have full authority to cease construction activities that are inconsistent with the proposed EAC;
- Continued implementation of the Aboriginal Consultation Plan (dated August 2013); and
- The opportunity for Aboriginal Groups to participate in monitoring.

The potential impact of the proposed Project on Aboriginal Interests associated with gathering for each Aboriginal Group is described in section 20 of this report.

## 19.5 Aboriginal Interests Associated with the Marine Environment

Aboriginal Groups consulted during the EA expressed concern regarding the potential adverse effects of the proposed Project on Aboriginal Interests associated with harvesting in the marine environment, including the asserted right to gather shellfish, invertebrates, and marine vegetation for subsistence, social and ceremonial purposes.

The marine environment in the area of the proposed Project contains a rich diversity of invertebrates important to Aboriginal Groups' traditional marine resource harvesting and diet. These include Dungeness crab and *Pandalus* shrimp, prawns, various species of shellfish, including barnacles, mussels, cockles, limpets, geoducks, abalone, periwinkles and clams. Various species of sea weed, kelp and eel grass are gathered by Aboriginal Groups as well.

Facility construction, operation, and decommissioning could potentially adversely affect Aboriginal Interests associated with harvesting from the marine environment through:

- Adverse changes in marine sediment or water quality;
- Sedimentation;
- Loss of habitat;
- Reduced access to shellfish and marine vegetation gathering sites;
- Interference by vessel traffic during construction phase and LNG shipping during operation phase and related navigation safety concerns; and
- Impacts to air quality from shipping activities.

Aboriginal Groups raised concerns with sediment toxicity and potential effects on health. In response to these concerns and comments on the draft Assessment Report, EAO has proposed a condition requiring the Proponent to develop and implement a marine water quality management and monitoring plan for construction for the Certified Dredge Area, which includes the results of adequate tissue sampling to assess toxin concentrations and validate assessment of potential human health effects of contaminants in re-suspended sediments on marine foods.

Project related shipping traffic has the potential to affect Aboriginal Interests associated with marine harvesting through:

- Inhibiting Aboriginal Groups' access to preferred harvesting locations due to:
  - LNG shipping and exclusion/safety zones; and
  - Interference by vessel traffic during construction phase and LNG shipping during operation phase;
- Impacts of vessel wake on preferred marine harvested species, harvesting locations and Aboriginal harvesters;
- Decrease (real and perceived) in safety when accessing harvesting areas; and
- Accidents and malfunctions, including potential spills from LNG carriers, tugs and other project-related vessels.

Aboriginal Groups expressed concerns regarding the potential adverse effects on their ability to access preferred marine resource harvesting locations and concerns regarding how vessels and barges employed to construct the marine terminal may restrict movement and safe navigation throughout Douglas Channel and near the Triple Island Pilot Station. Aboriginal Groups also commented on potential effects from the movement of LNG carriers and escort tugs during operation of the facility and marine terminal, including how safety and exclusion zones around the marine terminal could interfere with general vessel traffic and access to marine resource harvesting sites and activities.

All Aboriginal Groups expressed concerns related to vessel wake and the potential impacts of wake on marine harvesting activities, including shoreline harvesting.

Sections 5.6 and 7.3 of this report include detailed discussions of impacts of the proposed Project on marine resources and marine transportation and use, and summarize the key questions and concerns raised by Aboriginal Groups and other members of the Working Group during the course of Application Review.

### *EAO Response*

EAO understands that an Aboriginal Group's marine resource harvesting activities depend, in part, on the status of resources in the marine environment within their asserted traditional territory, and the extent to which the proposed Project could affect an Aboriginal Group's access to, and use of the area. EAO has considered the potential interactions and effects on marine resources in the marine environment in assessing potential impacts of the proposed Project on Aboriginal Interests related to harvesting marine resources.

The following key factors were considered by EAO in assessing potential impacts of the proposed Project on an Aboriginal Group's Aboriginal Interest associated with resource harvesting activities in the marine environment:

- The analysis of potential residual effects on relevant VCs, particularly marine resources (section 5.6), are low to moderate magnitude and are not expected to be significant;
- Potential for precluding or inhibiting an Aboriginal Group's access to marine resource harvesting areas;
- Key harvesting sites identified by an Aboriginal Group that overlap or are in proximity to the proposed Project and shipping route were considered in relation to past, present and anticipated future use of the area for harvesting;
- EAO acknowledges that during the construction phase, vessel traffic may temporarily disrupt navigation related to marine resource harvesting and other traditional use activities within the proposed Project area;
- Some restrictions for safety during the operations phase of the proposed Project may result in temporary restrictions to marine navigation and loss of access to some areas currently used for harvesting marine resources, however, those

areas are small relative to available productive areas and temporary restrictions to marine navigation are expected to be minor;

- Temporary impacts on navigation would include areas near the proposed Project's shipping terminal near Kitimat and along the shipping route in areas immediately surrounding Project-related vessels while transiting from the shipping terminal, through Douglas Channel and Principe Channel to the Triple Island Pilot Station;
- Shipping activities, including potential interruption from LNG carrier vessel wake waves, are not expected to displace Aboriginal shoreline users or cause significant adverse effects to marine harvesting activities;
- The Proponent revised the location of the proposed shipping route such that as it travels between Browning Entrance and Triple Island it moves further offshore by approximately 8 to 10 km. This revision was made as a result of input received from Aboriginal Groups about potential interactions with marine mammals, potential impacts from the pilot vessels in the vicinity of Triple Island and interactions with vessels bound for Prince Rupert, and is consistent with the TERMPOLE submission;
- Additionally, the Proponent has proposed mitigation to avoid and minimize potential effects to marine resources, marine transportation, and other concerns associated with marine harvesting activities raised by Aboriginal Groups. A list of proposed mitigations can be found in sections 5.6 and 7.3 respectively. Key mitigations proposed by the Proponent related to Aboriginal Interests associated with harvesting in the marine environment include, but are not limited to, the following:
  - Develop and implement a marine activities plan in accordance with applicable federal and provincial legislation and regulations. The marine activities plan will include measures to address potential effects from dredge activities, pile installation (including marine mammal exclusion zone, soft start procedures and consideration of sound dampening technologies) and shipping;
  - Use of timing windows and mitigations developed in consultation with DFO at the permitting stage, and would consider the location and timing of sensitive life stages specific to CRA fishery species. In-water marine construction, dredging, and sediment disposal activities would be conducted throughout the year; for the periods outside the timing windows of least risk, additional mitigation measures would be implemented to protect sensitive species and life stages as appropriate;
  - Plan LNG carrier's passage route to avoid interference with fishers and harvesters, where possible, with safety being primary concern; and
  - Use escorts tugs between Triple Island and Kitimat during LNG carrier transits.

Proposed conditions of the EAC that relate to Aboriginal Interests associated with harvesting in the marine environment include, but are not limited to, the following:

- The development and implementation of a marine water quality management and monitoring plan during construction for the Certified Dredge Area;



- The development and implementation of a wake verification plan during project operations; and
- The development of a marine activities plan for construction with the objective of mitigating and monitoring impacts to marine users.

If an EAC is issued and the proposed Project proceeds to permitting, the Proponent would be required to complete any additional baseline and field studies to fulfill permitting requirements.

In addition, the Proponent would be required to continue to implement the EAO-approved Aboriginal Consultation Plan for all phases of the proposed Project.

The potential impact of the proposed Project on Aboriginal Interests associated with harvesting resources in the marine environment for each Aboriginal Group is described in section 20 of this report.

### 19.6 Cultural Sites, Trails, and Travelways

Construction, operation, and/or decommissioning of the proposed Project facility could impact archaeological and heritage resources and sites of cultural significance through:

- Damage to or removal of CMTs;
- Alteration or removal of terrestrial archaeological or heritage sites;
- Qualitative changes in the experience of using sites and landscape features for ritual or spiritually important purposes through acoustic and visual quality changes;
- Physical disturbance or destruction of ritual sites, sacred sites, and culturally or spiritually important sites through Project-related clearing and infrastructure construction;
- Changes in use of or access to ritual sites, sacred sites and culturally or spiritually important sites as a result of Project activities such as clearing, infrastructure construction, and fencing; and
- Physical disturbance of landforms and natural features associated with ritual or spiritual use.

During site preparation activities (e.g., clearing and grubbing, site grading), there is potential for damage to or removal of CMTs. Although no CMT sites have been identified in the LSA, they are fairly common in the Kitimat region. Mitigation measures for the discovery of CMTs are discussed below under EAO's response.

One archaeological site was discovered within the proposed Project footprint during the course of the AIA, but no CMTs or intertidal sites. Project effects cannot be mitigated through avoidance, because the site is located in an area that will be covered in approximately 4 m of fill during construction. Because much of the Project footprint area is already substantially disturbed, effects could occur in either a disturbed or an undisturbed archaeological context.

Shipping activities during construction and operations could 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 Groups who use those sites or areas.

Marine travelways<sup>11</sup> used by Aboriginal Groups would experience an increase in shipping traffic as shipping traffic volume is estimated to be approximately 350 vessel visits per year. Shipping traffic during construction and operation are predicted to be similar, with approximately one vessel per day visiting the marine terminal. During construction tugs would make up approximately 80% of marine traffic. Vessels might spend one to seven days working around the marine terminal before leaving.

Aboriginal Groups expressed concerns regarding potential effects of vessel wake on coastal terrestrial sites and intertidal sites including sacred and culturally important sites.

Section 8.1 of this report includes a detailed discussion of impacts of the proposed Project on archaeological and heritage resources, and summarizes the key questions and concerns raised by Aboriginal Groups and other members of the Working Group during the course of Application Review.

#### *EAO response*

BC has a robust regulatory regime to protect and mitigate impacts to heritage resources. Archaeological sites in BC are protected under the HCA, and FLNR's Archaeology Branch is the primary agency responsible for administering the HCA and maintaining the Provincial Heritage Site Register. Section 13 of the HCA specifies that an individual (or corporation) must not "damage, excavate, dig in or alter, or remove any heritage object" from a heritage site, unless under a permit issued by the Minister pursuant to sections 12 and 14. For the proposed Project OGC would issue any section 12 site alteration permits.

Limitations on the effects assessment include the difficulty to accurately identify the presence of archaeological resources within the proposed Project footprint. Confidence in the overall effects assessment is high, given that provincially required mitigation programs would be conducted and would be based on input from Aboriginal communities and regulatory bodies.

For identified terrestrial archaeological and heritage sites in conflict with Project activities and physical works, the preferred mitigation measure is avoidance of these sites through Project redesign. Archaeological site GaTe-5, which was recorded in the LSA, will be managed in consultation with the Archaeology Branch and Haisla Nation

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<sup>11</sup> "Travelways" is a term used to refer to freshwater or ocean watercourses that are used to access traditional land use areas.

and in accordance with the Heritage Investigation Permit issued by the Archaeology Branch.

In response to potential vessel wake on coastal archaeological and heritage sites, the Application states that these sites have already undergone erosion by natural tidal action and storm surges; and intertidal sites are constantly interacting with the rising and lowering tides and related wave action. Project shipping traffic will introduce additional wave activity that is predicted to fall within the range of natural wave variation and new erosion on these sites is not expected. As a result, no new interaction between Project activities, namely wake from carriers, and resources along the shoreline are anticipated.

The Proponent has proposed mitigation to avoid and minimize potential effects to archaeological and heritage resources. A comprehensive list of mitigations proposed by the Proponent can be found in section 8 of this report under Heritage Effects. Key mitigations proposed by the Proponent which relate to an Aboriginal Interest in archeology and cultural heritage include, but are not limited to, the following:

- Archaeological sites that were recorded in the LSA would be managed in consultation with the Archaeology Branch and Haisla Nation and in accordance with a Heritage Investigation Permit that would be applied for with the Archaeology Branch;
- Wherever possible, if found, CMTs would be avoided. In situations where CMTs cannot be avoided, mitigation measures would focus on recording them completely and systematically; and
- A Chance Find Protocol will be developed and implemented prior to construction.

Archaeological and cultural heritage sites, trails and travelways identified by an Aboriginal Group that overlap or are in proximity to the proposed Project were considered in relation to past, present, and anticipated future use of the area. Multiple archaeological or cultural heritage sites identified by an Aboriginal Group that overlap or are in proximity to the proposed Project could indicate a greater potential effect on the Aboriginal Group's Aboriginal Interests associated with the historical connection to and continued use of these sites.

The potential impact of the proposed Project on culturally-important sites, trails, and travelways for each Aboriginal Group is described in section 20 of this report.

### 19.7 Aboriginal Title

Potential effects of the proposed Project on Aboriginal title claims are primarily related to the construction and operation of the proposed LNG facility. The facility footprint is a site held in fee simple within the asserted traditional territory of Haisla Nation. For further discussion of the potential impacts of the proposed Project on Haisla Nation's Aboriginal title claims, refer to section 20.1.

Potential effects of the proposed Project on Aboriginal title claims in the shipping route between the marine terminal in Kitimat Harbour and the Pilotage Station at or near Triple Island may include:

- Increases in marine traffic resulting in disruption in access to specific marine resource harvesting locations;
- Potential effects of vessel wake with shoreline resource harvesting activities and other cultural activities, and potential damage to intertidal and subtidal archaeological sites; and
- Potential reduction in the enjoyment of the land in proximity to the shipping route for the proposed Project from visual, noise, light and other sensory disturbance.

The following key factors have informed EAO's consideration of potential seriousness of impact of the proposed Project on Aboriginal title claims in the shipping route:

- The analysis of potential residual effects on relevant VCs, particularly the marine resources, marine transportation and use, and visual quality VCs – characterized in sections 5.6, 7.3, and 7.4 of this report – are low to moderate magnitude, and are not expected to be significant;
- The Proponent has proposed mitigation to avoid and minimize potential effects to marine resources, marine transportation and use, and visual quality. Key mitigations proposed include, but are not limited to, the following:
  - LNG carriers destined for the proposed Project terminal would only be permitted to enter the marine access route if a berth at the terminal would be available and there would be no planned anchoring of the LNG carriers along the marine access route; and
  - The use of escorts tugs between Triple Island and Kitimat during LNG carrier transits, and planned LNG carrier's passage route to avoid interference with fishers and harvesters, where possible, is proposed as a mitigation;
- In response to the issues raised during Application review and following additional consultation with TC, EAO proposes a condition that would require the development of a marine activities plan that would address all relevant mitigations and commitments and include a plan to communicate with Aboriginal Groups;
- EAO has proposed a condition related to the development and implementation of a wake verification plan during project operations; and
- EAO has also proposed a condition requiring the development and implementation of construction and operations EMPs in consultation with regulatory agencies and Aboriginal Groups.

Based on the assessment of residual and cumulative effects to marine resources, marine transportation and use, and visual quality, EAO's proposed conditions, EAO is of the view that the proposed project is expected to have negligible impacts on Aboriginal title claims in proximity to the shipping route.

## 20 Impacts on Aboriginal Interest by Aboriginal Group and EAO's Conclusions

The following sections consider the information received from each Aboriginal Group through consultation efforts during the EA process, and summarizes the consultation and accommodation of potentially affected Aboriginal Groups in relation to the proposed Project. Potential impacts of the proposed Project on Aboriginal Interests are characterized in general terms in section 19 of this report. Below, EAO outlines issues identified during the EA, provides additional background information specific to each of the Aboriginal Groups, and lays out its considerations and conclusions on the seriousness of impacts to the Aboriginal Interests of each of the Aboriginal Groups.

### 20.1 Haisla Nation

#### 20.1.1 Context

- Haisla Nation is an Aboriginal Group of the northern-Northwest Coast cultural area living along the Douglas Channel and Kitimat Arm.
- Haisla Nation has an elected Chief and Band Council who make political decisions, and Hereditary Chiefs who are the traditional leaders with high status in the community. The current Chief and Council were elected in June 2013
- Haisla Nation has 19 reserves, with IR 2 Kitamaat Village being the only populated reserve. As of April 2013, the registered population was 1,754. It is estimated that about 640 members live on IR 2 Kitamaat Village.

#### 20.1.2 Aboriginal Interests and EAO's Strength of Claim Assessment and Depth of Consultation

- The proposed Project (facility and marine terminal) would be located within Haisla Nation's asserted traditional territory. The proposed Project shipping route traverses approximately 50 km of Haisla Nation's asserted territory in Kitimat Arm and Douglas Channel.
- As articulated in EAO's letter to Haisla Nation on January 23, 2014, EAO assessed the strength of Haisla Nation's *prima facie* claim of Aboriginal rights to fish, gather, hunt and trap within the area of the proposed Project to be strong.
- On June 26, 2014, the Supreme Court of Canada released its decision in *Tsilhqot'in* which clarified the test for Aboriginal title relating to the elements of sufficient and exclusive occupation at 1846. EAO reconsidered its initial assessment of Aboriginal title claims in the vicinity of the proposed Project. The following village and habitation sites located in proximity to the proposed Project were identified in the previous assessment as being subject to strong Haisla Nation Aboriginal title claims:
  - Miya'nexaas just above the mouth of the Kitimat River;
  - Zagwis (Jugwees IR) at the head of Minette Bay;
  - Paxw near or overlapping the Alcan smelter;
  - C'imoc'a or Kitamaat village; and

- Walhsto 2 km south of Kitimaat village.
- In addition to these sites, Haisla Nation has also been assessed as having a strong *prima facie* claim to Aboriginal title to areas that were used regularly at 1846 to collect resources or that were used as travel corridors, between these village locations, including along the Kitimat River downstream of the Wedeene Rivers to Kitimat River Bridge, and the lower Kitimat River estuary and Minette Bay. Haisla Nation's regular use of areas that extend upriver into tributary valleys at 1846 is less clear. There is no information indicating that there was any historic overlap with any other Aboriginal Groups in these areas.
- Given the nature and location of the proposed Project, and the potential impacts of the proposed Project on Haisla Nation's Aboriginal Interests as discussed below, EAO is of the view that the duty to consult Haisla Nation lies towards the deep end of the *Haida* spectrum.
- All Aboriginal Groups listed in Schedules B and C of the Section 11 Order have been consulted at the deeper end of the *Haida* consultation spectrum as described in section 14 of this report.

### 20.1.3 Summary of Consultation

Haisla Nation was invited to review and provide comments on the draft AIR, draft Section 11 Order, the Proponent's Aboriginal Consultation Plan and Reports, the screening of the Application and on the Application. Haisla Nation was also provided with opportunities to attend Working Group meetings, workshops and to meet with EAO staff directly.

EAO provided \$10,000 in capacity funding to Haisla Nation during the Pre-Application phase and \$5,000 in capacity funding during the Application Review phase of the EA process to assist with costs associated with their participation in the EA review. The Agency provided \$50,000 in capacity funding to Haisla Nation.

The Proponent also provided capacity funding to Haisla Nation to support their participation in the regulatory process. In addition, the Proponent provided funding to Haisla Nation for a Project-specific TUS, which the Proponent received in October 2013. The TUS titled, *The LNG Canada Proposed Terminal Site and Tanker Route within Haisla Traditional Territory (Powell 2013)*, helped inform the Application.

The Proponent invited Haisla Nation to participate in all of the field studies at the proposed Project site and marine terminal. The Proponent also invited Haisla Nation to participate in the marine mammal surveys undertaken along the marine access route for the Application.

Haisla Nation was a very active participant in the EA, and EAO engaged with Haisla Nation in a variety of manners throughout the process to seek to better identify, understand, and resolve concerns. Haisla Nation provided comments on the draft AIR and the Application, attended face-to-face meetings and workshops, participated in

conference calls, and corresponded via email. During Application review, some of the engagement between EAO and Haisla Nation included:

- November 19, 2014 – Meeting to discuss synchronous permitting in Kitamaat Village with Haisla Nation, EAO, and OGC;
- November 20, 2014 – Meeting in Terrace between EAO and Haisla Nation to discuss general concerns and the approach through Application Review;
- December 17, 2014 – Fisheries meeting with EAO, Haisla Nation and DFO in Nanaimo;
- Jan 19, 2015 – Synchronous permitting follow up meeting in Vancouver with Haisla Nation, EAO, and OGC;
- January 20 to 22, 2015 – General Working Group meetings in Vancouver.

EAO met with Haisla Nation on February 16, 2015 to discuss Haisla Nation's outstanding issues and concerns with the proposed Project, including DAS, effluent discharge, loss of potential future eulachon habitat, social effects in community from work camps, light pollution, and dredging options. On February 25, 2015, EAO met with Haisla Nation, federal agencies and the Proponent to discuss DAS.

The Proponent met with Haisla Nation throughout the EA process to discuss the proposed Project, including with respect to capacity funding arrangements, commercial arrangements and opportunities, shipping, seeking feedback and participation in environmental baseline studies, including noise monitoring and marine mammal studies, baseline air quality monitoring program, the AIA, fish and fish habitat surveys, and permitting, including providing the AIA application for review and comment. Haisla Nation participated in environmental fieldwork and provided feedback on an additional location to include for underwater noise monitoring.

Specific meetings that occurred between the Proponent and Haisla Nation include:

- April 23, 2014 – Workshop with Haisla Nation technical staff and Council members on the "Proposed Site Layout and Potential Interactions with the Estuary";
- July 17, 2014 – Meeting to review and discuss the draft of Part C;
- September 29, 2014 – Meeting in Kitamaat Village to receive input to the general risk analysis element of the TERMPOL;
- November 5, 2014 – Presentation on 'LNG 101' to Haisla Nation members at a community meeting and dinner, and presented the proposed Project to the community; and
- February 23 and 24, 2014 – Discussion of responses to the comments submitted by Haisla Nation to EAO in January, and outstanding issues and concerns.

In addition, the Proponent met with Haisla Nation to discuss possible DAS locations on May 14, June 26, July 17, and September 5 of 2014. More details on these discussions can be found below under "Fishing and Marine Harvesting".

In September 2014, the Proponent invited the Haisla Nation to participate in a stakeholder tour of Oman LNG. Three representatives of the Haisla Nation participated in this tour from October 18 – 25, 2014, which included a visit to the Oman LNG facility, a tour of an LNG carrier, and meetings with local stakeholders and government officials to discuss their experience with the LNG industry.

The Proponent undertook a Project-specific socio-economic impact assessment with Haisla Nation and worked collaboratively with Haisla Nation on the collection of this information, which informed the Application. The Proponent also consulted with Haisla Nation on the geotechnical program at the proposed Project site, specifically regarding permits issued for activities associated with this program, as well as the Proponent's overall approach to environmental management.

Issues raised by Haisla Nation and the Proponent's responses are provided in the Working Group Issues Tracking Table. A summary of the Proponent's engagement activities with Haisla Nation is provided in the Aboriginal Consultation Reports.

#### 20.1.4 Potential Impacts of the Proposed Project on Haisla Nation's Asserted Aboriginal Interests

##### *Aboriginal Title*

As discussed previously, EAO is of the view that Haisla Nation has strong *prima facie* claim to Aboriginal title to the areas within and adjacent to the proposed Project.

On February 25, 2014, during the EA process, Haisla Nation responded to EAO's January 23, 2014 letter, agreeing with the initial assessment of strength of claims, but indicating concern with the lack of description of potential impacts of the proposed Project on Haisla Nation's Aboriginal title claims.

Potential effects related to the construction and operation of the facility, if certified, may include:

- Potential disruption of subsistence activities, including hunting, trapping, fishing and plant gathering within and in proximity to the facility footprint;
- Permanent disruption in access for Aboriginal Groups to the proposed Project area to hunt, trap, fish, gather or conduct other activities, where access may be restricted for safety reasons;
- Disruption of use and connectivity of trails and travelways within and around the proposed Project footprint;
- Associated infrastructure, including access roads and temporary construction camps may also impact use of these areas as trails, travelways, resource harvesting areas and home sites; and
- Increasing air emissions, with potential effects from acidification on vegetation, fish, and wildlife and potential future use of land in vicinity of the proposed facility.



EAO has considered the following factors in assessing the potential impacts of the proposed Project to the Aboriginal title claim:

- The proposed Project facility footprint is located on fee simple land, most of which has been zoned for industrial use. Approximately 10% of the area has previously been developed for methanol production, and transshipment, and for condensate transshipment;
- The Haisla Nation has provided a letter of support for the proposed DAS site located approximately 3.8 km from the loading site in upper Kitimat Arm, west of Kitimaat Village, indicating it also supports the disposal of dredged material at depth;
- The Proponent has proposed to develop and implement a wetland compensation plan to address loss of wetland habitat function for breeding and foraging terrestrial mammals, amphibians, and birds;
- The Proponent has proposed mitigation to clearly delineate vegetation clearing limits to avoid damage to important wildlife habitat features;
- The effects of air emissions on vegetation health and diversity from nitrogen and sulphate deposition are only expected to exceed critical loads in approximately 4 ha of vegetated communities immediately adjacent to the facility; and
- The Proponent has modelled surface water acidification and identified only one with critical load exceedances (End Lake), but it would still be below the biological effect threshold, and therefore no adverse effects are expected to occur. For all other lakes and streams, there would be no changes to critical load exceedances.

EAO has ensured that Haisla Nation has been meaningfully consulted and accommodated on the potential effects of this proposed Project. In EAO's opinion, the proposed Project may have a moderate impact on Haisla Nation's asserted Aboriginal title.

### *Harvesting Activities*

The proposed Project facility would be located in the Haisla Nation *wa'wais* area called *Yaksda*, which means "dirty water." Haisla Nation reports that its members hunt, trap, fish, gather and use cabins and campsites for traditional harvesting purposes within the area, including in the *Yaksda wa'wais* (Moore Creek and Anderson Creek watersheds), in the *Simgas* and *Zagwis wa'wais*, and along Kitimat Arm. Haisla Nation members use various locations within the *Yaksda wa'wais* to gather traditional foods during different times of year.

### Hunting

Haisla Nation members hunt a variety of species throughout their traditional territory. Large mammals, including black bear, moose, deer, and grizzly bear occupy the terrestrial environments and have significant subsistence and spiritual values for Haisla Nation members. Deer and moose are hunted at specific locations around Kitimaat Village and on active or decommissioned logging roads. Black bear and grizzly bear are

hunted at locations around Kitimaat Village, on active or decommissioned logging roads, at the flats between Anderson and Moore Creeks, and various locations along the marine access route.

Seal are hunted at several locations, including:

- The mouth of the Kitimat River;
- The Kitimat River estuary;
- Minette Bay from the east shoreline Coste Rocks (off the southeast corner of Coste Island [Louis Point]); and
- The rock reef in Emsley Cove.

Haisla Nation members hunt duck at specific locations around the flats of *Yaksda wa'wais* (Moore Creek and Anderson Creek watersheds) and at various locations along the shipping lanes.

Canada goose and quail are hunted in the *Yaksda wa'wais*. Seagull eggs are collected from rocky nesting sites, and other bird species are hunted for feathers and materials.

During the EA process, Haisla Nation identified the following issues and concerns related to their asserted Aboriginal right to hunt:

- Potential effects on wildlife and migratory birds;
- Potential effects of construction on mature growth forest;
  - Requested mitigations to preserve old growth forests;
- Potential impacts to wetlands;
- Potential effects on wildlife habitat,
  - Removal of vegetation and need to compensate for loss of wildlife habitat; and
- Potential effects on hunting areas.

Vessel traffic associated with the proposed Project during construction and operation has the potential to affect access to specific seal harvesting locations identified by Haisla Nation, including the mouth of the Kitimat River, the Kitimat River estuary, Coste Island, and Emsley Cove. A discussion on the potential impacts of the proposed Project on Aboriginal Interests associated with hunting is provided in section 19.1 of this report.

In consideration of the information available to EAO, EAO's proposed conditions, and EAO's analysis of residual and cumulative effects to terrestrial wildlife and marine birds, the proposed Project is expected to result in minor to moderate impacts to Haisla Nation's asserted Aboriginal right to hunt.

### Fishing and Marine Harvesting

Haisla Nation members fish in both freshwater and marine environments and harvest a wide variety of fish species, with eulachon and salmon understood to be among the most important. Kitimat River, Moore Creek, Anderson Creek, and Beaver Creek

provide access to extensive habitat for freshwater and estuarine fish species that are important to Haisla Nation harvesters. The Kitimat River is a critical access corridor for migrating anadromous fish, including all five species of Pacific salmon, steelhead and rainbow trout, cutthroat trout, Dolly Varden, and eulachon. Most of the harvested fish species spawn in freshwater habitats upstream of the Kitimat River. Off-channel habitats to the west of the main-stem of the Kitimat River support stickleback as well as juvenile coho and chum salmon. Spawning adult salmon were not directly observed in the Kitimat River during studies for the Application. Eulachon was also not observed in the Kitimat River.

The Kitimat River has traditionally been an important location for Haisla Nation to fish eulachon. However, development in the area over the last 50 years has led to concerns about pollution and Haisla Nation fishers have, as a result, shifted their focus to other eulachon runs. Eulachon spawn in late winter or early spring, and were often the earliest food source available for harvest. Eulachon fishing has not taken place in the Kitimat River since 1971 because of the discharge from the pulp and paper mill.

During the EA process, Haisla Nation identified the following issues and concerns related to their asserted Aboriginal right to fish:

- Potential effects on fish and fish habitat, including spawning areas, and need for compensation:
  - Effects to eulachon and eulachon habitat, including loss of potential future habitat;
  - Change in behaviour of fish due to pressure waves or underwater noise;
- Adverse impacts to marine life on the sea floor;
- LNG carrier wake and damage to harvesting activities along the shoreline;
- Potential effects on fishing sites, including potential disruption to navigability;
- Water quantity concerns – water withdrawal from Kitimat River;
- Water quality concerns:
  - Treatment of cooling water and effluent discharge management;
  - Dredging methods; and
  - Disposal at sea.

Haisla Nation identified a concern with respect to work occurring near a sensitive Kitimat River side channel over the March eulachon spawning window, specifically regarding potential impacts associated with increased noise and vibrations to spawning eulachon. In response, the Proponent worked with Haisla Nation to ensure that the geotechnical program minimized impacts on important fish habitat, by postponing site preparation and geotechnical drilling in these sensitive areas between December and April, after the spawning window had closed. The Proponent also consulted Haisla Nation on the EMP for the geotechnical program, seeking and incorporating their feedback into this plan.

Haisla Nation expressed concerns regarding loss of fish habitat and loss of potential future eulachon habitat. Haisla Nation identified the importance of working with the

Proponent to develop plans to minimize potential impacts to fish habitat at the proposed Project site.

In response to those concerns, on April 23, 2014, the Proponent held a workshop with Haisla Nation technical staff and Council members on the “Proposed Site Layout and Potential Interactions with the Estuary”. The purpose of this workshop was to present a detailed rendering of the facility, discuss potential Project interactions with the estuary, and identify any related issues and concerns. The workshop also provided a forum to discuss potential habitat compensation measures with the Haisla Nation Council, based in part on feedback received during engagement with Haisla Nation staff throughout 2013. At the meeting on April 23, Haisla Nation expressed support for the proposed re-route option of Beaver Creek to the south of the Project site, where it would join with Anderson Creek. Based on Haisla Nation’s concerns with fish habitat, the Proponent rerouted sections of Beaver Creek and the Kitimat side channel to maintain migration routes to upstream spawning habitats.

Haisla Nation also provided suggestions regarding additional options for habitat compensation, which the Proponent considered in its Conceptual Fish Habitat Offsetting Plan. The Proponent sought Haisla Nation feedback on the draft plan, and subsequently incorporated this feedback into versions that followed. The Proponent states they will continue to consult with Haisla Nation regarding the Fish Habitat Offsetting Plan, to ensure that Haisla Nation’s interests are incorporated into the final version that is submitted to the regulator.

In response to Haisla Nation’s concerns regarding eulachon, the Proponent proposed two potential research programs in the Conceptual Fish Habitat Offsetting Plan that involve eulachon:

1. A long-term stock assessment research program to monitor the status of salmon and eulachon populations in the Kitimat River, and identify the spatial and temporal distribution of spawning areas; and
2. A research program to investigate the feasibility of eulachon propagation to support the recovery of the Kitimat River eulachon population.

The Proponent also notes that the proposed realignment of the section of the Kitimat River Side Channel affected by the proposed Project would provide improved spawning habitat potential for eulachon in that area. Wherever possible, design specifications that target eulachon spawning habitat requirements will be incorporated into the final design of that realigned channel.

Haisla Nation expressed concern regarding the extent of access trails created for the geotechnical program and the effects on seasonal watercourses in the estuary impacting rearing salmon. Haisla Nation was interested in seeing other drainages delineated to ensure they were not obstructed before further road construction occurs. The Proponent stopped work at a particular site of concern, put measures in place to protect flow through the location, and changed access routes to minimize impacts to in-stream habitat (thereby reducing its footprint and potential disturbances to fish habitat).

Haisla Nation members fish and harvest marine resources throughout their traditional territory, and specifically along the Kitimat Arm, at streams along Douglas Channel, Principe Channel, at Banks, Stephens, and Porcher Islands. Shellfish and marine plant resources were important subsistence foods for Haisla Nation members, and were consumed throughout the year. Other marine species harvested include salmon, steelhead trout, eulachon, herring, halibut, cod, snapper, crab, clams, mussels, octopus, sea cucumber, and shrimp. Haisla Nation members travel as far as Clio Bay to harvest shellfish.

Haisla Nation members do not fish or collect shellfish or crab near to the terminal because of the proximity to industrial activity and due to real or perceived chemical contamination in the estuary. Clam harvesting is closed at the head of the channel due to biotoxin and sanitary concerns and would not be affected by the proposed Project.

Haisla Nation members expressed concerns regarding DAS activities, including the potential location. In response, the Proponent met with Haisla Nation on June 26 and July 17, 2014, and selected a preferred disposal location in Kitimat Arm based largely on the feedback received from Haisla Nation. In response to additional concerns raised by Haisla Nation during Application Review, the Proponent removed two DAS sites (DSA2 and DSA3) that had been submitted in their Application. Haisla Nation provided EC with a letter of support for the Proponent's DAS permit application on March 23, 2015.

Vessel traffic may adversely affect preferred harvested species, harvesting methods, traditional land and marine use activities or access to harvesting locations identified by Haisla Nation along the proposed Project's shipping route. Specific harvesting locations that interact with the proposed shipping route include the Kitimat Arm, Douglas Channel, Clio Bay, Principe Channel, Banks, Stephens, and Porcher Islands. Discussions on the potential impacts of the proposed Project on Aboriginal Interests associated with fishing and harvesting marine resources are provided in section 19.2 and 19.5 of this report respectively.

In consideration of the information available to EAO, EAO's proposed conditions, and EAO's analysis of residual and cumulative effects to freshwater and estuarine fish and fish habitat, and marine resources, the proposed Project is expected to result in moderate impacts to Haisla Nation's asserted Aboriginal right to fish and harvest marine resources.

### Trapping

Haisla Nation members trap small fur-bearing animals, including Pacific marten, beaver, fisher, land otter, mink, weasel, and muskrat. They trap throughout their traditional territory, and in specific locations along the Kitimat Arm. Haisla Nation members report no trapping cabins located at or near the proposed Project facility.

Construction of the proposed Project is expected to result in the permanent loss of approximately 49 ha of habitat for Pacific marten. Removal of high suitability old-growth coniferous forest in the facility LSA is the primary effect on Pacific marten year round living habitat. However, the facility LSA represents a very small portion of regionally available habitat for Pacific marten.

In consideration of the information available to EAO, EAO's proposed conditions, and EAO's analysis of residual and cumulative effects to wildlife and current and traditional land use, the proposed Project is expected to result in negligible impacts to Haisla Nation's asserted Aboriginal right to trap.

### Gathering

Haisla Nation members use various locations within the *Yaksda wa'wais* to gather traditional foods from the terrestrial environment during different times of the year. Terrestrial plants gathered include various berries (e.g., bunchberry, cloudberry, crabapple, cranberry, crowberry, black and red currant, elderberry, black gooseberry, huckleberry, raspberry, soapberry, salal, saskatoon, strawberry, thimbleberry), and other species such as hazelnuts, lily of the valley, devil's club, springbank, clover, fireweed, lichen, licorice, pacific silverweed, rice-root, wild onions, common juniper, cinquefoil, copperbush, cow parsnip, Indian hellebore, Labrador tea, lupine, skunk, cabbage, Sylvan goat's beard, wild rose, tubers, and roots. Medicinal plants included black hawthorn and bog and oval-leafed blueberry.

During Application Review, Haisla Nation identified the following issues and concerns related to their asserted Aboriginal right to gather in the terrestrial environment:

- Potential effects to traditional plants (and associated mitigation plans); and
- Air emissions, including monitoring and cumulative effects.

Construction, operation, and decommissioning of the proposed Project could affect Haisla Nation's ability to gather in the terrestrial environment through:

- Changes in the abundance, availability, diversity, and health of harvested traditional plant species;
- Interference with traditional plant gathering methods;
- Limiting or eliminating the use of, or access to, identified valued traditional use locations; and
- Adversely affecting the experience of Haisla Nation members who use land and marine areas affected by Project activities when exercising their plant gathering interests.

As described in section 5.7, potential effects of the proposed Project on vegetation resources, including harvested species would be related primarily to the preparation of the site-specific infrastructure. An estimated 278 ha of vegetation would be cleared within the proposed Project footprint to accommodate the full build out of the facility.

Construction of the proposed Project will result in the direct loss of terrestrial gathering locations and access corridors for those locations within the proposed Project footprint. Haisla Nation's gathering activities would be affected through the direct loss, or alteration of habitat to early seral plant communities of areas located within or near the proposed Project footprint that are used for harvesting and vegetation gathering.

Haisla Nation requested a mitigation plan for anticipated effects to traditional use plant species. The Proponent proposed mitigation aimed at incorporating traditional use plants where appropriate and technically feasible in wetland compensation measures and reclamation of temporary construction areas. In addition, the Proponent developed the proposed wetland compensation measures in consultation with Haisla Nation.

The majority of effects on harvested species and harvesting locations would be highly localized and limited to the proposed Project footprint. Neighboring harvesting areas would largely be unaffected by the proposed Project and would remain available for harvesting of any of the 20 traditional use plant species found in the proposed Project footprint. Traditional users who use harvesting areas within the proposed Project footprint could encounter a high level of interference during operations because the proposed Project footprint would be fenced and therefore restrict access.

As described in detail in section 5.7 of the Application, the construction and operation may result in low magnitude changes in native vegetation health and diversity due to air emissions effects of sulphur dioxide fumigation, nitrogen deposition and acid deposition. Vegetation communities potentially affected by air emissions from the proposed Project will continue to persist, although their growth rate or vigor may be reduced within the areas where critical loads for sulphur dioxide, nitrogen, sulphate and acid are exceeded.

In consideration of the information available to EAO, EAO's proposed conditions, and EAO's analysis of residual and cumulative effects to vegetation and wetland resources, the proposed Project is expected to result in minor impacts to Haisla Nation's asserted Aboriginal right to gather.

#### *Cultural Sites, Trails, and Travelways*

Haisla Nation has asserted Aboriginal rights to spiritual and cultural use of its traditional territory. The Application states that Haisla Nation views all areas within their territory, not just noted sacred sites, as being spiritual.

Haisla Nation members utilize many transportation trails throughout their traditional territory. Marine transportation trails include specific locations at Kitimat Arm, Douglas Channel, and throughout the coastal shipping lanes. Haisla Nation members also partake in canoe journeys along Grenville Channel and the Skeena River.

Construction, operation, and decommissioning could affect the use of sacred or culturally important sites and landscape features by Haisla Nation members, by physically altering those sites or features, interfering with access to those areas, or by

adversely affecting the experience of Aboriginal Groups who use those sites or areas through changes in the acoustic environment and visual quality at those sites. The below table summarizes the predicted interactions between the proposed Project and known Haisla Nation spiritual and cultural use sites.

**Table 20-1: Facility Interactions with Known Spiritual and Cultural Use Sites**

Site	Location & Description	Potential Interaction
<i>Awazois</i>	- The boggy flats on western side of the mouth of Kitimat River	- Safety Zone
<i>Dendenyac'is</i> ("grove of red cedar") - "important stand of red and yellow cedar" – "on both sides, close to the river and easy access for the old people"	- Named site - ritual/spiritual use undetermined; "important stand of red and yellow cedar"	- Water Supply System ROW - Temporary Construction ROW for Water Supply System Upgrade
<i>Gelcistis</i> "long bend" – long "bent" beach	- "about a mile below the Service Centre bridge"	- Water Supply System ROW - Temporary Construction ROW for Water Supply System Upgrade
<i>Paxw</i>	- Current marine terminal docks area - Named site of early Gitamaat settlement - Important traditional Haisla Nation site	- Safety Zone interaction - LNG loading line Corridor (Including Associated Infrastructure) - Haul Road Widening - Marine Terminal - Dredging Area - Material Offloading/Laydown Area
1 registered heritage site – CMTs		- Safety Zone - LNG Processing and Storage Site - Potential Tree Clearing

The water supply system ROW and temporary construction ROW for water supply system upgrades will cross through the *Dendenyac'is* area and may cross through *Gelcistis*, resulting in the removal of some available areas that may currently be used for spiritual and cultural purposes.

According to the Application, Haisla Nation reports that there are no community or personal ritual sites in the Project footprint and there are also no known Haisla Nation member burial sites in the area of the proposed Project. However, one archaeological site was discovered within the Project footprint area during the course of the AIA. Upon discovery, the Proponent immediately informed Haisla Nation and arranged a field visit with Haisla Nation staff and two elders to determine the cultural significance of the site. The site was also appropriately marked with flagging tape to ensure no activity would take place in the site boundaries.

The archaeological site, GaTe-5, will be managed in consultation with the Archaeology Branch and Haisla Nation and in accordance with the Heritage Investigation Permit



issued by the Archaeology Branch. EAO's assessment of the effects of the proposed Project on heritage resources is in section 8 of this report.

Project shipping activities could affect Haisla Nation use of sacred and culturally important sites and landscape features through:

- Qualitative changes in the experience of using sites and landscape features for ritual or spiritually important purposes;
- Effects on ritual sites, sacred sites, and culturally or spiritually important sites; and
- Effects on landforms and natural features associated with ritual or spiritual use.

Marine travelways used by Haisla Nation, including Kitimat Arm, Douglas Channel, and throughout the coastal shipping lanes, would experience a minimal increase in shipping traffic, as shipping traffic during construction and operation is predicted to be similar, with approximately one vessel per day visiting the marine terminal. Module carriers (approximately 173 m long), break bulk carriers (approximately 194 m long), and tugs with tows (tugs will be approximately 25 m long) would be used during construction, with tugs making up approximately 80% of this traffic. Vessels might spend one to seven days working around the marine terminal before leaving.

In consideration of the information available to EAO, EAO's proposed conditions, and EAO's analysis of residual and cumulative effects to culturally important sites, trails and travelways, the proposed Project is expected to result in minor impacts to Haisla Nation's culturally important sites, trails, and travelways.

#### 20.1.5 Other Matters of Concern Raised by Haisla Nation

During the EA process, Haisla Nation raised a number of additional concerns with the proposed Project. Concerns raised by multiple Aboriginal Groups and responses from EAO are provided in section 18 of this report. Concerns specific to Haisla Nation and responses from EAO, are outlined below.

**Table 20-2: Other Matters of Concern Raised by Haisla Nation**

Key issue raised	EAO response
Concern regarding potential nighttime light emissions and the effect on the community.	Potential effects on visual quality are assessed in section 7.4 of this report
Concern with mitigations to preserve old growth forest within LSA.	Proposed condition around visual quality minimizes clearing by requiring the maintenance of a mature vegetation buffer of at least 30 m between the Kitimat River and the proposed project area.

## 20.2 Gitga'at First Nation

### 20.2.1 Context

- Gitga'at First Nation is a Southern Tsimshian group formerly based at Kitkiata Inlet on Douglas Channel and now located at Hartley Bay. Unlike the Nine Allied Tsimshian Tribes of the lower Skeena River and Prince Rupert Harbour, the Gitga'at First Nation did not relocate to Fort Simpson in the 1830s, but they did move to William Duncan's model village of Metlakatla in the 1860s to 1880s. Subsequently, the tribe established a new winter village at Hartley Bay in 1887. They are recorded in historical and ethnographic texts as the Gitga'ata, Kitkiata, Kit-kah-ta, and numerous other variations on that name, and have been known officially as the Kitkahta Indian Band and Hartley Bay Village Council. They are currently affiliated with the Tsimshian First Nations Treaty Society.
- Gitga'at First Nation has 15 registered reserves, settlements, or villages with a total area of 641.7 ha. Gitga'at First Nation has a registered population of 736, with 588 members living off-reserve in Prince Rupert and approximately 170 members living on reserve in Hartley Bay.
- Gitga'at First Nation is governed by a Village Council with one Chief and four Councillors, under a custom electoral system.

### 20.2.2 Aboriginal Interests and EAO's Strength of Claim Assessment and Depth of Consultation

- The proposed Project facility would be located approximately 13 km from Gitga'at First Nation's asserted traditional territory and the proposed Project shipping route would traverse approximately 100 km of Gitga'at First Nation's asserted traditional territory.
- As articulated in EAO's letter to Gitga'at First Nation on February 19, 2014, EAO assessed Gitga'at First Nation's Aboriginal rights claim, based on currently available information related to the activities, practices, traditions and customs integral to the distinctive culture of the Gitga'at people prior to contact with Europeans (understood to be around 1787). On June 26, 2014, the *Tsilhqot'in Nation v. British Columbia (Tsilhqot'in)* decision was released by the Supreme Court of Canada. The decision clarified the test for Aboriginal title relating to the elements of sufficient and exclusive occupation at 1846.
- The Province assessed Gitga'at First Nation as having strong *prima facie* claim of Aboriginal rights to harvest marine and terrestrial resources to areas in proximity to the shipping route that overlapped with its asserted territory. EAO is of the view that there is information that may indicate sufficient or exclusive occupation at 1846 that supports a moderate or strong *prima facie* claim of Aboriginal title within or near those portions of the proposed Project areas in close proximity to the Gitga'at sites at Kitkiata Inlet, Hartley Bay, the south end of Pitt Island and west Gill Island, and nearby harvesting areas.
- Given the nature and location of the proposed Project, and the potential impacts of the proposed Project on Gitga'at First Nation's Aboriginal Interests as

discussed below, EAO is of the view that the duty to consult Gitga'at First Nation lies in the middle of the *Haida* spectrum.

- Gitga'at First Nation disagreed with EAO's strength of claim assessment stating Gitga'at First Nation asserts Aboriginal title to much of the Douglas Channel and that Gitga'at First Nation has a strong prima facie claim to Aboriginal title for certain places along the shipping route.
- Notwithstanding the above conclusion, all Aboriginal Groups listed in Schedules B and C of the Section 11 Order have been consulted at the deeper end of the *Haida* consultation spectrum.

### 20.2.3 Summary of Consultation

Gitga'at First Nation was invited to review and provide comments on the draft AIR, Section 11 Order, the Proponent's Aboriginal Consultation Plan and Reports, the screening of the Application and on the Application. Gitga'at First Nation was also provided with opportunities to attend Working Group meetings, workshops and to meet with EAO staff directly.

EAO provided \$5,000 in capacity funding to Gitga'at First Nation during the Pre-Application phase and \$10,000 during the Application Review phase of the EA process to assist with costs associated with participation in the EA review, including completion of traditional use studies. The Agency provided \$50,000 in capacity funding to Gitga'at First Nation.

Gitga'at First Nation was an active participant in the EA, during both Pre-Application and Application Review, and EAO engaged with Gitga'at First Nation in a variety of manners throughout the process to seek to better identify, understand, and resolve concerns. Gitga'at First Nation participated in the EA by providing comments on the draft AIR, draft Section 11 Order and the Application, attending face-to-face meetings and workshops, participating in conference calls, and corresponding via email.

During Application Review, some of the engagements between EAO and Gitga'at First Nation include:

- January 20 to 22, 2015 – Working Group meeting in Vancouver;
- February 13, 2015 – meeting in Vancouver to discuss SOC;
- March 4, 2015 – meeting in Victoria to discuss any Gitga'at First Nation outstanding concerns with the proposed Project; and
- April 15, 2015 – meeting in Vancouver to discuss results of additional Wake analysis.

The Proponent also provided capacity funding to Gitga'at First Nation to support their participation in the regulatory process and completion of Gitga'at First Nation traditional use and socio-economic impact assessment reports to identify where the proposed Project may interact with their Aboriginal Interests. On November 25, 2014, the Proponent received the final versions of the Economic Impact Assessment and Social

Impact Assessment studies as well as the “*Gitga’ata First Nation Traditional Use or Occupancy Study Project for the Proposed LNG Carrier Shipping Route: Preliminary Report*”. The Proponent noted that given the late arrival of the studies they had not been incorporated into the Application, but that these studies would inform ongoing consultation, including the development of mitigation strategies, plans and general Project planning.

Additional information related to Gitga’at First Nation’s Aboriginal Interests from the following documents were included in the Application:

- *Gitga’at List of Proposed Potential Adverse Project Effects, Rationale and Measurable Parameters (Gitga’at First Nation 2013);*
- *Being Gitka’a’ata: A Baseline Report on Gitka’a’ata Way of Life, a Statement of Cultural Impacts Posed by the Northern Gateway Pipeline, and a Critique of the ENGP Assessment Regarding Cultural Impacts (Satterfield et al. 2011);*
- *Gitga’at Economic Development Strategy (Hartley Bay Council 2011);* and
- *Gitga’at Sustainable Tourism Strategy (Gitga’at Nation 2003).*

The Proponent engaged with Gitga’at First Nation throughout the EA process, including discussions regarding results of baseline studies and strategies to mitigate potential adverse effects of the proposed Project; as well as focused discussions with respect to the proposed Project’s shipping activities, LNG carrier vessel wake and the TERMPOLE process. Meetings were also held with Gitga’at First Nation to discuss the consultation process and methods for engaging Gitga’at First Nation members through the Application Review phase, as well as potential training, employment, business and contracting opportunities resulting from the proposed Project.

In Pre-Application meetings with the Proponent, Gitga’at First Nation identified concerns related to air quality monitoring and the timing and duration for collection of baseline air quality data in Hartley Bay. In response to concerns expressed by Gitga’at First Nation, the Proponent committed to ongoing air quality monitoring until September 2014 to collect one full year of baseline data at three air quality receptor sites installed within Gitga’at First Nation’s asserted traditional territory. Gitga’at First Nation commented that they may want to change locations of air quality monitoring stations in their asserted traditional territory based on the outcome of the BC Government’s regional Kitimat Airshed Assessment. The Proponent committed to continue to discuss air quality concerns with Gitga’at First Nation, in addition to proposed mitigation measures to address the potential adverse impacts on Gitga’at First Nation’s Aboriginal Interests.

Gitga’at First Nation also identified eight view points of interest, including viewpoints from Hartley Bay and marine harvesting sites along the proposed shipping route, which were incorporated into the visual quality assessment and included in the Application. The Proponent also discussed with Gitga’at First Nation how the visual quality assessment and view point images could be used in consultation with community members throughout the Application Review stage of the EA process.

Gitga'at First Nation also provided information regarding the timing of marine mammal presence and indicated that Pacific white-sided dolphin aggregations were largest (greater than 100 animals) in the shipping RSA during February. Based on this information, the timing of the marine mammal field program was adjusted to capture these sightings. The Proponent invited Gitga'at First Nation to participate in the marine mammal surveys undertaken for the Application.

The Proponent engaged in detailed discussions with Gitga'at First Nation regarding the proposed marine access route and potential adverse effects of shipping activities on Gitga'at First Nation's Aboriginal Interests. On April 14-15, 2014, the Proponent met with Gitga'at First Nation and discussed the proposed approach to the LNG carrier Wake Study and received feedback from Gitga'at First Nation. On April 24, 2014, the Proponent provided Gitga'at First Nation with the draft scope of work for the Wake Study for their review and comment. The final LNG Canada technical Wake Study report was provided to Gitga'at First Nation on January 5, 2015. Additional material developed by the Proponent to address wake concerns, including a wake visualization video of an LNG carrier transiting a channel and LNG Canada's safe shipping video were also shared with Gitga'at First Nation.

In September 2014, the Proponent invited Gitga'at First Nation to participate in a stakeholder tour of Oman LNG. Representatives of Gitga'at First Nation (along with representatives from the District of Kitimat and Haisla Nation) participated in this tour from October 18 – 25, 2014, which included a visit to the Oman LNG facility, a tour of an LNG carrier, and meetings with local stakeholders and government officials to discuss their experience with the LNG industry.

On November 28, 2014, following a request from Gitga'at First Nation, the Proponent provided a draft Conceptual Fish Habitat Offsetting Plan and invited Gitga'at First Nation to attend a Fish and Wetland Compensation Plan workshop held at the LNG Canada Information Centre in Kitimat on December 1, 2014.

In response to Gitga'at First Nation's comments on the Application, the Proponent provided several technical memos and information request responses. The Proponent and Gitga'at First Nation engaged in separate meetings on the priority issues of concern identified by Gitga'at First Nation. Issues raised by Gitga'at First Nation and the Proponent's and EAO's responses are provided in the Working Group Issues Tracking Table.

In the final Aboriginal Consultation Report #3, which included consultation activities from May 2014 – January 2015, the Proponent committed to ongoing consultation with Gitga'at First Nation to address priority issues of concern, including: interference from shipping activities on Aboriginal and commercial fishers; invasive species; cultural impacts and health impacts to the community; effects of shipping on marine mammals; GHG emissions; and impacts on traditional governance.

During Application Review, on January 8, 2015, Gitga'at First Nation provided EAO with the following Project-specific traditional use study and socio-economic impact assessment reports:

- *Social Impact Assessment of the LNG Canada Project on the Gitga'at First Nation* (Social Impact Report) (Ritchie and Gill, July 2014);
- *Economic Impact Assessment of the LNG Canada Project on the Gitga'at First Nation Final Report* (Compass Resource Management July 21, 2014); and
- *Gitga'at First Nation Traditional Use and Occupancy Study Project for the Proposed LNG Carrier Shipping Route: Preliminary Report* (Inglis Consulting October 2014). This report provided additional information regarding Gitga'at First Nation's Aboriginal title and rights along the proposed Project shipping route. EAO and Ministry of Justice Aboriginal Research Division (JAG) reviewed this report and determined it did not contribute to a change in the Province's strength of claim assessment. A summary of JAG's conclusions were provided to EAO in a memo, dated March 16, 2015, and provided to Gitga'at First Nation on April 19, 2015.

The traditional use and impact assessment reports noted above were provided following submission of the Proponent's Application. EAO reviewed and considered these reports in the assessment of potential impacts of the proposed Project on Gitga'at First Nation's Aboriginal Interests.

Gitga'at First Nation provided the Proponent with a letter of support for the proposed Project, dated February 12, 2015, and shared this letter with EAO in March 2015.

In a comment submitted to EAO on April 17, 2015, Gitga'at First Nation noted that it is still not clear to Gitga'at First Nation how the Proponent's final wake study incorporated the information provided by Gitga'at First Nation's consultant, Sea Science Inc. in April 2015, EAO met with Gitga'at First Nation and other Aboriginal Groups to better inform EAO's conclusions regarding vessel wake and to inform EAO's proposed condition.

On April 21, 2015, Gitga'at First Nation provided EAO with a letter indicating its support for the proposed Project, provided that the Proponent continued to fulfill its commitments under the impact mitigation and benefits agreement.

A summary of the Proponent's consultation activities with Gitga'at First Nation is provided in the Aboriginal Consultation Reports.

## 20.2.4 Potential Impacts of the Proposed Project on Gitga'at First Nation's Asserted Aboriginal Interests

### *Aboriginal Title*

EAO has ensured that Gitga'at First Nation has been meaningfully consulted and accommodated on the potential effects of this proposed Project. As discussed in section 19.7 of this report, in consideration of the information available to EAO, EAO's proposed conditions, and EAO's analysis of residual and cumulative effects to marine resources, marine transportation and use, and visual quality, EAO is of the view that the proposed project is expected to have negligible impacts on Aboriginal title claims in proximity to the shipping route.

### *Harvesting Activities*

Gitga'at First Nation traditionally relied upon a number of land-based and marine resources, including: seaweed and plants; fish, octopus, and shellfish; birds; and mammals. Salmon, halibut, and cedar are particularly central to Gitga'at First Nation's culture and way of life.

### Hunting

Gitga'at First Nation members hunt a variety of species throughout their asserted traditional territory, including, seal, sea-lions, deer, mountain goat, moose, black bear, duck, and geese. Seal and sea-lions are hunted around Ferrant Island, Fin Island, and Hartley Bay. Deer and mountain goat are hunted along the Douglas Channel shorelines, from Kishkosh Inlet and Old Town, and black bear are hunted at various locations along the proposed Project shipping route. Duck and geese are both hunted at Old Town and Kishkosh Inlet and moose are hunted at Old Town.

All of the hunting sites identified above are located in proximity to the proposed Project shipping route. A discussion on the potential impacts of the proposed Project on Aboriginal Interests associated with hunting is provided in section 19.1 of this report.

In consideration of the information available to EAO, EAO's proposed conditions, and EAO's analysis of residual and cumulative effects to terrestrial wildlife and marine birds and marine resources the proposed Project is expected to result in minor impacts on Gitga'at First Nation's asserted Aboriginal right to hunt.

### Fishing and Marine Harvesting

Gitga'at First Nation members fish and harvest marine resources throughout their traditional territory, including: salmon, halibut, cod, crab, herring, shrimp and prawns, octopus, sea cucumber, chiton, shellfish, seaweed, and kelp. According to the Application, all of the aforementioned species are harvested throughout the proposed Project shipping route. Specific fishing and harvesting locations include:

- Salmon – harvested at Hartley Bay, Old Town, along rivers and creeks feeding into Douglas Channel, and Union Pass;
- Halibut and cod – around Hartley Bay;
- Seagull eggs – collected near water on Campania Island;
- Crab – around islands, in inlets and bays;
- Shrimps and prawns – Douglas Channel and associated inlets; and
- Seaweed and kelp – around Otter Channel, Otter Pass, and Estevan Sound.

During Application Review, Gitga’at First Nation stated that they had an eulachon fishing station on the Kemano River.

With the exception of the Kemano River, all of the identified Gitga’at First Nation specific fishing and marine harvesting sites listed above are in proximity to the proposed Project shipping route.

Vessel traffic associated with the proposed Project during construction and operation has the potential to affect harvesting-related activities, including temporary restrictions in marine navigation and access to specific harvesting locations. During construction, most of the Project-related increases in marine traffic would occur near the proposed Project’s shipping terminal near Kitimat in Douglas Channel. During operations, Project-related effects to increased marine traffic would occur along the shipping route from Kitimat to the Triple Island Pilot Station, including increased marine traffic near the Gitga’at community of Hartley Bay.

Gitga’at First Nation expressed several concerns regarding potential impacts from the proposed Project on Gitga’at First Nation’s Aboriginal Interests related to fishing and marine harvesting, including:

- Potential effects on current use of lands and resources for traditional purposes;
- Increased local air pollution emissions, with potential effects on freshwater fish habitat;
- Potential effects associated with operation of the LNG facility and terminal and related shipping and marine transportation activities on marine resource harvesting sites and activities;
- Increased shipping traffic may interfere with access to Aboriginal and commercial fishing opportunities;
- Vessel noise/acoustic disturbance may adversely affect fish populations and marine mammals;
- Vessel strikes may cause injury or mortality to marine mammals;
- Potential impacts of wake on shoreline environments, fish and fish habitat, shoreline harvesters, marine users in small boats;
- Ballast water exchange and accidental discharges of bilge or hull fouling may introduce invasive species;
- Increased greenhouse gas emissions and the associated potential adverse effects on the marine environment (e.g., decreased ocean pH) and marine resources (e.g. shellfish);



- Cumulative effects of shipping on marine resources, harvesting, tourism, recreation, fisheries, navigation, and Aboriginal cultural identity;
- Water intake from the Kitimat River and potential impacts to fish habitat;
- Water quality concerns, including: surface water acidification of lakes and streams; effluent discharge management at the marine terminal; dredging and disposal at sea;
- Concerns with how the wetland compensation plan will be carried out;
- Competition for resource harvesting in Gitga'at asserted traditional territory; and
- Adequacy of proposed mitigation measures.

On February 9, 2015, Gitga'at First Nation provided general support for the Conceptual Fish Habitat Offsetting Plan and corresponding technical review, indicating that for the most part, the proposed offsetting measures appear to have been well thought out and the Proponent is proposing to spend considerable effort to obtain the required data to support and implement the projects.

Gitga'at First Nation expressed concern and dissatisfaction with the Proponent's wake study, mainly because the study did not analyze wave period, direction and height at near shore locations. Gitga'at First Nation requested additional modelling to assess impacts from two LNG carriers passing one another at the narrowest point on the marine access route, as well as impacts to shoreline harvesters in calm weather conditions and Gitga'at marine users travelling in small boats close to shore. Recognizing this as a key area of concern, EAO required additional studies from the Proponent during Application Review.

In response to Gitga'at First Nation's concerns, the Proponent met with Gitga'at First Nation on April 14-15, 2014, and provided information regarding preliminary proposed mitigation measures, including, a reduction in vessel speed along the marine access route, passing restrictions so that LNG carriers may only be permitted to pass in straight sections of the route, the use of escort tugs between Triple Island and Kitimat during all LNG carrier transits and the use of three tugs to support the berthing of vessels.

Additional information regarding mitigation measures and assessment of residual effects and cumulative effects on the marine transportation and use VC is discussed in section 7.3 of this report. A discussion on the potential impacts of the proposed Project on Aboriginal Interests associated with fishing and harvesting marine resources is provided in section 19.2 and 19.5 of this report respectively.

In consideration of the information available to EAO, EAO's proposed conditions, and EAO's analysis of residual and cumulative effects to freshwater and estuarine fish and fish habitat and marine resources, the proposed Project is expected to result in minor impacts to Gitga'at First Nation's asserted Aboriginal right to fish and harvest marine resources in the area of the proposed Project.

## Trapping

Gitga'at First Nation members trap beaver, marten, fisher, land otter, mink, weasel, and muskrat at specific locations along the Kitimat Arm. Gitga'at First Nation has two traplines in the vicinity of the Project shipping route: one on southern Pitt Island and one in Kiskosh Inlet.

A discussion on the potential impacts of the proposed Project on Aboriginal Interests associated with trapping is provided in section 19.2.3 of this report.

In consideration of the information available to EAO, EAO's proposed conditions, and EAO's analysis of residual and cumulative effects to terrestrial wildlife and marine birds, the proposed Project is expected to result in negligible impacts on Gitga'at First Nation's asserted Aboriginal right to trap.

## Gathering

According to the Application, Gitga'at First Nation members gather berries, crab-apples, wild rice, various tubers and roots, and other terrestrial plant species for medicinal purposes. Plant harvesting was indicated to occur throughout the proposed Project shipping route and specifically near past and present settlements.

During Application Review, Gitga'at First Nation expressed concerns with the cumulative effects of air emissions and the potential impacts of increased local air emissions on vegetation. They also stated that Gitga'at First Nation plant harvesters use waterways along the marine access route to gather plants and there is particular danger when travelling by small boats. A discussion on the potential impacts of the proposed Project on Aboriginal Interests associated with terrestrial vegetation gathering is provided in section 19.4 of this report.

In consideration of the information available to EAO, EAO's proposed conditions, and EAO's analysis of residual and cumulative effects to vegetation and wetland resources, the proposed Project is expected to result in negligible impacts on Gitga'at First Nation's asserted Aboriginal right to gather.

## *Cultural Sites, Trails, and Travelways*

In the Application, Gitga'at First Nation identified cultural sites of significance and travelways within the proposed Project shipping route, including:

- Rock art – within 200 m, of the ocean;
- Human remains – at Hartley Bay, Turtle Point, Old Town, Campania Island, and Otter Channel;
- Shell midden and fish traps – found throughout the proposed Project shipping route; and
- Travelways – throughout the proposed Project shipping route.

All of the above cultural values identified as culturally important to Gitga’at First Nation are within or in proximity to the proposed Project shipping route.

During Application Review, Gitga’at First Nation raised concerns about CMTs and stated that damage or removal of CMTs can affect a Gitga’at First Nation member’s connection to identity, which is directly related to Aboriginal health. CMTs are also used as guides to find good areas with high quality cedar, which some elders rely on for income by selling basketry/weaving. In addition, the use of CMTs is directly connected to Gitga’at First Nation’s current use of the area for traditional purposes. Alteration or removal of terrestrial or intertidal archaeological or heritage sites can be affected in the same way. This could lead to disconnection of identity affecting Aboriginal health and potential tourism opportunities, which some community members rely on for income. This could also affect land markers for contemporary use.

In response, the Proponent noted that no CMTs and no inter-tidal archaeological or heritage sites were identified in conflict with the proposed Project site or marine terminal. The Proponent also indicated that no proposed Project effects of any kind are anticipated on archaeological and heritage resources within Gitga’at First Nation’s asserted traditional territory.

Gitga’at First Nation expressed concerns related to the potential effects of LNG carriers passing by cultural and heritage sites such as Gitga’at First Nation’s graveyard at Turtle Point, where cultural ceremonies take place. The concern was with visual quality effects and heritage effects from vessel wake on culturally important sites and activities along the shoreline. A discussion on the potential impacts of the proposed Project on Aboriginal Interests associated with archeological and heritage resources is provided in section 19.6 of this report.

In consideration of the information available to EAO, EAO’s proposed conditions, and EAO’s analysis of residual and cumulative effects to archaeological and heritage resources, the proposed Project is expected to result in minor impacts to Gitga’at First Nation’s culturally important sites, trails, and travelways.

#### 20.2.5 Other Matters of Concern Raised by Gitga’at First Nation

During the EA process, Gitga’at First Nation raised a number of additional concerns with the proposed Project. Concerns raised by multiple Aboriginal Groups and responses from EAO are provided in section 18 of this report. Concerns specific to Gitga’at First Nation and responses from EAO, are outlined below.

**Table 20-3: Other Matters of Concern Raised by Gitga’at First Nation**

Key issues raised	EAO response
Concern that small-scale vessel spills are not being recorded, which, cumulatively may contribute to contamination of shellfish and potentially, marine birds as a result.	Accidents and malfunctions are assessed in section 10.  Prior to the commencement of construction activities, the Proponent would be required to develop ERPs to address

Key issues raised	EAO response
	<p>preparedness, prevention and response to an accident or malfunction on the proposed Project throughout the construction and operational phases.</p> <p>For marine emergency response, the Proponent has committed to work with marine users to develop a shared and coordinated marine based response to marine emergencies.</p>

## 20.3 Gitxaala Nation

### 20.3.1 Context

- Gitxaala Nation is a Tsimshian group based at *Lach Klan*, also known as the village of Kitkatla on Dolphin Island, located 45 km south of Prince Rupert, BC and approximately 118 km west of the proposed Project facility. Kitkatla is only accessible by boat or float plane. Gitxaala Nation has 21 registered reserves, settlements, or villages with a total area of 1885.2 ha. Gitxaala Nation has a registered population of 1,912, with 444 members living on-reserve.
- Gitxaala Nation refer to themselves as *Git Lax Moon*, meaning “people of the salt water”.
- Gitxaala Nation is governed by a Council with a Chief Councillor, Deputy Chief and five Councillors, under a custom electoral system.

### 20.3.2 Aboriginal Interests and EAO’s Strength of Claim Assessment and Depth of Consultation

- Gitxaala Nation’s asserted traditional territory is presented in the Strategic Land Use Planning agreement between Gitxaala Nation and the Province, with a northern boundary that includes the Prince Rupert area north of Porcher Island.
- Within their asserted traditional territory, Gitxaala Nation assert Aboriginal title, the Aboriginal right to fish and gather marine resources, governance over lands and waters and associated rights of access and travel, and rights to teach and pass on traditional activities to maintain Gitxaala Nation’s way of life.
- The proposed Project facility would be located approximately 30 km from Gitxaala Nation’s asserted traditional territory. The proposed Project’s shipping route would traverse approximately 230 km of the marine environment in Gitxaala Nation’s asserted traditional territory.
- As articulated in EAO’s letter dated January 31, 2014, EAO assessed Gitxaala Nation’s Aboriginal rights claim, based on currently available information related to the activities, practices, traditions and customs integral to the distinctive culture of the Gitxaala people prior to contact with Europeans (understood to be around 1787). On June 26, 2014, the *Tsilhqot’in Nation v. British Columbia (Tsilhqot’in)* decision was released by the Supreme Court of Canada. The decision clarified the test for Aboriginal title relating to the elements of sufficient and exclusive occupation at 1846.

- A summary of the Province’s understanding regarding Gitxaala Nation’s strength of claims to Aboriginal rights and title with respect to the lands adjacent to the proposed Project shipping route, is as follows:
  - Douglas Channel: Kitimat Arm to Gribbel Island – There is no indication that the proposed Project would overlap with what is understood to be Gitxaala Nation’s asserted traditional territory at the time of European contact (1787);
  - Wright Sound to Dolphin Island along the proposed Project Shipping Route – There is information indicating that this area was within what is understood to be Gitxaala Nation’s asserted traditional territory prior to European contact (1787) and that Gitxaala Nation used this area prior to contact, which supports a strong *prima facie* claim to Aboriginal rights to fish, hunt, trap and gather marine and terrestrial harvest resources in this area. EAO is of the view that there is information indicating sufficient or exclusive occupation at 1846 that supports a strong *prima facie* claim of Aboriginal title within or near those portions of the proposed Project areas in close proximity to the Gitxaala Nation village sites, *Çitçiyéks* at the south end of Pitt Island and *Ks’we.n* at the south end of Banks Island, village sites at Kitkatla, Port Canaveral, *Laxt’dzəp* at Sand Island IR4, *Tétsəp* on MacCauley Island and *wəłhatyaét mədik* at Alpha Bay and nearby harvesting areas; and
  - Brown Passage (near Porcher Island) – There is information indicating that this area was within what is understood to be Gitxaala Nation’s asserted traditional territory prior to European contact (1787) and that Gitxaala Nation used this area prior to contact, which supports a strong *prima facie* claim to Aboriginal rights to fish, hunt, trap and gather marine and terrestrial harvest resources in this area.
- Given the nature and location of the proposed Project, and the potential impacts of the proposed Project on Gitxaala Nation’s Aboriginal Interests as discussed below, EAO is of the view that the duty to consult Gitxaala Nation lies in the middle of the *Haida* spectrum.
- Gitxaala Nation disagreed with EAO’s assessment of Gitxaala Nation’s strength of claim stating the Preliminary Assessments prepared by EAO do not capture the full extent of potential impacts to Gitxaala Nation’s Aboriginal rights from the proposed Project, as well as potential impacts to Gitxaala Nation’s title to the area. Gitxaala Nation also does not agree that its Aboriginal title is limited to these specific sites and asserts that its Aboriginal title to all of the areas within its Traditional Territory that would be affected by marine traffic components of the proposed Project. This includes the fifteen reserves along the proposed tanker route as well as additional village sites.
- Notwithstanding the above conclusion, all Aboriginal Groups listed in Schedules B and C of the Section 11 Order have been consulted at the deeper end of the *Haida* consultation spectrum as described in section 14 of this report.

### 20.3.3 Summary of Consultation

Gitxaala Nation was invited to review and provide comments on the draft AIR, draft Section 11 Order, the Proponent's Aboriginal Consultation Plan and Reports, the screening of the Application and the Application. Gitxaala Nation was also provided with opportunities to attend Working Group meetings, workshops and to meet with EAO staff directly.

EAO provided \$10,000 in capacity funding to Gitxaala Nation during the Pre-Application phase and \$5,000 in capacity funding during the Application Review phase of the EA process to assist with costs associated with their participation in the EA review. The Agency provided \$50,000 in capacity funding to Gitxaala Nation.

The Proponent and Gitxaala Nation signed a Capacity Funding Agreement on December 18, 2013, which included funding to support participation in the regulatory process, to provide input into the assessment of effects and proposed mitigation measures, and to collect TU/TK and socioeconomic information. The TUS was used to help inform the Application.

On January 16, 2014, the Proponent provided Gitxaala Nation with an update on the TERMPOLE review process.

On March 5, 2014, the Proponent provided Gitxaala Nation with the *Glosten Associates' Third Party Expert Review of the Moffatt and Nichol Enbridge Northern Gateway Project Wake Study* (Wake Study), which Gitxaala Nation reviewed and provided comments on. The Proponent offered to meet to discuss the third party review, as well as the scope of work for the Proponent's forthcoming wake study. On April 25, 2014, the Proponent provided Gitxaala Nation with the planned scope of work for the Proponent's wake study for review and comment and provided the TERMPOLE proposed scope of work to Gitxaala Nation for review and comment.

Gitxaala Nation was an active participant in the EA, during both Pre-Application and Application Review, and EAO engaged with Gitxaala Nation in a variety of manners throughout the process to seek to better identify, understand, and resolve concerns. Gitxaala Nation participated in the EA by providing comments on the draft AIR, draft Section 11 Order and the Application, attending face-to-face meetings and workshops, participating in conference calls, and corresponding via email.

During Pre-Application, Gitxaala Nation raised several concerns regarding the Section 11 Order and the draft AIR, including:

- Consultation requirements and the manner in which the Section 11 Order was implemented by the Proponent;
- Lack of specificity in the draft AIR on requirements for the Application to include a specific assessment of impacts on Gitxaala Nation's Aboriginal Interests;
- VCs selected should include not only biophysical and socioeconomic components but should also include VCs that relate to activities carried out by

- Gitxaala Nation and encompass the exercise of Aboriginal Interests; and
- Failure to explicitly require examination of cumulative effects in relation to Aboriginal Interests.

During Application Review, some of the engagement between EAO and Gitxaala Nation included:

- January 20 to 22, 2015 – Working Group meeting in Vancouver;
- April 13, 2015 – meeting in Victoria to discuss any outstanding Gitxaala Nation comments or concerns with the proposed Project; and
- April 15, 2015 – meeting with Aboriginal Groups in Vancouver to discuss results of additional wake analysis.

On April 1, 2014, Gitxaala Nation provided the Proponent with the *Gitxaala Valued Components Report* (Calliou Group 2014), *Gitxaala Nation Socioeconomic Baseline Final Report* (Firelight Group 2014), and *Gitxaala Use Study Report* (Calliou Group 2014) to help inform the Application. Information contained in these studies was used to inform the selection of VCs and to inform and expand the study areas used to assess specific VCs, as well as to inform the Proponent's assessment of potential impacts to Aboriginal Interests. In addition, the Proponent informed their approach to assessing Aboriginal Interests in the Application on the report, and assessed each of the VCs that Gitxaala Nation identified as being important to their community.

On July 3, 2014, the Proponent met with Gitxaala Nation to provide an update on the EA schedule, wake study, and TERMPOL process. The Proponent met again with Gitxaala Nation on August 25, 2014, to discuss Part C of the Application, their comments and associated changes to the final Application. The Proponent and Gitxaala Nation, including its consultants, met in Vancouver on January 9, 2015, to discuss the Application, including Gitxaala Nation key issues and the Proponent's response to those issues raised through the Working Group process.

In October 2014, the Proponent offered the Gitxaala Nation an opportunity to tour an operational LNG processing facility and LNG carrier in Sur, Oman. Representatives from Gitxaala Nation were identified to join the tour, but at the time, personal and other unforeseen circumstances precluded participating in the trip.

The Proponent met with Gitxaala Nation on February 10, 2015 to discuss the additional wake study being undertaken by the Proponent, and Gitxaala Nation's request for further assessment related to harvesting locales. At this meeting, the Proponent agreed to develop a document outlining proposed plans and processes, relevant to Gitxaala Nation's key interests and concerns, including estimated timing and protocols to engage with Gitxaala Nation. This document would provide additional certainty to Gitxaala Nation on how the Proponent would continue to address specific areas of concern. An initial draft of this document was provided on April 10th, 2015.

The Proponent also sought Gitxaala Nation's participation in the air, noise, marine mammal, and visual quality assessments, as well as feedback on potential receptor

sites. Gitxaala Nation provided additional air quality receptor locations, one of which was included in the Proponent's air quality study. Gitxaala Nation members also participated in baseline air quality monitoring activities.

Issues raised by Gitxaala Nation and the Proponent's responses are provided in the Working Group Issues Tracking Table. A summary of the Proponent's engagement activities with Gitxaala Nation is provided in the Proponent's Aboriginal Consultation Reports.

In a meeting between EAO and Gitxaala Nation on April 13, 2015, Gitxaala Nation emphasized the importance that Aboriginal governance has to Gitxaala Nation and how traditionally houses have authority and jurisdiction over their territories. Although the Proponent assessed Aboriginal governance as it relates to harvesting, Gitxaala Nation expressed the concern that Aboriginal governance is not just about subsistence activities, but about maintaining house system authority. For example, any potential interference or development within a territory may be perceived as interference with a house's authority or jurisdiction. It was not clear to Gitxaala Nation how EAO assessed Aboriginal governance or cultural identity in EAO's draft Assessment Report.

EAO indicated that it had considered the information and findings in the Proponent's Application, which was organized around the following potential adverse project effects to Aboriginal Interests:

- Disturbance of traditional harvesting (e.g., hunting, fishing, trapping, gathering);
- Disturbance of the use of sacred and culturally important sites and landscape features;
- Changes that affect aspects of traditional Aboriginal Governance;
- Changes in aspects of Aboriginal cultural identity; and
- Effects on Aboriginal spiritual places.

EAO reviewed all of the sub-components (indicators) under each effect listed above, and this information and analysis was a key foundation for informing EAO's assessment of impacts to Aboriginal Interests, which is based around the subcategories for harvesting activities (hunting, fishing, trapping, and gathering) and cultural sites, trails, and travelways. In reviewing a draft of this report, Gitxaala Nation indicated to EAO that it did not agree that their rights were limited to these interests.

#### 20.3.4 Potential Impacts of the proposed Project to Gitxaala Nation's Asserted Aboriginal Interests

##### *Aboriginal Title*

EAO has ensured that Gitxaala Nation has been meaningfully consulted and accommodated on the potential effects of this proposed Project. As discussed in section 19.7 of this report, in consideration of the information available to EAO, EAO's proposed conditions, and EAO's analysis of residual and cumulative effects to marine resources,



marine transportation and use, and visual quality, EAO is of the view that the proposed project is expected to have negligible impacts on Aboriginal title claims in proximity to the shipping route.

### *Harvesting Activities*

Traditionally, the seasonal runs of salmon, herring and eulachon set the pattern for the yearly cycle of Gitxaala Nation's economic activities. Gitxaala Nation also harvest a number of other resources, including sea mammals, various plant species, including seaweed and the bark of several species of trees, seabird eggs, land mammals such as bear, deer and goat, and shellfish. The harvesting and consumption of traditional foods continues to be very important to Gitxaala Nation members living at Kitkatla and elsewhere.

Gitxaala Nation members report that significant harvesting times occur from February to June and again in October through December.

### Hunting

The Application states that hunting is important to Gitxaala Nation's culture, both pre- and post-contact. Gitxaala Nation hunt a variety of species throughout their asserted traditional territory, including:

- Deer – hunted around Goschen Island, Principe and Otter Channels, and in Wright Sound;
- Mountain goats – hunted in one identified area in Port Stephen's in Principe Channel;
- Duck – hunted in areas around Goschen, Gurd, McCauley and Dolphin islands and the northwest portion of Banks Island;
- Goose – hunted in areas around Goschen, Gurd, and Dolphin islands and the northwest portion of Banks Island;
- Swan – hunted in areas around Goschen, Gurd, and Dolphin islands;
- Harbour seal – hunted around Goschen Island and Principe Channel; and
- Sea lion – hunted around Goschen Island.

The hunting sites identified above all overlap or are in proximity to the proposed Project shipping route. Vessel traffic may adversely affect preferred harvested species, harvesting methods, traditional land and marine use activities or access to hunting locations identified by Gitxaala Nation along the proposed Project's shipping route.

Temporary restrictions to marine navigation, travelways and access related effects to Gitxaala Nation's hunting activities would be primarily limited to the effects of Project-related vessels transiting along the shipping route to and from Douglas Channel and the Triple Island Pilot Station, and BC Pilotage Authority crew boats transiting between Prince Rupert and the Triple Island Pilot Station.

During Application Review, Gitxaala Nation raised concerns regarding potential shipping impacts on marine mammals, such as disruption in behaviour due to underwater noise effects, resulting in impacts to marine mammal populations and the feeding grounds of migrating marine mammals. A discussion on the potential impacts of the proposed Project on Aboriginal Interests associated with hunting is provided in section 19.1 of this report.

In consideration of the information available to EAO, EAO's proposed conditions, and EAO's analysis of residual and cumulative effects to terrestrial wildlife and marine birds, and marine resources, the proposed Project is expected to result in minor impacts to Gitxaala Nation's asserted Aboriginal right to hunt.

### Fishing and Marine Harvesting

Marine resources make up a large part of Gitxaala Nation's subsistence, and the reliance on these resources goes beyond commercial and food procurement, it forms part of Gitxaala Nation's identity and community. In addition, Gitxaala Nation identified fishing as a key component of their governance and cultural identity. Important species include herring, salmon species, a variety of rockfish, halibut, eulachon, a variety of invertebrates (including shrimp, crab, shellfish, and octopus), seaweed, and kelp. Harvesting of shellfish and other tidal resources is an important harvesting activity and includes chitons, sea prunes, sea cucumbers, clams, cockles, mussels, urchins, and sea gull eggs. Northern Abalone, or *Bilhaa*, is an important "cultural keystone species."

Gitxaala Nation members fish and harvest marine resources throughout their asserted traditional territory. Specific locations within the proposed Project shipping route include:

- Salmon – west of Porcher Island, Principe, Otter, and Douglas channels, south of Fin Island and Wright Sound, as well as along Stephen's Island, the Tree Knob group, and Goschen Island;
- Herring – Goschen Island and Principe Channel;
- Prawns – Principe Channel;
- Halibut and cod – specific locations around Goschen Island, Principe and Otter Channels, in Wright Sound, and areas around Gurd and Dolphin Islands;
- Octopus and invertebrates – all around Dolphin and Banks Islands, north end of Principe Channel, north of Anger Island, and Otter Passage;
- Greenling and rockfish – reported in areas around Goschen Island, Principe and Otter channels, and South of Fin Island;
- Shellfish – west of Banks Island, Principe Channel, and Otter Channel, south of Fin Island and Wright Sound; and
- Kelp and seaweed – specific locations around Goschen, Dolphin, and Gurd Islands, throughout Principe Channel, and in Otter Channel.

The proposed shipping route from Douglas Channel to the Triple Island Pilot Station would traverse Browning Entrance to Principe Channel approximately 10-12 km west of the village of Kitkatla on Dolphin Island. The village of Kitkatla is located approximately 72 km (by boat) from the Triple Island Pilot Station.

During the EA, Gitxaala Nation expressed the following concerns regarding potential impacts of the proposed Project on their asserted Aboriginal right to fish:

- Increased marine traffic impacts on traditional harvesting, marine and terrestrial species, access and navigation, the spread of invasive species, and visual, noise and wake effects;
- Cumulative effects on harvesting activities and harvested species, particularly in the marine environment;
- Potential impacts of high TSS levels (due to vessel propeller wash) on key spawning areas;
- Potential impact of vessel wake on small vessels and shoreline resources, harvesting and activities;
- Vessel speed around Triple Island, and the importance of Triple Island as a feeding area for cetaceans;
- Cumulative vessel traffic at Triple Island, including traffic from Prince Rupert; and
- Behavioural impacts to marine mammals due to underwater noise.

As discussed at the meeting between the Proponent and Gitxaala Nation on February 10, 2015, the Proponent would endeavor to apply controlled speeds between 8 and 14 knots for safety of navigation, with a typical maximum speed of 12 knots. As LNG carriers are approaching the Triple Island pilot boarding area, now planned to be 8 to 10 km offshore of Triple Island, speeds would decrease from oceangoing speeds to coastal speeds, and would be reduced even further for pilot boarding and travelling with the escort tug.

During Application Review, Gitxaala Nation stated that vessel wake and associated interactions with shoreline resources, harvesting and other activities remained a key area of concern for Gitxaala Nation. In response, EAO required the Proponent to undertake additional wake wave analysis. The Proponent met with Gitxaala Nation on February 10, 2015 and identified four sites for further analysis to provide data on wake wave period, frequency, and amplitude. The results of the additional wake analysis were shared with Gitxaala Nation on April 6, 2015, and EAO hosted a meeting with all Aboriginal Groups and the Proponent to discuss the findings on April 15, 2015.

The Proponent is continuing its ongoing engagement with Gitxaala Nation fishers and mariners to further discuss the proposed Project shipping, and additional methods for minimizing the potential for adverse effects on Gitxaala Nation activities in their traditional territory. The Proponent also committed to engaging Gitxaala Nation in the development of EMPs referenced in the Application, in particular as they relate to marine activities but also social management plans, and other areas of interest.

In a phone conversation with EAO on March 27, 2015, Gitxaala Nation stated that the Proponent has not adequately addressed the effects of ship wake hitting the shoreline. At a meeting between Gitxaala Nation and EAO on April 13, 2015, Gitxaala Nation expressed concern that the Proponent's wake study and additional wake analysis did

not assess effects of wake on receptors (e.g., shoreline harvesters, small fishing vessels).

EAO is proposing a condition which would require the Proponent to develop a wake verification plan, which ultimately would determine the accuracy of the results of the EA, particularly in relation to potential safety hazards to marine and shoreline users. Should wake effects be greater than predicted, the Proponent would be required to implement an approach to adaptive management.

Additional information regarding mitigation measures and assessment of residual effects and cumulative effects on marine transportation and use is discussed in section 7.3 of this report.

In consideration of the information available to EAO, EAO's proposed conditions, and EAO's analysis of residual and cumulative effects to freshwater and estuarine fish and fish habitat, and marine resources, the proposed Project is expected to result in minor impacts to Gitxaala Nation's asserted Aboriginal right to fish and harvest marine resources.

### Trapping

The Application states that trapping is important to Gitxaala Nation's culture, both pre- and post- contact. After the collapse of the fur trade industry, trapping remained culturally important to Gitxaala Nation people, although it does not represent an important economic resource.

Gitxaala Nation members trap mink in Otter Channel and on West Porcher Island. Otter Channel is in proximity to the proposed Project shipping route.

A discussion on the potential impacts of the proposed Project on Aboriginal Interests associated with trapping is provided in section 19.3 of this report.

In consideration of the information available to EAO, EAO's proposed conditions, and EAO's analysis of residual and cumulative effects to wildlife and current and traditional land use, the proposed Project is expected to result in negligible impacts to Gitxaala Nation's asserted Aboriginal right to trap.

### Gathering

According to the Application, plant species such as berries, tree cambium, roots, and crab apples play a large part in Gitxaala Nation members' traditional diet. Medicinal and material plants such as hellebore, devil's club, Labrador tea, yew, cedar, water parsley, juniper, and ferns were also used. A discussion on the potential impacts of the proposed Project on Aboriginal Interests associated with terrestrial gathering is provided in section 19.4 of this report.

In consideration of the information available to EAO, EAO’s proposed conditions, and EAO’s analysis of residual and cumulative effects to vegetation and wetland resources, the proposed Project is expected to result in negligible impacts to Gitxaala Nation’s asserted Aboriginal right to gather.

*Cultural Sites, Trails, and Travelways*

Gitxaala Nation has extensive marine travelways used to access harvesting areas, sacred areas and culturally important sites throughout their traditional territory, including several areas within the proposed Project’s shipping route. In the “*Gitxaala Nation Use Study LNG Canada Export Terminal Project*” (Calliou 2014), Gitxaala Nation members explained that throughout their traditional territory there were places associated with experiences, stories and events, and provided a list of storied places, *spanoxnox* and *adawx* sites and teaching areas which they described under the general description as “Sacred Places”.

The table below provides a summary of Gitxaala Nation’s cultural sites, trails, and travelways.

**Table 20-4: Gitxaala Nation’s Cultural Sites, Trails, and Travelways**

Description	Location
<i>Spanoxnox</i> location <sup>1</sup>	South end (“at the point”) of McCauley Island
<i>Spanoxnox</i> location <sup>1</sup>	East side of Banks Island
<i>Spanoxnox</i> location <sup>1</sup>	“In” Principe Channel
<i>Spanoxnox</i> location <sup>1</sup>	“Around” Aristizabal Island
<i>Spanoxnox</i> location <sup>1</sup>	Otter Channel (Kwil dooyks)
Identified Sacred Place	Keecha (IR 11)
Identified Sacred Place	Bear Bay
Identified Sacred Place	“Near Larsen Harbour”
Identified Sacred Place	“On the west coast of Porcher Island.
Identified Sacred Place	“in Squally Channel”
Identified Sacred Place	“in Lewis Passage near McDonald Bay”
Identified Sacred Place	“Off the North Tip of Gill Island”
Identified Sacred Place	“near Keswar Point and End Hill in Principe Channel”
Identified Sacred Place	“off west coast of Dolphin Island”
Identified Sacred Place	“at Calamity Bay” “near Calamity Bay on the south end of Banks Island.
Identified Sacred Place	“Camps around Ka’oiya [IR Kooryet 19]
Identified Sacred Place	End Hill
Identified Sacred Place	Wright Sound
Identified Sacred Place	In Principe Channel across from Mink Trap Bay
Identified Sacred Place	In Principe Channel across from Port Stephens
Identified Sacred Place	In Principe Channel across from Anger Island
Identified Sacred Place	In Principe Channel near Colby Bay
Identified Sacred Place	In Principe Channel near Whelan Point

Description	Location
Identified Sacred Place	On Pitt Island near Port Stephens
Identified Sacred Place	“by” Anger Island
<i>Spanoxnox</i> location <sup>1</sup>	East side of Banks Island
<i>Spanoxnox</i> location <sup>1</sup>	“In” Principe Channel
<i>Spanoxnox</i> location <sup>1</sup>	“Around” Aristizabal Island
<i>Spanoxnox</i> location <sup>1</sup>	Otter Channel (Kwil dooyks)
Transportation- Marine navigation	Marine travelways throughout, with a particularly high concentration of travel up Principe and Petrel Channels and to Dolphin Island and the village of Kitkatla.
Transportation- Canoe journeys	In 2012, the Gathering Strength Canoe journey included Dolphin Island and travelled routes along Greenville Channel, through Write Sound, and along the Douglas Channel.
Camps (canoe journey)	Of the current camps associated with the Gathering Strength Canoe Journey along Douglas Channel, two are along the shipping route, and one is located nearby.
Sites and Settlements	Two current reported camp sites occur on Petrel Channel, in Keecha 11, along Principe Channel. Past settlements and sites exist throughout Principe channel, the west side of Banks Island, the northwest side of Campania Island, Calamity Bay and in the areas surrounding Dolphin, Goschen, Gurd and Porcher Island.

**Sources:** Gitxaala Use Study (Calliou 2014) and Gitxaala final written submissions to Enbridge JRP (Gitxaala Nation 2010).

<sup>1</sup> *Spanoxnox* refers to sacred locations where supernatural beings called *Naxnox* reside throughout Gitxaala Nation’s traditional territory (Calliou 2014).

Gitxaala Nation expressed concern regarding potential sensory disturbance from lights on existing large shipping traffic and “loss of opportunities for peaceful enjoyment and spiritual practice in preferred areas as a result of large vessel traffic” (Gitxaala Nation and the Firelight Group 2014). Gitxaala Nation also noted how changes to visual quality as a result of passing LNG carriers can affect sacred places and cultural identity through an increased disconnect with and disruption of the “sense of place”; further, that the experience of harvesting is also altered by changes in visual quality (Gitxaala Nation and Calliou Group 2014).

During Application Review, Gitxaala Nation raised concerns that there is no archaeological and heritage resources management plan for operations. Gitxaala Nation maintains that vessel wake will compromise intertidal and subtidal archaeological sites. At a minimum, monitoring would be required to verify the Application's prediction that there will be no adverse effects on heritage resources. EAO proposes a condition that would require the Proponent to develop and implement a wake verification plan during operations.

In consideration of the information available to EAO, EAO’s proposed conditions, and EAO’s analysis of residual and cumulative effects on archaeological and heritage resources, the proposed Project is expected to result in minor impacts to Gitxaala Nation’s culturally important sites, trails, and travelways in the area of the proposed Project.

### 20.3.5 Other Matters of Concern Raised by Gitxaala Nation

During the EA process, Gitxaala Nation raised a number of additional concerns with the proposed Project. Concerns raised by multiple Aboriginal Groups and responses from EAO are provided in section 18 of this report. Concerns specific to Gitxaala Nation and responses from EAO, are outlined below.

**Table 20-5: Other Matters of Concern Raised by Gitxaala Nation**

Key issues raised	EAO response
Concern with the reliance on yet to be developed mitigation measures to address effects.	<p>EAO concludes that the mitigation measures provided in the Application and the conditions proposed by EAO are sufficient for the purposes of the EA. Some of the proposed conditions require the development of plans, including adaptive management approaches. These have been proposed to address the fact that more detailed project design information would inform the development of specific mitigations and to address uncertainty in some VC conclusions. EAO also notes that additional mitigation will likely be required through any subsequent permitting.</p> <p>EAO proposes a condition that would require the Proponent to continue to engage with Aboriginal Groups in the development of relevant plans.</p>

## 20.4 Kitselas First Nation

### 20.4.1 Context

- Kitselas First Nation is located at the upper end of Kitselas Canyon on the Skeena River at Kitselas, just east of Terrace. Kitselas First Nation has 10 registered reserves, settlements or villages with an area of 1,885.2 ha.
- Kitselas First Nation has a registered population of 602, with 283 members living on-reserve and 319 members living off-reserve.
- Kitselas First Nation is governed by the Kitselas Band Council, made up of one Chief and five Councillors, under the *Indian Act* electoral system.

### 20.4.2 Aboriginal Interests and EAO's Strength of Claim Assessment and Depth of Consultation

- Kitselas First Nation asserts both a traditional territory and a harvesting area. The asserted traditional territory is mostly terrestrial but extends to the mouth of the Skeena River and includes both Smith Island and Kennedy Island. Kitselas First Nation's asserted harvesting area is mostly marine and includes the northwest coastline, extending as far north as the borders of Alaska and as far south as the southernmost tip of Banks Island. The harvesting area includes both Principe Channel and Triple Island.
- The proposed Project facility would be located approximately 6 km south of

Kitselas First Nation's asserted traditional territory. The proposed Project shipping route traverses approximately 160 km of the marine environment in Kitselas First Nation's asserted harvesting area.

- As articulated in EAO's letter dated January 31, 2014, EAO assessed Kitselas First Nation's Aboriginal rights claim, based on currently available information related to the activities, practices, traditions and customs integral to the distinctive culture of the Kitselas First Nation people prior to contact with Europeans (understood to be around 1787). On June 26, 2014, the *Tsilhqot'in Nation v. British Columbia (Tsilhqot'in)* decision was released by the Supreme Court of Canada. The decision clarified the test for Aboriginal title relating to the elements of sufficient and exclusive occupation at 1846.
- Ethnographic sources describe Kitselas First Nation's asserted traditional territory as centered on the Kitselas Canyon and noted that, at the time of contact (understood to be in the late 1700s or early 1800s), some Kitselas First Nation members may have taken a coastal route to get to and from the annual eulachon fishery on the Nass River. The proposed shipping route is outside of what ethnographic sources describe as the traditional territory of Kitselas First Nation. There is also no indication that Kitselas First Nation used any areas near the proposed shipping routes at the time of contact. Although Kitselas First Nation provided information indicating use of marine fishing and harvesting sites along the proposed shipping route, it is unclear whether this reflects historic use (including at time of contact) and there are questions about whether any such use by Kitselas First Nation would have been subject to permission or drawn on kinship ties by Southern Tsimshian tribes.
- EAO's assessment of Kitselas First Nation's *prima facie* claims to Aboriginal rights to areas in proximity to the shipping route proposed Project area is weak-to-moderate.
- Given the nature and location of the proposed Project, and the potential impacts of the proposed Project on Kitselas First Nation's Aboriginal Interests, EAO is of the view that the duty to consult Kitselas First Nation lies toward the low end of the *Haida* spectrum.
- Notwithstanding the above conclusion, all Aboriginal Groups listed in Schedules B and C of the Section 11 Order have been consulted at the deeper end of the *Haida* consultation spectrum as described in section 14 of this report.

#### 20.4.3 Summary of Consultation

Kitselas First Nation was invited to review and provide comments on the draft AIR, Section 11 Order, the Proponent's Aboriginal Consultation Plan and Reports, the screening of the Application, and on the Application. Kitselas First Nation was also provided with opportunities to attend Working Group meetings, workshops and to meet with EAO staff directly.

EAO provided \$5,000 in capacity funding to Kitselas First Nation during the Pre-Application phase and \$10,000 in capacity funding during the Application Review



phase of the EA process to assist with costs associated with their participation in the EA review. The Agency provided \$10,500 in capacity funding to Kitselas First Nation.

Kitselas First Nation was an active participant in the EA, during both Pre-Application and Application Review, and EAO engaged with Kitselas First Nation in a variety of manners throughout the process to seek to better identify, understand, and resolve concerns. Kitselas First Nation participated in the EA by providing comments on the draft AIR and the Application, attending face-to-face meetings and workshops, participating in conference calls, and corresponding via email.

During Application Review, some of the engagement between EAO and Kitselas First Nation included:

- January 20 to 22, 2015 – Working Group meeting in Vancouver;
- February 18, 2015 – meeting in Terrace to discuss any Kitselas First Nation outstanding concerns with the proposed Project; and
- April 15, 2015 – meeting with Aboriginal Groups in Vancouver to discuss results of additional wake analysis.

The Proponent provided capacity funding to Kitselas First Nation through a Capacity Funding Agreement, which was executed in August 2014, to support their review of the proposed Project, participation in the regulatory process and for the completion of a TUS. On September 30, 2014, Kitselas First Nation provided a summary traditional use report on Kitselas First Nation's traditional use practices to the Proponent. This information was cross-referenced with the publically-available information and used in preparing the Application. A final report has not yet been provided to the Proponent.

In addition, the Proponent worked collaboratively with Kitselas First Nation to develop a socio-economic impact assessment that met the community's needs, including hiring and training a Kitselas First Nation member as a community liaison for the assessment.

During the EA, the Proponent met numerous times with Kitselas First Nation to discuss the proposed Project and related activities, and was invited to present the proposed Project to Kitselas members at a community meeting in November 2013. The Proponent also held a marine users workshop with Kitselas fishermen in March 2014, and on a separate occasion met with Kitselas elders to present the proposed Project and answer questions. On September 30, 2014, the Proponent met with Kitselas First Nation to gather input on the general risk analysis element of the TERMPOL. The Proponent met with Kitselas First Nation on July 16, 2014, to review the draft Part C of the Application. The Proponent and Kitselas First Nation met again on December 15, 2014, to discuss the Application and to further discuss Kitselas First Nation's issues and concerns.

Kitselas First Nation expressed an interest in baseline air quality monitoring in Kitselas First Nation asserted traditional territory and soil sampling to understand acidification and the potential health effects of increased air emissions. Kitselas First Nation identified two sites in their asserted traditional territory where they wanted air quality to

be monitored.

In response, the Proponent set up passive air quality monitoring units at these two sites in fall 2013, and Kitselas First Nation members have been participating in the monitoring program since Fall 2013. The Proponent also undertook soil sampling in the Kitimat Valley, following initial discussions in September 2013 where concerns regarding potential soil acidification were raised. Kitselas First Nation members participated in the soil sampling work during October 2013. To help inform Kitselas First Nation's understanding of baseline air quality conditions, in September 2014, the Proponent agreed to continue to support the collection of air quality data into early 2015 from passive monitors in Kitselas First Nation's asserted traditional territory. Other information used in the development of the Application includes:

- *Report to Kitselas First Nation Regarding Kitselas Traditional Use/Occupancy of Coastal Territories between the Mouths of the Kitimat and Skeena Rivers (Smith 2008); and*
- *Report on the Kitselas Traditional Histories and Territories Project (Smith 1999).*

Issues raised by Kitselas First Nation and the Proponent's responses are provided in the Working Group Issues Tracking Table. A summary of the Proponent's engagement activities with Kitselas First Nation is provided in the Aboriginal Consultation Reports.

In drafting this report, EAO considered a report provided by Kitselas First Nation to EAO on April 28, 2015 entitled *Kitselas First Nation Traditional Use Study Analysis: Shell LNG Canada Project* (Siomonn Pulla, April 8, 2015). The report provided additional information regarding Kitselas First Nation's asserted Aboriginal Interests within the Kitimat River Valley and the coastal waters around Kitimat, including Douglas Channel and Banks Island. Information in the report was based on traditional knowledge and use studies (1998-1999; 2010-2014), and pertained primarily to twentieth-century land and resource use in the Kitimat River valley, and to Kitselas First Nation's presence on the coast in the twentieth and present centuries.

EAO and JAG's Aboriginal Research Division reviewed this report and determined that although the report provided greater clarity about Kitselas First Nation's historic and contemporary ties to the area in question (and the other Aboriginal groups using/occupying those area and the complex social networks), given the legal tests for Aboriginal rights and title are focused on a very specific period in time, the information did not change the current strength of claim assessment. A summary of the conclusions were provided to Kitselas First Nation on April 30, 2015. This report was not provided to the Proponent.

On May 1, 2015 EAO had provided responses to Kitselas First Nation on all the questions and concerns raised by Kitselas First Nation on EAO's draft assessment report and proposed conditions. In these responses, EAO provided additional explanation regarding how conclusions on the above issues were reached. The more detailed discussion about these issues is contained in the VC sections of this report.

On May 5, 2015, EAO met with Kitselas First Nation to discuss outstanding concerns. Kitselas First Nation strongly expressed that they would not be able to support the proposed Project given the outstanding concerns that they felt had not been adequately mitigated, and their view that the Proponent was not engaging in sufficient impact management and benefit discussions.

Regarding EAO's strength of claims assessment, Kitselas First Nation emphasized that they stood by the position presented in their Pulla (2015) report, particularly that Kitselas First Nation claims Aboriginal rights to fish in the Kitimat area including the Kitimat valley and upper Kitimat Arm.

At the meeting on May 5, 2015, EAO committed to clearly reflecting Kitselas First Nation's outstanding concerns in the final version of the assessment report. These concerns were focussed on the following three key areas of impacts that Kitselas First Nation felt were still outstanding. These conditions are discussed below and in the relevant sections of Part B in this report:

- Water withdrawals from the Kitimat River – Concerns that the amount of water withdrawal would be harmful to fish populations that are reliant on habitat in the Kitimat River, or migrate up the Kitimat River, as well as to terrestrial wildlife. Concerns regarding any contaminants in the effluent discharged into the estuary.
  - This report has considered the potential effects of water withdrawals on fish and fish habitat in section 5.5 and the potential effects of effluent discharge in section 5.6. EAO also proposes conditions regarding water quality at the effluent discharge location and fish and fish habitat. EAO notes that further consideration of the impacts of water withdrawals would occur during the water licence permitting process.
- Transportation of condensate by rail – Concerns about the risks posed by the transportation of condensate by rail through Kitselas First Nation's reserve and territory given the amount of condensate that would be transported. The concern was that the transportation of condensate was excluded from the scope of the EA and that alternatives to rail transportation may not have been fully considered.
  - EAO notes that the extraction, storage and transportation of condensate (or natural gas liquids) were included in the original project description dated March 2013. This issue was discussed with Transportation Canada during Application Review. Transportation Canada noted that dangerous goods must be handled, offered for transport and transported in accordance with the *Transportation of Dangerous Goods Act* and associated regulations. Anyone who handles, offers for transport, imports and/or transports dangerous goods must comply with the regulations – this includes holding a valid transportation of dangerous goods certificate, completing the appropriate documentation, using the proper means of containment, reporting any reportable spills and holding a valid

Emergency Response Assistance Plan (approved by Transportation Canada), when required.

- Management of socio-economic effects – Concern about indirect effects of the proposed Project on Kitselas First Nation members, and that the management plan proposed by EAO is too narrow in scope and would not adequately address Kitselas First Nation concerns (e.g. on-reserve impacts, broader community health and wellbeing impacts).
  - The social and economic sections of this report (sections 6 and 7) discuss EAO’s conclusions regarding the potential socio-economic impacts of the proposed Project and the range of conditions that EAO proposes. EAO’s proposed condition would include all mitigation measures proposed by the Proponent in their Application, related to infrastructure and services, as well as community health and wellbeing.

During the course of Application Review, EAO provided Kitselas First Nation the opportunity to review and comment on draft guidance prepared by CSCD to inform the development of socio-economic effects management plans. If an EAC is issued, EAO remains committed to working with Kitselas First Nation to ensure the plan prepared by the Proponent presents an adequate approach to mitigate socio-economic impacts, and informs the broader management of any cumulative socio-economic effects. EAO’s proposed condition would also require the Aboriginal Groups, including Kitselas First Nation, are engaged in the development and implementation of the plan.

#### 20.4.4 Potential Impacts of the Proposed Project on Kitselas First Nation’s Asserted Aboriginal Interests

##### *Harvesting Activities*

##### Hunting

Kitselas First Nation members hunt a variety of species throughout their asserted traditional territory, including:

- Mountain goat – hunted at Upper Chist Creek, and around Bolton, Hunter, and Hoult creeks;
- Deer and moose – hunted at Upper Kitimat River and tributaries (i.e., Wedeene River, and Davies, Hoult, Hunter, Chist, McKay, and Bolton creeks);
- Black bear – hunted at specific locations at the Little Wedeene and Wedeene River valleys, south of Lakelse Lake to Kitimat River; and the Clore River Valley; and
- Duck and geese – hunted at Upper Kitimat River and tributaries, in similar areas frequented by water animals.

The specific hunting sites identified above are not in proximity to the proposed Project footprint.

In consideration of the information available to EAO, EAO's proposed conditions, and EAO's analysis of residual and cumulative effects to terrestrial wildlife and marine birds, the proposed Project is expected to result in negligible impacts to any Kitselas First Nation hunting activities in the area of the proposed Project.

### Fishing and Marine Harvesting

Kitselas First Nation members fish in freshwater environments for salmon, trout, sturgeon, whitefish, suckers, chubs and kokanee salmon. Salmon and trout are fished at specific locations on the Kitimat River and tributaries, including the Clore River valley, and areas adjacent to Kitselas First Nation communities.

During a fisheries workshop with the Proponent in March 2014, Kitselas First Nation identified important marine fishing and harvesting sites, including clam and seaweed harvesting sites around Dolphin Island and in Kitkiata Inlet. Other important fishing areas were identified on the northwest side of Fin Island (used to catch sable fish using long lines), the area between Anger and Pitt Islands called "mink trap" (used to catch salmon by gill nets), and the southeast side of McCauley Island and the southwest side of Pitt Island (used to catch prawns and crabs by traps). In addition, Kitselas First Nation members reportedly fish in Chatham Sound and Principe Channel.

During the EA, Kitselas First Nation identified the following issues and concerns related to their asserted Aboriginal right to fish:

- Vessel wake and potential impacts to shoreline harvesters (particularly on elders harvesting);
- Potential impacts to resources such as salmon, eulachon, herring eggs, seaweed, cockles, shellfish, trout, halibut, and sablefish;
- Water quantity concerns, including:
  - Concern that water withdrawals from the Kitimat River could impact available fish habitat during low-flows and prevent fish access to parts of the river; and
  - Concern that water permits may be allocated based on historical data which is out of date and does not accurately represent current conditions;
- Water quality concerns, including:
  - Potential surface water acidification of lakes and streams from air emissions;
  - Effluent discharge management at the marine terminal;
  - Impacts of dredging and DAS;
- Importance of the estuary:
  - Potential accidents or malfunctions at the facility could impact upstream fishing activities;

- The importance of the Fish Habitat Offsetting Plan to manage impacts to fish and fish habitat; and
- Human health impacts from potential bio-availability of contaminants.

With the exception of Chatham Sound, the marine fishing and marine harvesting sites identified above by Kitselas First Nation are located within or in proximity to the proposed shipping route. Construction vessels and associated support vessels may disrupt navigability on marine waterways used to access Kitselas First Nation's fishing and marine harvesting areas. A discussion on the potential impacts of the proposed Project on Aboriginal Interests associated with fishing and harvesting marine resources is provided in sections 19.2.2 and 19.2.5 of this report, respectively.

During Application Review, Kitselas First Nation stated the importance of the Kitimat estuary and commented that everything that happens at the proposed Project facility would impact the fish runs that come up into the upper Kitimat River. Kitselas First Nation expressed concern about water quality and the potential effects on freshwater fish and fish habitat in the Kitimat River. A discussion on freshwater and estuarine fish and fish habitat is provided in section 5.5 of this report.

In mid-July 2014, the Proponent worked with Kitselas First Nation to include a member of the Nation in preliminary freshwater reconnaissance field work, to help support the development of the Fish Habitat Offsetting Plan. This field work was undertaken with the purpose of investigating the potential for fish habitat creation or enhancement in watercourses within Kitselas First Nation asserted traditional territory to offset the proposed Project fish habitat effects at the facility site in Kitimat.

Kitselas First Nation expressed concern regarding potential restrictions on CRA fisheries due to shipping activities. In response, the Proponent held a shipping and marine use workshop with Kitselas First Nation in March 2014 to seek feedback from Kitselas First Nation members regarding CRA fishing activities being undertaken along the marine access route. Potential effects on fisheries are assessed in marine transportation and use section 7.3 of this report.

Kitselas First Nation members expressed several concerns surrounding the effect of shipping wake on community elders harvesting along the shoreline. A discussion on the potential effects of shipping wake is provided in marine transportation and use section 7.3 of this report.

In consideration of the information available to EAO, EAO's proposed conditions, and EAO's analysis of residual and cumulative effects to freshwater and estuarine fish and fish habitat and marine resources, the proposed Project is expected to result in minor impacts to Kitselas First Nation's fishing and marine resource harvesting activities.

### Trapping

Kitselas First Nation members trap beaver, marten, fisher, mink, weasel, and muskrat. Kitselas First Nation members actively trap near the Kitimat River and its tributaries, and trapline cabins occur on the North Kitimat River, the upper Kitimat River, and in the valleys of Chist Creek and Bolton Creek. Trapping also occurs along the Kitimat River from McKay Creek to the valley west of Mount Davies, and the valleys along Chist, McKay, and Davies creeks.

The specific trapping sites listed above are not in proximity to the proposed Project footprint. A discussion on the potential impacts of the proposed Project on Aboriginal Interests associated with trapping is provided in section 19.3 of this report. In consideration of the information available to EAO, EAO's proposed conditions, and EAO's analysis of residual and cumulative effects to terrestrial wildlife and marine birds, the proposed Project is expected to result in negligible impacts to any Kitselas First Nation trapping activities.

### Gathering

Kitselas First Nation members gather forest plants and berries in the Upper Kitimat River and tributary valleys, typically at lower elevations adjacent to marshes, lakes, streams, and rivers. Berries, crab-apples, wild rice, various tubers, and roots are gathered along the Kitimat River from McKay Creek to the valley west of Mount Davies, in areas adjacent to roadways in upper Kitimat River valley, and in Davies Creek Valley.

The specific gathering sites listed above are not in proximity to the proposed Project footprint. A discussion on the potential impacts of the proposed Project on Aboriginal Interests associated with gathering is provided in section 19.2.4 of this report.

During the EA, Kitselas First Nation expressed concern with potential cumulative effects from RTA air emissions and their impacts on vegetation, soil, marine and freshwater habitat, and general health impacts. Kitselas First Nation elders also identified the concern of potential air pollution and the perception of air pollution on harvesting traditional resources, such as salmon berries, soap berries and devil's club.

In response to these concerns, the Proponent held a human health and country foods workshop with Kitselas First Nation elders on March 13, 2014, to discuss the potential impacts and to understand concerns. A discussion on the potential impacts of the proposed Project air emissions on country foods is found in section 9 of this report.

In consideration of the information available to EAO, EAO's proposed conditions, and EAO's analysis of residual and cumulative effects to vegetation and wetlands resources, the proposed Project is expected to result in negligible impacts to any Kitselas First Nation gathering activities.

### *Cultural Sites, Trails, and Travelways*

The Application states that there is Kitselas First Nation rock art throughout the Kitselas Canyon, and specific sites at Ringbolt and the Dry Islands. In addition, the Application references archaeological sites throughout the Kitselas Canyon, with three specific sites along the river in the Kitselas Canyon. Kitselas Canyon is located east of Terrace; the rock art and other specific sites referenced above are at least 50 km from the proposed Project footprint.

In consideration of the information available to EAO, EAO’s proposed conditions, and EAO’s analysis of residual and cumulative effects on archaeological and heritage resources, the proposed Project is expected to result in negligible impacts to any Kitselas First Nation’s culturally important sites, trails, and travelways.

#### 20.4.5 Other Matters of Concern Raised by Kitselas First Nation

During the EA process, Kitselas First Nation raised a number of additional concerns with the proposed Project. Concerns raised by multiple Aboriginal Groups and responses from EAO are provided in section 18 of this report. Concerns specific to Kitselas First Nation and responses from EAO, are outlined below.

**Table 20-6: Other Matters of Concern Raised by Kitselas First Nation**

Key issues raised	EAO response
The movement of condensate by rail from the facility.	<p>The potential effects from a condensate spill, as well as Project design measures to reduce risk and consequences of such an event, are assessed in the accidents and malfunctions assessment in Section 10 of this report.</p> <p>The movement of condensate by rail is not within scope of the assessment of the proposed Project. However, according to the Proponent’s responses, the transportation of condensate by rail from Kitimat has taken place for many years and condensate was last transported from Kitimat in 2013. The expected volume of condensate proposed to be transported by the proposed Project is less than was has been previously transported along the same rail corridor.</p>
Engagement of Kitselas in social management planning and development, and concern that the scope of the socio-economic effects management plan, which is limited to infrastructure and services, is too narrow and will not address impacts to community health and well-being.	<p>EAO proposes a condition that would require the Proponent to develop a a plan to manage socio-economic effects that particularly that focusses on infrastructure and services and would include on-going monitoring, adaptive management and reporting. The holder must engage with Aboriginal Groups in developing and implementing the plan.</p> <p>Many negative effects on community health and wellbeing are closely tied to impacts on community infrastructure and services. By mitigating these effects, negative effects on community health and wellbeing would be reduced.</p> <p>In addition, EAO is proposing a condition requiring the Proponent to develop a health and medical services plan.</p>



## 20.5 Kitsumkalum First Nation

### 20.5.1 Context

- Kitsumkalum First Nation is located just west of the city of Terrace, east of the junction of the Kitsumkalum and Skeena rivers. Kitsumkalum First Nation has four registered reserves, settlements, or villages with an area of 597 ha. Kitsumkalum First Nation has a registered population of 736, with 237 members living on-reserve and 499 members living off-reserve.
- Kitsumkalum First Nation is governed by a Band Council with one Chief and seven Councillors, under the *Indian Act* electoral system.

### 20.5.2 Aboriginal Interests and EAO's Strength of Claim Assessment and Depth of Consultation

- The proposed Project facility would be located approximately 30 km from Kitsumkalum First Nation's asserted traditional territory. The proposed Project shipping route would traverse approximately 40 to 50 km of Kitsumkalum First Nation's asserted traditional territory.
- Ethnographic sources characterize Kitsumkalum First Nation as one of the 12 tribes of the Coast Tsimshian cultural-linguistic group, but prior to contact (late 1700s or early 1800s), Kitsumkalum First Nation was one of the tribes that did not relocate its village from the Skeena River to the coast. Kitsumkalum's traditional territory is described by ethnographers as centred on Kitsumkalum Lake.
- As articulated in EAO's letter dated January 31, 2014, EAO assessed Kitsumkalum First Nation's Aboriginal rights claim, based on currently available information related to the activities, practices, traditions and customs integral to the distinctive culture of the Kitsumkalum people prior to contact with Europeans (understood to be late 1700s or early 1800s). On June 26, 2014, the *Tsilhqot'in Nation v. British Columbia (Tsilhqot'in)* decision was released by the Supreme Court of Canada. The decision clarified the test for Aboriginal title relating to the elements of sufficient and exclusive occupation at 1846.
- With respect to the northern portion of the proposed Project shipping route overlapping Kitsumkalum First Nation's asserted territory near Stephens Island, this is an area that ethnographic and historical sources indicate was a resource area used by the Nine Allied Tsimshian Tribes, belonging to the *Gitwilgyots* tribe.
- Kitsumkalum provided information indicating historic use of Stephens Island, including marine fishing camps. It is unclear whether this historic use occurred at time of contact or 1846, and there are questions about whether any such use by Kitsumkalum would have been subject to permission or drawn on kinship ties by the *Gitwilgyots* tribe.
- EAO understands that subsequent to population reductions (following, for instance, a smallpox epidemic occurring in this area in 1836), clan or *wilnaat'al* affiliations may have determined use of house territories, such that kinship or social ties to clan members of other Tsimshian-based Aboriginal Groups (not part

of the Nine Allied Tsimshian Tribes) may have occurred with greater intensity in the coastal area. Other nineteenth century development such as the presence of missionaries (i.e. establishment of the mission village of Metlakatla in 1862), and the establishment of an industrial economy in the 1880s may have disrupted these ties, and also enabled members of groups other than the Nine Allied Tsimshian Tribes to establish themselves much more freely on the coast around Prince Rupert.

- Based on these considerations, EAO has assessed Kitsumkalum First Nation's strength of claim to Aboriginal rights to fish in proximity to the shipping route by Stephens Island to be weak-to-moderate.
- Given the nature and location of the proposed Project, and the potential impacts of the proposed Project on Kitsumkalum First Nation's Aboriginal Interests, EAO is of the view that the duty to consult Kitsumkalum First Nation lies at the lower end of the *Haida* consultation spectrum.
- Notwithstanding the above conclusion, all Aboriginal Groups listed in Schedules B and C of the Section 11 Order have been consulted at the deeper end of the *Haida* consultation spectrum as described in section 14 of this report.

### 20.5.3 Summary of Consultation

Kitsumkalum First Nation was invited to review and provide comments on the draft AIR, draft Section 11 Order, the Proponent's Aboriginal Consultation Plan and Reports, the screening of the Application and on the Application. Kitsumkalum First Nation was also provided with opportunities to attend Working Group meetings, workshops and to meet with EAO staff directly.

EAO provided \$5,000 in capacity funding to Kitsumkalum First Nation during the Pre-Application phase and \$10,000 in capacity funding during the Application Review phase of the EA process to assist with costs associated with their participation in the EA review. CEAA provided \$10,500 in capacity funding to Kitsumkalum First Nation.

Kitsumkalum First Nation was an active participant in the EA, during both Pre-Application and Application Review, and EAO engaged with Kitsumkalum First Nation in a variety of manners throughout the process to seek to better identify, understand, and resolve concerns. Kitsumkalum First Nation participated in the EA by providing comments on the draft AIR, draft Section 11 Order and the Application, attending face-to-face meetings and workshops, participating in conference calls, and corresponding via email.

During Application Review, some of the engagement between EAO and Kitsumkalum First Nation includes:

- January 20 to 22, 2015 – Working Group meeting in Vancouver; and
- February 17, 2015 – Meeting in Terrace to discuss any Kitsumkalum First Nation outstanding concerns with the proposed Project.

Kitsumkalum First Nation attended Working Group Meetings January 20-22, 2015 in Vancouver, and through the Working Group process provided follow-up comments to the Proponent's responses on the EA Application on January 30, 2015.

In drafting this report, EAO considered a report provided by Kitsumkalum First Nation to EAO on October 24, 2014 entitled *No Permission Required: Title and Rights in the Traditional Territory of the Kitsumkalum Indian Band* (Wolfhard). Wolfhard reports several sites in proximity to the proposed shipping route that are important to Kitsumkalum First Nation, including:

- Stephens Island;
- Arthur Island;
- William Island;
- Porcher Island;
- Henry's Island; and
- Edye Passage.

EAO understands that Kitsumkalum First Nation has significant disagreement with the notion that historic Kitsumkalum First Nation use of coastal areas is or was subject to permission by the Nine Tsimshian Allied Tribes, a notion that the Province has considered as weakening the strength of claims of Kitsumkalum First Nation in this area. As discussed in section 15.1 of this report, EAO understands that a house group, or *waap*, had a role in determining or controlling use of what was considered its territory. EAO also understands that there are complex Tsimshian cultural and social systems involving a network of *huwaap* that share a matrilineal connection to a common ancestral group and that these affiliated matrilineal groups are called clans or crest. A Tsimshian person belonged (and belongs today) to one of four clans.

Central to Kitsumkalum First Nation's disagreement with EAO's strength of claim assessment is their position that Kitsumkalum First Nation is a Tsimshian tribe, and has been an integral member of a "Tsimshian Nation" collective, sharing common Tsimshian laws, customs and social organization, since time immemorial. Kitsumkalum First Nation refers to the 1993 statement of intent of the Tsimshian Tribal Council to support the idea of rights and title being held by a "Tsimshian Nation." Kitsumkalum First Nation also assert shared exclusive title to areas exclusively held by the Tsimshian Nation, areas regarded as shared or held in common. Finally, Kitsumkalum First Nation asserts that it holds title and rights over specific locations within those shared areas.

Subsequent to population reductions (following, for instance, a smallpox epidemic occurring in this area in 1836), clan or *wilnaat'al* affiliations may have determined use of house territories, such that kinship or social ties to clan members of other Tsimshian-based Aboriginal Groups (not part of the Nine Allied Tsimshian Tribes) may have occurred with greater intensity in the coastal area. Although use of areas based on kinship ties, which may not have required formal permission to be sought or granted, appears to be a form of community acceptance that makes use of such areas conditional on clan-based kinship or social ties to corresponding clans of the Nine Allied Tsimshian tribes, which probably only occurred if its leadership determined there would

be no detriment to the resource itself. Other nineteenth century development such as the presence of missionaries, and the establishment of an industrial economy may have disrupted these ties, and also enabled members of groups other than the Nine Allied Tsimshian Tribes to establish themselves much more freely on the coast.

Existing ethnographic and historical materials indicate that the coast between the Skeena River and the Nass River was, at contact and 1846, territory belonging to the Nine Allied Tsimshian Tribes, with all the ethnographically reported sites attributed to one or another of the groups which now make up the Lax Kw'alaams Band and Metlakatla First Nation. This information is not contradicted by the very specific descriptions of Kitsumkalum First Nation asserted traditional territory recorded in the twentieth century. While ethnographic and historical sources support the idea of a cultural-linguistic group known broadly as the Tsimshian, to which Kitsumkalum First Nation undoubtedly belongs, they do not support the notion of a traditional, overarching political Tsimshian collective at the time of contact or at 1846. More recent statements made through a statement of intent filed with the BC Treaty Commission in 1993, or statements made in 2002 by the Allied Tsimshian Tribes that they shared portions of their traditional territories with the Kitsumkalum First Nation and that Kitsumkalum First Nation has claims in these areas, needs to be considered in the context of all available information regarding use at time of contact and at 1846.

The Proponent and Kitsumkalum First Nation executed a Capacity Funding Agreement in May 2014, to assist Kitsumkalum First Nation to fully participate in the EA process and to undertake a TUS to help inform the Proponent's Application. On May 22, 2014, Kitsumkalum First Nation provided an Interim Letter Report on Kitsumkalum First Nation's traditional use practices to the Proponent. This information was subsequently used in the development of the Application. Information from the *Kitsumkalum Community Marine Use Plan (2014)* was incorporated into Section 14 of the Application where appropriate.

Kitsumkalum First Nation expressed interest in an assessment of air quality at Kalum Lake and interest in students possibly participating in an air quality monitoring program. In respond to these interests, the Proponent consulted with Kitsumkalum First Nation on potential locations for a passive air quality monitoring unit. The unit was placed on Kitsumkalum 1 IR in November 2013 outside the community school, with Kitsumkalum First Nation participation. The Proponent also installed a passive air quality monitoring unit at a requested location near Kalum Lake in February 2014 with participation from Kitsumkalum First Nation. Data from these monitors, as well as other monitoring stations, are discussed in the air quality VC in section 5.2 of the Application.

The Proponent met with Kitsumkalum First Nation to review the draft Part C of the Application on July 16, 2014, and met on September 30, 2014 and on December 9, 2014 to discuss the overall TERMPOL process.

Issues raised by Kitsumkalum First Nation and the Proponent's responses are provided in the Working Group Issues Tracking Table. A summary of the Proponent's

engagement activities with Kitsumkalum First Nation is provided in the Aboriginal Consultation Reports.

#### 20.5.4 Potential Impacts of the Proposed Project on Kitsumkalum First Nation's Asserted Aboriginal Interests

##### *Harvesting Activities*

Deer, elk, mountain goat, mountain sheep, bear, porcupine, raccoons, eagles, marmot, caribou, moose, cougar, hare, lynx, swans, geese, ducks, and, other waterfowl are listed as significant food sources in the *Kitsumkalum First Nation Interim Letter Report (Crossroads, 2014)*.

##### Hunting

The Application states that Kitsumkalum First Nation members hunt mountain sheep, deer, and black bear in the vicinity of the Kitsumkalum River and tributaries. Traditionally, hunting primarily occurred within the Kitsumkalum, Skeena, and Ecstall river valleys and certain coastal islands. In addition, Kitsumkalum First Nation members hunt sea lion, seals, and sea otter.

The above identified terrestrial hunting sites are not in proximity to the proposed Project footprint or the proposed Project shipping route. EAO is aware of a village site for the House of Niiskiimas at Lakelse Lake, which EAO understands to be Giluts'aaw territory. A discussion on the potential impacts of the proposed Project on Aboriginal Interests associated with hunting is provided in section 19.1 of this report.

During Application Review, Kitsumkalum First Nation raised concerns regarding potential shipping impacts on marine mammals, such as disruption in behaviour and underwater noise effects, and effects on marine mammal populations and feeding grounds of migrating marine mammals. A discussion on the potential impacts of the proposed Project on marine mammals is found in section 5.6 of this report.

In consideration of the information available to EAO, EAO's proposed conditions, and EAO's analysis of residual and cumulative effects to terrestrial wildlife and marine birds, and marine resources, the proposed Project is expected to result in negligible impacts on any Kitsumkalum First Nation hunting activities.

##### Fishing and Marine Harvesting

The Application states that Kitsumkalum First Nation members fish salmon, trout whitefish, sturgeon, suckers, chubs, and Kokanee salmon at freshwater areas throughout their traditional territory, and specifically salmon and trout at the Kitsumkalum River and tributaries. Kitsumkalum First Nation members also harvest salmon from the Skeena River.

Kitsumkalum First Nation members currently harvest marine species throughout their asserted traditional territory, including: cod, octopus, halibut, herring, cuttlefish, dogfish, porpoise, bullhead, devilfish, eels, flounders, red snapper, shrimp, abalone (at Arthur Island), pilchard, eulachon, all five species of salmon, steelhead, crab, prawns, and sea cucumber. Kitsumkalum First Nation members also harvest bivalves, barnacles, snails, sea birds and marine plant species such as kelp.

Kitsumkalum First Nation fish and harvest marine resources for subsistence and commercial purposes within Edye Passage, at the north end of Porcher Island, and throughout Chatham Sound and Hecate Strait. Shellfish and invertebrates are harvested throughout Chatham Sound and Hecate Strait. Herring are extremely important to Kitsumkalum First Nation, and herring eggs are harvested from the area around Stephens Island. According to the Application, Kitsumkalum First Nation historically inhabited marine fishing camps in Hecate Strait, Edye Passage, Stephens Island, and Work Channel, and they continue to use these same locations. Kitsumkalum First Nation's commercial fishery is one of their key livelihoods. With the exception of Stephens Island, located approximately 8 to 10 kilometers east of the proposed Project shipping route, the above identified fishing and marine resource harvesting sites are not in proximity to the proposed Project shipping route.

Kitsumkalum First Nation raised the following concerns regarding potential impacts of the proposed Project on their asserted Aboriginal right to fish:

- Impacts to water quality, including:
  - Potential acidification of lakes;
  - Human health impacts from potential bio-availability of contaminants (marine);
- Potential impacts of vessel wake:
  - Effects on shoreline, fish habitat, harvesting areas, harvesters;
  - Impacts on marine users in small boats;
  - Impacts from two passing LNG carriers;
  - Requested follow up plans and monitoring (at Triple Island and west side of Arthur Island) to ensure wake effects from shipping do not affect vegetation and intertidal invertebrates;
- Increased marine traffic interfering with small vessels or restricting access to sites;
- Impacts on fish, fish habitat, and other harvesting activities and locations;
  - Specific concerns related to impacting the ability to fish for halibut;
  - Impacts of shipping on food security, including commercial and Aboriginal fishing and traditional harvesting;
  - Potential effects of the physical presence of LNG carriers (and combined with other project LNG carriers) on the behaviour of fish;
  - Concern that shipping will have a negative impact on fish migration routes;
- Cumulative effects of shipping on marine fisheries and shoreline harvesting around Triple Island and Principe Bay; and
- Impacts on marine mammals due to the speed and noise of LNG carriers.

Kitsumkalum First Nation stated that Principe Channel, which the Province understands to be outside Kitsumkalum First Nation's claimed territory, is an area of concern with respect to effects on shoreline harvesters and marine fisheries from shipping and in combination with other projects' traffic inbound for and outbound from Kitimat.

During Application Review, Kitsumkalum First Nation expressed concern with the suggestion that halibut long-liners can deploy and retrieve gear when the area is clear of traffic, as well as concerns with the proposed mitigation measures. Kitsumkalum First Nation also commented on the use of AIS as a mitigation measure for traffic communication and the potential displacement of fisherman due to vessel traffic and ship wake.

The Proponent responded to Kitsumkalum First Nation's comments in a Technical Memo (*Comment ID #283: Interference with Marine Fisheries*), which stated that they had committed to a number of measures designed to avoid or reduce adverse effects on fishing and marine users and committed to ongoing consultation with Aboriginal Groups to identify appropriate mitigation measures.

Kitsumkalum First Nation responded to the information in the Proponent's memo and stated that halibut fishing may occur in deeper more open waters where average wave heights are higher, but there are boat-based fisheries conducted in more confined waters where wake waves may in fact disrupt these smaller boats from fishing activities. They restated that shipping would impact Kitsumkalum First Nation traditional fishing activities through having to move gear as a carrier passes and potential indirect impacts from carrier wake.

A discussion of the potential impacts of the proposed Project on Aboriginal Interests associated with fishing and harvesting marine resources is provided in section 19.2 and 19.5 of this report.

Kitsumkalum First Nation reviewed the conceptual fish habitat offsetting plan and reiterated their concern that there is potential for impacts to Kitsumkalum First Nation members' marine resources use (fishing, vegetation harvesting and/or invertebrate harvesting) from shipping activity (physical presence of the vessels, noise, and wake wave action). Kitsumkalum First Nation also stated that potential changes in fish migration routes and the ability of fish to access rearing areas would affect Kitsumkalum First Nation's ability to exercise their traditional right to fish in their asserted traditional territory.

The Proponent responded to Kitsumkalum First Nation's comments in a memo titled, *Kitsumkalum First Nation Review of LNG Canada Conceptual Fish Habitat Offsetting Plan*, and stated that the Application considered changes in the marine water column, including the potential for the physical presence of LNG carriers to cause a change of behaviour in fish, and assessed the residual effects of underwater noise or pressure waves on fish and fish habitat. Through acoustic modelling and expert opinion, the Application determined that following a reduction in LNG carrier travel speeds, residual

effects from shipping are not anticipated to affect the ongoing viability of marine fish species or cause harm to endangered or threatened species. In addition, the Proponent stated they would continue to work with Kitsumkalum First Nation to address concerns related to Project shipping and impacts to CRA fisheries.

In consideration of the information available to EAO, EAO's proposed conditions, and EAO's analysis of residual and cumulative effects to freshwater and estuarine fish and fish habitat and marine resources, the proposed Project is expected to result in minor impacts to Kitsumkalum First Nation's fishing and marine resource harvesting activities.

### Trapping

Kitsumkalum First Nation members trap beaver, marten, fisher, mink, weasel, and muskrat at specific locations on the Kitsumkalum River and tributaries.

A discussion on the potential impacts of the proposed Project on Aboriginal Interests associated with trapping is provided in section 19.3 of this report.

In consideration of the information available to EAO, EAO's proposed conditions, and EAO's analysis of residual and cumulative effects to terrestrial wildlife and marine birds, the proposed Project is expected to result in negligible impacts on any Kitsumkalum First Nation trapping activities.

### Gathering

Kitsumkalum First Nation members gather and harvest a variety of plant species, including: a variety of berry species; numerous trees for bark, wood, cambium, and sap; roots and bulbs; Labrador tea; and wild mushrooms.

A discussion on the potential impacts of the proposed Project on Aboriginal Interests associated with terrestrial gathering is provided in section 19.4 of this report.

During Application Review, Kitsumkalum First Nation expressed concern about potential cumulative effects from RTA air emissions and the possible impacts of air emissions on traditional resources and human consumption within Kitsumkalum First Nation's asserted traditional territory. A discussion on the potential impacts of the proposed Project air emissions on traditional resources is found in section 9 of this report.

In consideration of the information available to EAO, EAO's proposed conditions, and EAO's analysis of residual and cumulative effects to vegetation and wetland resources, the proposed Project is expected to result in negligible impacts to any Kitsumkalum First Nation gathering activities.

### *Cultural Sites, Trails, and Travelways*



The Application did not provide any information that indicates Kitsumkalum First Nation members have culturally important sites in the area of the proposed Project.

During Application Review, Kitsumkalum First Nation stated that they would like to see an assessment of vessel wake on culturally important sites. The Proponent responded that culturally important sites already exposed to wave action are not likely to be regularly exposed to higher waves or experience a change in erosion patterns due to vessel wake. However, the Proponent committed to complete an assessment of potential wake effects on specific locations within Principe Channel. EAO is proposing a condition that would require the Proponent to develop and implement a wake verification plan during Project operations.

In consideration of the information available to EAO, EAO's proposed conditions, and EAO's analysis of residual and cumulative effects on archaeological and heritage resources, the proposed Project is expected to result in negligible impacts to any Kitsumkalum First Nation culturally important sites, trails, and travelways.

#### 20.5.5 Other Matters of Concern Raised by Kitsumkalum First Nation

During the EA, Kitsumkalum First Nation raised a number of additional concerns with the proposed Project that were common across Aboriginal Groups. Concerns raised by multiple Aboriginal Groups and responses from EAO are provided in section 18 of this report. There were no additional concerns specific to Kitsumkalum First Nation.

## 20.6 Metlakatla First Nation

### 20.6.1 Context

- The First Nation community of Metlakatla is located about 7 km northwest of Prince Rupert on the Tsimshian Peninsula and is only accessible by sea or air.
- Metlakatla First Nation has about 3,464.4 ha of land on 16 reserves. Seven of these reserves are shared with Lax Kw'alaams Band.
- As of September 2013, Metlakatla First Nation had a registered population of 860, with 85 members living on-reserve and 775 members living off-reserve. Metlakatla First Nation governance consists of one Chief and six Councillors, each serving three-year terms according to the *Indian Act* electoral system.
- Metlakatla First Nation is actively involved in land use planning initiatives around land and resource use within their asserted traditional territory. In 2006, Metlakatla First Nation signed a Land and Resource Protocol agreement as well as a Strategic Land Use Planning agreement with the BC government.
- Metlakatla First Nation has a Marine Use Plan and Co-Management Agreements with BC Parks for conservancies in their territory, including Dundas and Melville Islands, Stephens Islands, Lucy Islands, Rachael Islands and Kinahan Islands.
- Metlakatla First Nation's asserted traditional territory extends from the coastal islands in eastern Hecate Strait to Lakelse Lake near Terrace, from Portland Canal and Observatory Inlet in the north to the headwaters of the Ecstall River in

the south, and the lower portions and the mouth of the Skeena River and its tributaries.

#### 20.6.2 Aboriginal Interests and EAO's Strength of Claim Assessment and Depth of Consultation

- The proposed Project facility would be located approximately 20 km from Metlakatla First Nation's asserted traditional territory. The proposed Project's shipping route would traverse approximately 30 to 40 km of Metlakatla First Nation's asserted traditional territory.
- As outlined in EAO's letter from December 20, 2013, EAO assessed Metlakatla First Nation Aboriginal rights claim, based on currently available information related to the activities, practices, traditions and customs integral to the distinctive culture of the Nine Allied Tsimshian Tribes prior to contact with Europeans (understood to be around 1787). On June 26, 2014, the *Tsilhqot'in Nation v. British Columbia (Tsilhqot'in)* decision was released by the Supreme Court of Canada. The decision clarified the test for Aboriginal title relating to the elements of sufficient and exclusive occupation at 1846.
- Ethnographic and historical sources suggest that Stephens Island was a resource area used for fishing and seaweed harvesting by the Nine Allied Tsimshian Tribes and belonged to the *Gitwilgyots* tribe. There is also indication of an Indian smoke house on this island, and a site described as a fishing station. Based on this information, EAO has assessed Metlakatla First Nation as having a strong *prima facie* claim to Aboriginal rights to fish, gather, hunt and trap marine and terrestrial resources in the northern portion of the proposed shipping route, and a moderate *prima facie* claim to Aboriginal title to the Stephens Island group.
- Given the nature and location of the proposed Project, and the potential impacts of the proposed Project on Metlakatla First Nation's Aboriginal Interests as discussed below, the Province is of the view that the duty to Metlakatla First Nation lies in the low to middle end of the *Haida* spectrum.
- Notwithstanding the above conclusion, all Aboriginal Groups listed in Schedules B and C of the Section 11 Order have been consulted at the deeper end of the *Haida* consultation spectrum as described in section 14 of this report.

#### 20.6.3 Summary of Consultation

Metlakatla First Nation was invited to review and provide comments on the draft AIR, draft Section 11 Order, the Proponent's Aboriginal Consultation Plan and Reports, the screening of the Application and on the Application. Metlakatla First Nation was also provided with opportunities to attend Working Group meetings, workshops and to meet with EAO staff directly.

EAO provided \$10,000 in capacity funding to Metlakatla First Nation during the Pre-Application phase and \$5,000 in capacity funding during the Application Review phase of the EA process to assist with costs associated with their participation in the EA review. CEAA provided \$10,500 in capacity funding to Metlakatla First Nation.

Metlakatla First Nation was an active participant in the EA, during both Pre-Application and Application Review phases, and EAO engaged with Metlakatla First Nation in a variety of manners throughout the process to seek to better identify, understand, and resolve concerns. Metlakatla First Nation participated in the EA by providing comments on the draft AIR and the Application, attending face-to-face meetings and workshops, participating in conference calls, and corresponding via email.

During Application review, some of the engagement between EAO and Metlakatla First Nation included:

- January 20 to 22, 2015 – Working Group meeting in Vancouver;
- February 18, 2015 – meeting in Prince Rupert to discuss any Metlakatla First Nation outstanding concerns with the proposed Project; and
- April 15, 2015 – meeting with Aboriginal Groups in Vancouver to discuss results of additional Wake analysis.

In addition to EAO-led consultation activities throughout the EA, the Proponent met with Metlakatla First Nation to discuss issues and concerns with respect to the proposed Project's marine access route, shipping activities and potential effects on Metlakatla First Nation's Aboriginal Interests. During the EA process, Metlakatla First Nation also participated in the baseline air quality monitoring program.

The Proponent provided capacity funding to Metlakatla First Nation through a Capacity Funding Agreement, signed on September 19, 2014, which included allocation of funding for collection of traditional use information where the proposed Project may interact with Metlakatla First Nation's Aboriginal Interests. Traditional use information provided by Metlakatla First Nation was included in the Application and included current and traditional use areas, resource harvesting activities and culturally important sites around Lucy Island, Stephens Island and Triple Island.

On March 3, 2014, the Proponent held a shipping and fisheries/marine use workshop with Metlakatla First Nation. Participants included fisheries users, elders and Metlakatla Stewardship Office staff. Potential proposed Project interactions with the marine environment VCs were discussed, as well as potential adverse effects from the proposed Project on Metlakatla First Nation's Aboriginal Interests. Metlakatla First Nation shared information with the Proponent regarding traditional use and harvesting activities throughout their territory and provided the *2013 Metlakatla First Nation Multi-Species Calendar Logbook* to develop a further understanding of the methods and species important to Metlakatla First Nation for fishing, hunting, and marine harvesting.

On July 10, 2014, the Proponent met with Metlakatla First Nation to provide an overview of the draft of Part C of the Application. At the meeting, Metlakatla First Nation identified areas of interest to focus discussions for the upcoming Application Review phase. These included emissions from LNG carriers and marine transportation and use, potential impacts to traditional harvesting and use areas (in particular near Triple Island and other nearby Islands) and related effects to traditional governance systems,

cumulative effects of increased vessel traffic and potential impacts to marine mammals, socio-economic impacts to Metlakatla First Nation members, concerns regarding accidents and malfunctions and concerns regarding vessel wake.

On December 3, 2014 Metlakatla First Nation provided the Proponent with a project-specific traditional use report titled *Metlakatla First Nation Traditional Use and Ecological Knowledge Report of LNG Canada's Proposed Export Terminal Project* Final Report (DMCS November 30, 2014). The report provided traditional use information specifically related to the proposed Project area and was considered by EAO as supplemental to information included in the Application for assessing potential impacts of the proposed Project on Metlakatla First Nation's Aboriginal Interests.

The Proponent also held an introductory meeting with Metlakatla Development Corporation staff to discuss potential employment, contracting and business opportunities related to the proposed Project.

Metlakatla First Nation provided comments on EAO's draft report and noted that while the Proponent has been working to understand project-related impacts on Metlakatla First Nation traditional use activities, the Proponent and Metlakatla First Nation have yet to discuss specific mitigations measures to address impacts to specific traditional uses.

Issues raised by Metlakatla First Nation and the Proponent's and EAO's responses are provided in the Working Group Issues Tracking Table. A summary of the Proponent's consultation activities with Metlakatla First Nation is provided in the Proponent's Aboriginal Consultation Reports.

#### 20.6.4 Potential Impacts of the proposed Project to Metlakatla First Nation's Asserted Aboriginal Interests

##### *Aboriginal Title*

EAO has ensured that Metlakatla First Nation has been meaningfully consulted and accommodated on the potential effects of this proposed Project. As discussed in section 19.7 of this report, in consideration of the information available to EAO, EAO's proposed conditions, and EAO's analysis of residual and cumulative effects to marine resources, marine transportation and use, and visual quality, EAO is of the view that the proposed project is expected to have negligible impacts on Aboriginal title claims in proximity to the shipping route.

##### *Harvesting Activities*

Traditionally, seasonal rounds from village to winter/spring/summer/fall fishing camps dominated Coast Tsimshian life. The harvest of salmon and eulachon were supplemented by hunting, trapping, foraging and shellfish gathering. During summer and autumn months, various plants were gathered for food, materials and medicines.

Metlakatla First Nation provided a report titled *Metlakatla First Nation Traditional Use and Ecological Knowledge Report of LNG Canada's Proposed Export Terminal Project Final Report* (DMCS November 30, 2014) in which they concluded that the proposed Project would impact Metlakatla First Nation's fishing, marine resource harvesting, hunting, trapping, food processing, and plant gathering activities. Specifically, the proposed Project would result in an increase in vessel traffic along Melville Island and Stephens Islands, Triple Island, through Principe Channel, Douglas Channel and Kitimat Arm, and in turn, would impact the ability of Metlakatla First Nation to access their traditional fishing and marine resource harvesting grounds, hunting, trapping, and plant gathering areas (DMCS 2014).

### Hunting

The Application reports that Metlakatla First Nation members hunt species that include ungulates, mountain goat, geese and seal. Ungulates are hunted around the Lakelse watershed and in terrestrial areas in Chatham Sound. Mountain goat are hunted around the Skeena River valley and tributaries and geese are hunted in the Lakelse watershed. Metlakatla First Nation members hunt seal at Metlakatla Pass, Stephens Island, and Triple Island.

None of the specific hunting sites above are located within the footprint for the proposed Project facility. The identified seal hunting sites at Stephens Island and Triple Island are located approximately 8 to 10 km east from the proposed Project shipping route.

Metlakatla First Nation raised concerns regarding increased marine traffic in the Prince Rupert harbour area would also include BC Pilotage Authority crew boats and tug boats travelling between Prince Rupert and the Triple Island Pilot Station via Metlakatla Pass. Although Metlakatla Pass is outside of the proposed Project shipping route, increased vessel traffic in the area could impact Metlakatla First Nation's seal hunting activities. A discussion on the potential impacts of the proposed Project on Aboriginal Interests associated with hunting is provided in section 19.1 of this report.

Metlakatla First Nation also identified several culturally important species, including sea lion, porpoise, blackfish (killer whale), whales, eagles, ravens, and wolves.

In consideration of the information available to EAO, EAO's proposed conditions, and EAO's analysis of residual and cumulative effects to terrestrial wildlife and marine birds and marine resources, the proposed Project is expected to result in negligible impacts on Metlakatla First Nation's asserted Aboriginal right to hunt.

### Fishing and Marine Harvesting

Metlakatla First Nation fish and harvest marine resources throughout their traditional territory. All species of salmon, herring, halibut, and cod are harvested at Metlakatla Pass, Stephens Island, Triple Island, and throughout Chatham Sound. Shrimps and

prawns are harvested around Prince Rupert, Stephens Island, and Triple Island. Metlakatla First Nation members harvest crab and shellfish extensively throughout the proposed Project shipping route.

Key issues raised by Metlakatla First Nation during the EA include:

- Cumulative effects from multiple projects on the North Coast and potential impacts to marine resources, country foods and traditional marine harvesting activities;
- Concern with respect to anchorage of LNG carriers around Lucy Island, Stephens Island and Triple Island and impacts to harvesting activities;
- Potential impacts from shipping activities (e.g. increased marine traffic, vessel wake) and impacts to marine navigation, access to harvesting areas and culturally important sites;
- Concerns regarding BC Pilotage Authority boats transiting from Prince Rupert to the Triple Island Pilot Station through Metlakatla Pass;
- Potential economic impacts resulting from increased vessel traffic and potential interference with commercial and traditional fishing;
- Concerns regarding the transportation of dangerous goods and potential spills in the marine environment;
- Effectiveness of proposed mitigation measures for shipping interference with Aboriginal fishing and harvesting, and request for follow-up;
- Potential impacts of underwater noise from increased marine traffic on marine mammals; and
- Vessel wake, wake study analysis and potential impacts to shoreline harvesting near Triple Islands and other islands adjacent to Browning Entrance (e.g., Stephens Island, Porcher Island).

During Application Review, Metlakatla First Nation raised concerns with the effectiveness of proposed mitigation measures on shipping interference with fishers and harvesters. They indicated that the predictability of this effect is such that a follow-up program is warranted to verify the effectiveness of mitigation measures aimed at limiting harmful impact to marine uses for traditional purposes. The Proponent responded that the proposed Project shipping would not commence for at least five years after construction starts, and the Proponent believes there is enough time to develop shipping and communication protocols in consultation with Metlakatla First Nation.

The report entitled *Impact Assessment of LNG and Other Development on the Metlakatla First Nation* (2014) noted that shipping is a key environmental concern in the Prince Rupert area, both due to past and present terminal development and shipping activity and future planned growth in this industry. The report described that existing shipping routes overlap with many key traditional harvesting areas. The Triple Island area is an important traditional harvesting area and is used year round by Metlakatla First Nation members for multiple different harvesting activities. At least one family member from each Metlakatla family group uses the Triple Island area for harvesting on a consistent basis. Due to the importance of the Triple Island area for harvesting activities, Metlakatla First Nation is particularly concerned about potential effects from

the proposed Project's shipping activities with LNG carrier vessels around the Triple Island Pilot Station and cumulative effects from increased marine traffic. The Village of Metlakatla is approximately 45 km from the Triple Island Pilot Station.

Metlakatla First Nation raised concerns regarding increased marine traffic in the Prince Rupert harbour area would also include BC Pilotage Authority crew boats and tug boats travelling between Prince Rupert and the Triple Island Pilot Station via Metlakatla Pass, with vessels passing within 200 m of the Village of Metlakatla. They were also concerned with excess vessel speeds causing wake effects and damages to their dock and boats moored in the marina.

Specific information regarding mitigation measures and assessment of residual effects and cumulative effects on the marine transportation and use is discussed in section 7.3 of this report. A discussion of the potential impacts of the proposed Project on Aboriginal Interests associated with fishing and harvesting marine resources is provided in section 19.2 and 19.5 of this report.

In consideration of the information available to EAO, EAO's proposed conditions, and EAO's analysis of residual and cumulative effects to freshwater and estuarine fish and fish habitat and marine resources, the proposed Project is expected to result in minor impacts to Metlakatla First Nation's asserted Aboriginal right to fish and harvest marine resources.

### Trapping

Metlakatla First Nation members trap small fur-bearing animals in and around the Lakelse watershed and in Chatham Sound. Neither of these areas is within the proposed Project footprint or shipping route.

A discussion on the potential impacts of the proposed Project on Aboriginal Interests associated with trapping is provided in section 19.3 of this report.

In consideration of the information available to EAO, EAO's proposed conditions, and EAO's analysis of residual and cumulative effects to terrestrial wildlife and marine birds, the proposed Project is expected to result in negligible impacts on Metlakatla First Nation's asserted Aboriginal right to trap.

### Gathering

Metlakatla First Nation members gather terrestrial vegetation for sustenance, medicine, and material in areas throughout the proposed shipping route and especially near past and present settlements in Chatham Sound. The specific gathering site in Chatham Sound does not intersect with the proposed Project footprint or shipping route.

A discussion on the potential impacts of the proposed Project on Aboriginal Interests associated with terrestrial gathering is provided in section 19.4 of this report.

In consideration of the information available to EAO, EAO's proposed conditions, and EAO's analysis of residual and cumulative effects to vegetation and wetland resources, the proposed Project is expected to result in negligible impacts on Metlakatla First Nation's asserted Aboriginal right to gather.

*Cultural Sites, Trails, and Travelways*

The TUS report provided by Metlakatla First Nation concluded that the proposed Project would impact water transportation routes, campsites, and other habitation areas, historic sites, spiritual sites and cultural sites due to increase in vessel traffic along Melville Island and Stephens Islands, Triple Island, through Principe Channel, Douglas Channel and Kitimat Arm.

According to the TUS, culturally significant historic sites, including pictographs, petroglyphs, CMTs, fish traps, weirs and fences, gravesites and archaeological sites are found throughout Metlakatla First Nation traditional territory. Importantly, a number of archaeological sites are located at both ends of the proposed Project shipping route, including: the northern portion of Kitimat Arm in the Kitimat River watershed in close proximity to the proposed Project footprint; and west of Melville Island near the point of origin of the proposed Project Shipping Route. These sites represent an important part of the cultural fabric of Metlakatla First Nation's society and way of life (DMCS 2014).

In addition, many permanent and temporary villages, campsites, cabins, foundations, fire hearths, and other habitation areas are found throughout inland sections of Metlakatla First Nation's asserted traditional territory, including areas of the lower Skeena and Kitimat River drainages located near to and within the proposed Project shipping route (DMCS 2014).

The Application identifies several Metlakatla First Nation cultural sites, trails, and travelways, which are captured in the table below.

**Table 20-7: Metlakatla First Nation Cultural Sites, Trails, and Travelways**

Description	Locations
Rock Art	Throughout proposed Project shipping route, near the shore
Archaeological Sites, including CMTs and shell middens	Throughout proposed Project shipping route near the shore; specific locations are areas around Stephens Island
Transportation – Marine navigation routes	Throughout proposed Project shipping route; specific locations are Metlakatla Pass, Lucy Island, Stephens Island, and Triple Island

The Application provides additional information regarding mitigation measures proposed to avoid and minimize potential effects on Metlakatla First Nation's Aboriginal Interests related to culturally important sites. A discussion on the potential impacts of the proposed Project on Aboriginal Interests associated with archeological and heritage resources is provided in section 19.6 of this report.



In consideration of the information available to EAO, EAO's proposed conditions, and EAO's analysis of residual and cumulative effects on archaeological and heritage resources, the proposed Project is expected to result in minor impacts to Metlakatla First Nation's culturally important sites, trails, and travelways.

#### 20.6.5 Other Matters of Concern Raised by Metlakatla First Nation

During the EA process, Metlakatla First Nation raised a number of additional concerns with the proposed Project. Concerns raised by multiple Aboriginal Groups and responses from EAO are provided in section 18 of this report. Concerns specific to Metlakatla First Nation and responses from EAO, are outlined below.

**Table 20-8: Other Matters of Concern Raised by Metlakatla First Nation**

Issues Raised	EAO/Proponent Response
Concern that LNG carriers would impact migratory birds at Stephens and Lucy Islands.	The effects to migratory birds as a result of Project shipping activities were assessed in section 5.8 of this report.

### 20.7 Lax Kw'alaams Band

#### 20.7.1 Context

- Lax Kw'alaams Band is made up of people from nine (originally 10) former Allied Tsimshian Tribes who, prior to contact, had relocated their winter villages from the lower Skeena River to the Prince Rupert area. They eventually moved their winter villages around the Fort Simpson Hudson's Bay Company trading post to take advantage of trade opportunities with European fur traders. As the village grew and the nine tribes amalgamated, the community name became the Port Simpson Band. In 1986, the Aboriginal Group name officially changed to Lax Kw'alaams Band.
- The village of Lax Kw'alaams (also referred to as Port Simpson) is located on the Tsimpsian Peninsula approximately 30 km northwest of Prince Rupert and is accessible by ferry, road, sea and air. The village of Lax Kw'alaams is approximately 130 km northwest of the proposed Project facility.
- Lax Kw'alaams Band consists of 78 reserves, settlement, and villages with an area of 11,898.7 ha located primarily along the lower Skeena River, Portland Inlet and Work Channel. Seven of the 78 reserves are shared with Metlakatla First Nation. As of September 2013, Lax Kw'alaams Band had a registered population of 3,646, with 668 of those members living on their own reserve, 68 living on other reserves, and 2,910 living off reserve. Lax Kw'alaams Band is governed under the *Indian Act* electoral system and has a Mayor, a Deputy Chief, and 11 Councillors.
- As stated in the Interim Land and Marine Resources Plan of the Nine Allied Tsimshian Tribes of Lax Kw'alaams (2004 Interim Land Use Plan), over 2,000 traditional sites have been identified by the Nine Allied Tsimshian Tribes of

Lax Kw'alaams Band. These sites include traplines, fishing areas, hunting area, forest harvesting areas, berry-picking areas, areas where medicinal plants are gathered, village sites, shell middens, burial grounds, battle areas, areas with pictographs, petroglyphs, culturally modified trees or stone fish weirs, and places with which traditional place names are associated. Many of these areas are still used for traditional purposes such as forest harvesting, fishing and hunting.

#### 20.7.2 Aboriginal Interests and EAO's Strength of Claim Assessment and Depth of Consultation

- The proposed Project facility would be located approximately 15 km south of Lax Kw'alaams Band's asserted traditional territory. The northern portion of the proposed Project's shipping route would traverse approximately 20 km within the marine portion of Lax Kw'alaams Band's asserted traditional territory.
- EAO is of the preliminary view that Lax Kw'alaams Band has a strong *prima facie* claim to Nine Allied Tsimshian Tribes Aboriginal rights to fish, gather, hunt and trap marine and terrestrial resources in the northern portion of the shipping route associated with the proposed Project.
- As articulated in EAO's letter of December 20, 2013 to Lax Kw'alaams Band, EAO assessed Lax Kw'alaams Band's Aboriginal rights claim, based on currently available information related to the activities, practices, traditions and customs integral to the distinctive culture of the Nine Allied Tsimshian Tribes prior to contact with Europeans (understood to be around 1787).
- On March 5, 2014, Lax Kw'alaams Band responded to EAO's initial strength of claim assessment articulated in the December 20, 2013 letter indicating that Lax Kw'alaams Band does not agree with EAO's characterization of the range of rights that Lax Kw'alaams Band holds in the area of the proposed Project, and does not agree with the manner in which EAO had initially assessed Aboriginal title interests in Lax Kw'alaams Band's traditional territory that would be affected by the proposed Project. Lax Kw'alaams Band has indicated they have a strong claim to Aboriginal title to the Stephens Island group and the north end of Porcher Island.
- On June 26, 2014, the *Tsilhqot'in Nation v. British Columbia (Tsilhqot'in)* decision was released by the Supreme Court of Canada. The decision clarified the test for Aboriginal title relating to the elements of sufficient and exclusive occupation at 1846.
- Ethnographic and historical sources suggest that Stephens Island was a resource area used for fishing and seaweed harvesting by the Nine Allied Tsimshian Tribes and belonged to the *Gitwilgyots* tribe. There is also indication of an Indian smoke house on this island, and a site described as a fishing station. Based on this information, EAO has assessed Lax Kw'alaams Band as having a strong *prima facie* claim to Aboriginal rights to fish, gather, hunt and trap marine and terrestrial resources in the northern portion of the proposed shipping route, and a moderate *prima facie* claim to Aboriginal title to the Stephens Island group.
- Given the nature and location of the proposed Project, and the potential impacts of the proposed Project on Lax Kw'alaams Band's Aboriginal Interests as

discussed below, EAO is of the view that the duty to consult Lax Kw'alaams Band lies toward the low to middle end of the *Haida* spectrum.

- Notwithstanding the above conclusion, all Aboriginal Groups listed in Schedules B and C of the Section 11 Order have been consulted at the deeper end of the *Haida* consultation spectrum as described in section 14 of this report.

### 20.7.3 Summary of Consultation

Lax Kw'alaams Band was invited to review and provide comments on the draft AIR, draft Section 11 Order, the Proponent's Aboriginal Consultation Plan and Reports, the screening of the Application and on the Application. Lax Kw'alaams Band was also provided with opportunities to attend Working Group meetings, workshops and to meet with EAO staff directly.

EAO provided \$10,000 in capacity funding to Lax Kw'alaams Band during the Pre-Application phase and \$5,000 in capacity funding during the Application Review phase of the EA process to assist with costs associated with their participation in the EA review. CEAA provided \$10,500 in capacity funding to Lax Kw'alaams Band.

Lax Kw'alaams Band was an active participant in the EA, during both Pre-Application and Application Review phases, and EAO engaged with Lax Kw'alaams Band in a variety of manners throughout the process to seek to better identify, understand, and resolve concerns. Lax Kw'alaams Band participated in the EA by providing comments on the draft AIR and the Application, attending face-to-face meetings and workshops, participating in conference calls, writing letters, and corresponding via email.

During Application review, some of the engagement between EAO and Lax Kw'alaams Band included:

- January 20 to 22, 2015 – Working Group meeting in Vancouver;
- March 2, 2015 – meeting in Vancouver to discuss any Lax Kw'alaams Band outstanding concerns with the proposed Project; and
- April 15, 2015 – meeting with Aboriginal Groups in Vancouver to discuss results of additional wake analysis.

The Proponent provided capacity funding to Lax Kw'alaams Band through a capacity funding agreement, signed on July 23, 2014, to support their review of the proposed Project, participation in the regulatory process and for the completion of studies. To date, neither EAO nor the Proponent has received a TUS or other socio-economic information from Lax Kw'alaams Band.

Other documents with relevant traditional use information were incorporated or cited in the Application, including:

- The Lax Kw'alaams First Nation Land and Marine Resource Plan, titled *Lut'ak Dil Loomsk Txamii Laxyuup Ksi'aamks dil Laxsuulda. Interim Land and Marine Resource Plan of the Allied Tsimshian Tribes of Lax Kw'alaams* (Lax Kw'alaams 2004);

- Naikun Offshore Wind Energy Project Assessment Report (EAO 2009); and
- Kitimat-Summit Lake Pipeline Looping Project Assessment Report (EAO 2008).

The Proponent's consultation activities with Lax Kw'alaams Band included meetings and discussions with respect to the proposed Project's shipping activities, including the access route from Triple Island to Kitimat, the proposed Wake Study for the Project, the TERMPOL review process.

On April 25, 2014, the Proponent provided Lax Kw'alaams Band, for their review and comment, the draft scope of work for the proposed wake study and information on the selected contractor. Lax Kw'alaams Band expressed interest in the Proponent's wake study proposed scope of work, and requested that the wake study assess impacts to the receiving shoreline and marine VCs identified by Lax Kw'alaams Band.

With respect to potential shipping related interactions with Lax Kw'alaams Band's marine use activities, the Proponent invited Lax Kw'alaams Band to attend a fisheries and marine use workshop in Prince Rupert on March 3, 2014, in follow up to fisheries workshops held in December 2013. As no representative from Lax Kw'alaams Band attended the workshop, the Proponent offered to hold a marine use and shipping workshop specifically with Lax Kw'alaams Band members to discuss the marine access route and seek feedback regarding potential impacts to marine resources, interests and use. However, Lax Kw'alaams Band preferred to enter into a capacity funding agreement and initiate the TUS work prior to engaging in discussions regarding marine use and therefore cancelled the workshop.

Issues raised by Lax Kw'alaams Band and the Proponent's responses are provided in the Working Group Issues Tracking Table. A summary of the Proponent's consultation activities with Lax Kw'alaams Band is provided in the Proponent's Aboriginal Consultation Reports.

#### 20.7.4 Potential Impacts of the proposed Project on Lax Kw'alaams Band's Aboriginal Interests

In a letter to EAO March 19, 2015, Lax Kw'alaams Band noted that they do not agree with the conclusions reached with respect to proposed Project impacts on Lax Kw'alaams Band's Aboriginal Interests due to the lack of Lax Kw'alaams Band's specific information. As such, they believe mitigation measures proposed to reduce impacts on Lax Kw'alaams Band's Aboriginal Interests remain inadequate.

##### *Aboriginal Title*

EAO has ensured that Lax Kw'alaams Band has been meaningfully consulted and accommodated on the potential effects of this proposed Project. As discussed in section 19.7 of this report, in consideration of the information available to EAO, EAO's proposed conditions, and EAO's analysis of residual and cumulative effects to marine resources,

marine transportation and use, and visual quality, EAO is of the view that the proposed project is expected to have negligible impacts on Aboriginal title claims in proximity to the shipping route.

### *Harvesting Activities*

#### Hunting

Lax Kw'alaams Band members hunt several species at Lakelse Lake, including grizzly bear, black bear, moose, mountain goat, mallard duck, geese, swan, and grouse. Lakelse Lake is approximately 35 km northeast of the proposed Project facility.

The Application states that Lax Kw'alaams Band members hunt seal and sea lion along the shipping route, and specifically at Stephens, Triple, Prescott, Dundas, Zayas, Dunia, and Melville Island, as well as all the surrounding islands and islets. Deer, mallard ducks, geese, swan and grouse are hunted at Stephens and Prescott Islands.

The specific hunting sites at Stephens and Triple Island are located approximately 8 to 10 km east from the proposed Project shipping route. Melville Island is located approximately 12 to 15 km from the proposed Project shipping route. A discussion on the potential impacts of the proposed Project on Aboriginal Interests associated with hunting is provided in section 19.1 of this report.

In consideration of the information available to EAO, EAO's proposed conditions, and EAO's analysis of residual and cumulative effects to terrestrial wildlife and marine birds, and marine resources, the proposed Project is expected to result in minor impacts to Lax Kw'alaams Band asserted Aboriginal right to hunt.

#### Fishing and Marine Harvesting

Lax Kw'alaams Band members fish for salmon, halibut, greenling, rockfish, crab, and harvest shellfish at Stephens, Prescott, Dundas, Zayas, Duniia, and Melville Islands, and all surrounding islands and islets. They also fish for salmon throughout Chatham Sound. Herring, including roe on kelp, are harvested at Edye Passage, the interior coastlines along Chatham Sound, and North Porcher Island. Seaweed and mussels are harvested at Stephens and Prescott Islands. Lax Kw'alaams Band members report that they harvest in intertidal areas within the area of the proposed Project shipping route.

Lax Kw'alaams Band members also harvest freshwater fish, specifically trout and all species of salmon, at Lakelse Lake.

The shipping route would traverse approximately 20 km of Lax Kw'alaams Band's asserted traditional territory. The Village of Lax Kw'alaams is located approximately 45 km from the Triple Island Pilot Station.

During the EA, Lax Kw'alaams Band identified the following issues and concerns related to their asserted Aboriginal right to fish:

- Potential impacts to the health and abundance of fish and marine mammal populations, including potential underwater noise impacts to fish and invertebrates, in particular to SARA-listed species, and risk of ship strikes;
- Potential changes in fish behaviour and concerns with any potential changes in fish migration patterns;
- Cumulative effects assessment related to marine species, proposed mitigations and environmental management plans for marine mammals and fish;
- Potential effects on ability to harvest due to shipping interference around Triple Island, as well as wake impacts to shoreline harvesting near Triple Islands and Islands adjacent to Browning Entrance (e.g., Stephens Island, Porcher Island);
- Concerns with the cumulative effects assessment related to shipping activities including: Prince Rupert bound shipping; effects on fisheries in the vicinity of Triple Island; effects on marine resources; and inadequate assessment of vessel traffic increase.

Lax Kw'alaams Band stated that their primary concern with the proposed Project is the impacts marine shipping will have on their Aboriginal Interests. They believe that the Proponent has not adequately assessed the impacts of between 170 and 350 LNG carriers transiting the waters each year, including impacts on marine resources.

During Application Review, Lax Kw'alaams Band raised concerns with the supplemental memo provided by the Proponent (*Potential Cumulative Effects from Prince Rupert Shipping Traffic on Marine Transportation and Use*), and stated that it does not address the gap in the cumulative effects assessment conducted for marine shipping near Triple Island. A discussion on the potential impacts of the proposed Project on marine transportation and use is provided in section 7.1 of this report.

Lax Kw'alaams Band also expressed several concerns with the Wake Study, including:

- Wake study fails to consider “constructive interference” between wakes of multiple ships, and existing wave patterns;
- Does not consider persistent interaction, or nibbling away of wake effects on lands and resources; and
- Conclusions are based on incorrect assumption of uniform depth of water, ignoring potential wave size in shallows or beach areas.

A discussion of the potential impacts of the proposed Project on Aboriginal Interests associated with fishing and harvesting marine resources is provided in section 19.2 and 19.5 of this report.

In a letter dated April 17, 2015, Lax Kw'alaams Band stated that mitigation measures are needed for impacts on marine mammals in Lax Kw'alaams Bands' traditional territory and that there remains an inadequate assessment of cumulative impacts on marine resources. EAO notes that the Proponent revised the location of the proposed

shipping route such that as it travels between Browning Entrance and Triple Island it moves further offshore by approximately 8 to 10 km. This revision was made as a result of input received from Aboriginal Groups about potential interactions with marine mammals, potential impacts from the pilot vessels in the vicinity of Triple Island and interactions with vessels bound for Prince Rupert, and is consistent with the Proponent's TERMPOLE submission.

In consideration of the information available to EAO, EAO's proposed conditions, and EAO's analysis of residual and cumulative effects to freshwater and estuarine fish and fish habitat and marine resources, the proposed Project is expected to result in minor impacts to Lax Kw'alaams Band's asserted Aboriginal right to fish and harvest marine resources.

### Trapping

Lax Kw'alaams Band members report that they trap small fur-bearing animals, including beaver, mink, marten, and sea otter. Trapping occurs at Dundas, Zayas, Duniia, and Melville Island, and all surrounding islands and islets.

Melville Island is located northeast of Triple Island, approximately 12 to 15 km from the proposed Project shipping route. The other specific trapping sites identified above are outside of the proposed Project shipping route.

A discussion on the potential impacts of the proposed Project on Aboriginal Interests associated with trapping is provided in section 19.3 of this report.

In consideration of the information available to EAO, EAO's proposed conditions, and EAO's analysis of residual and cumulative effects to terrestrial wildlife and marine birds, the proposed Project is expected to result in negligible impacts to Lax Kw'alaams Band's asserted Aboriginal right to trap.

### Gathering

Lax Kw'alaams Band members gather and harvest several different types of terrestrial vegetation at specific sites within their asserted traditional territory. Band members harvest various tree species, including spruce root, red-cedar bark, yellow-cedar and alder in the interior islands in Chatham Sound, at Stephens, Prescott, Dundas, Zayas, Duniia, and Melville Islands, and all surrounding islands and islets. Salal, berries, creeping raspberries, Saskatoon berries, and bunch berries are also gathered at the specific locations identified above, and also at Lakelse Lake. Various tree species and Pacific Yew, devil's club, hellebore, and stinging nettle are harvested in both the Little and Big Wedeene valleys. None of the gathering locations identified is located within the proposed Project footprint.

A discussion on the potential impacts of the proposed Project on Aboriginal Interests associated with gathering is provided in section 19.4 of this report.

In consideration of the information available to EAO, EAO’s proposed conditions, and EAO’s analysis of residual and cumulative effects to vegetation and wetland resources, the proposed Project is expected to result in negligible impacts to Lax Kw’alaams Band’s asserted Aboriginal right to gather.

*Cultural Sites, Trails, and Travelways*

Lax Kw’alaams Band identified archaeological sites, including CMTs and shell middens at the mouth of Lakelse River. In addition, Lax Kw’alaams Band reported general archeological sites, including CMTs, shell middens, and rock art (e.g. petroglyphs) throughout the proposed shipping route near the shoreline. Lax Kw’alaams Band states that CMTs are present on Porcher Island and also identified marine travelways throughout the proposed shipping route and throughout Chatham Sound. Neither Chatham Sound nor Porcher Island overlap with the proposed Project shipping route.

According to the Application, the Lax Kw’alaams Band’s *Land and Marine Resources Plan* identifies three “Cultural and Natural Areas” and one “Special Management Area”, and both may experience potential Project interactions. The three “Cultural and Natural Areas” include areas around Dundas and Melville islands, Stephens Island and the northern section of Porcher Island and are identified as areas of importance, especially for the collection of marine resources.

The potential impacts of the proposed Project on Aboriginal Interests associated with archeology and other cultural heritage are discussed in section 19.6 of this report.

In consideration of the information available to EAO, EAO’s proposed conditions, and EAO’s analysis of residual and cumulative effects on archaeological and heritage resources, the proposed Project is expected to result in negligible impacts to Lax Kw’alaams Band’s culturally important sites, trails, and travelways.

20.7.5 Other Matters of Concern Raised by Lax Kw’alaams Band

During the EA process, Lax Kw’alaams Band raised a number of additional concerns with the proposed Project. Concerns raised by multiple Aboriginal Groups and responses from EAO are provided in section 18 of this report. Concerns specific to Lax Kw’alaams Band and responses from EAO, are outlined below.

**Table 20-9: Other Matters of Concern Raised by Lax Kw’alaams Band**

Key Issues Raised	EAO Response
Concern that TERMPOL would not adequately consider and protect Aboriginal Interests in Lax Kw’alaams Band’s territorial waters.	Due to the level of interest and concern regarding the marine environment, shipping activities were included in the scope of the EA. The Application assessed potential impacts from shipping activities, including proposed Project interactions with CRA fishing activities, impacts from increased vessel traffic, invasive species, emergency response capabilities and accidents and malfunctions.



Key Issues Raised	EAO Response
	The Proponent volunteered to participate in a TERMPOL review process for the proposed Project and shared the draft scope of work for the TERMPOL review with Lax Kw'alaams Band in April 2014 and has shared drafts of the TERMPOL submission as they become complete.

## 20.8 Métis Nation

### 20.8.1 Context

- The Métis are recognized as Aboriginal peoples, distinct from Indian and Inuit, as noted in Section 35(2) of the *Constitution Act, 1982*.
- The Métis are originally the descendants of eighteenth-century unions between European men (explorers, fur traders and pioneers) and Indian women, mainly on the Canadian plains (Manitoba, Saskatchewan and Alberta).
- The MNBC has six geographical divisions with 35 chartered communities and provides services to Métis across BC. The Northwest BC Métis Association is the local chartered community located in Terrace (MNBC 2013).
- The Northwest BC Métis Association in Terrace has approximately 164 members (MNBC 2013). There are 935 Métis residing in the Regional District of Kitimat Stikine (Statistics Canada 2006 census).

### 20.8.2 EAO's Approach to Consultation

- BC consulted MNBC on behalf of the Government of Canada pursuant to the *Memorandum of Understanding between the Canadian Environmental Assessment Agency and the British Columbia Environmental Assessment Office on Substitution of Environmental Assessments (2013)*.
- Consultation with MNBC is not an acknowledgement on the part of BC that it owes a duty of consultation or accommodation to Métis in BC under Section 35 of the *Constitution Act, 1982*.

### 20.8.3 Summary of Consultation

As part of the substituted EA process, MNBC was included in Schedule D of the Section 11 Order and provided the following opportunities:

- Notification of key milestones, including the issuance of the Application Information Requirements, the acceptance of the Application to EAO for review, the timing of public comment periods, including open houses, referral of the final Assessment Report to Ministers, and the decision of the Ministers;
- Invitation to meet with EAO to discuss any MNBC current use of land and resources for traditional purposes in the proposed Project area; and
- Invitation to review and comment on EAO's draft Assessment Report, including Part C (this report).

The Proponent provided MNBC with notification of the proposed Project, as well as the first Aboriginal Consultation Reports. The Proponent did not receive any comments or concerns from MNBC with respect to the proposed Project, and did not receive any detailed information on MNBC traditional use. The Proponent's Application assumed that MNBC current/traditional use would be affected in a similar manner to other Aboriginal Groups expressing concerns about impacts to current/traditional use, and therefore assumed that proposed mitigation measures would be similarly effective.

At the commencement of the EA process MNBC provided the Agency with a letter indicating a desire to be consulted on the proposed Project to protect the sustenance and cultural needs of Métis citizens and ensure meaningful and adequate consultation has been undertaken. MNBC expressed that the Métis have a desire for the sustainable use of natural resources, which includes:

- Managing natural resources to meet present needs without compromising the needs of future generations;
- Providing stewardship of natural resources based on an ethic of respect for the land;
- Balancing economic, productive, spiritual, ecological, and traditional values of natural;
- Resources to meet the economic, social, and cultural needs of the Métis peoples and other Aboriginal and non-Aboriginal communities; and
- Conserving biological diversity, soil, water, fish, wildlife, scenic diversity, and other natural resources, and restoring damaged ecologies (MNBC 2013).

EAO met with MNBC on March 20, 2015 and discussed the EA of the proposed Project and any outstanding questions or concerns from MNBC. MNBC indicated that their members use the area that may be impacted by the proposed Project and provided EAO with maps indicating areas (but not intensity) of use and activity. No specific concerns were raised with the proposed Project.

#### 20.8.4 Potential Impacts of the Proposed Project on Métis Harvesting Activities

Data provided by MNBC indicate that their members have one salmon fishing site and one camper site within the facility LSA, and one crabbing site and nine fishing sites within the facility RSA. Along the shipping route, MNBC indicated that their members have five flatfish, one salmon and one other fishing site within the shipping LSA, as well as one overnight camping site. Within the shipping RSA, MNBC members have an additional three crabbing sites and eight flatfish, 10 salmon and two other fishing sites.

The effects of the proposed Project are expected primarily within and adjacent to the proposed Project footprint. A discussion of the potential impacts of the proposed Project on Aboriginal Interests associated with hunting, trapping, gathering, fishing, and cultural heritage interests is provided in section 19.2 of this report.

In consideration of the information available to EAO, EAO's proposed conditions, and EAO's analysis of residual and cumulative effects to freshwater and estuarine fish and fish habitat and marine resources, the proposed Project is expected to result in negligible impacts to MNBC fishing and harvest of marine resources.

## **21 Weighing Impacts on Aboriginal Interests with Other Interests**

The Crown has a responsibility to weigh the potential impacts and accommodations on Aboriginal Interests with other societal interests, including the social, environmental and economic benefits of the proposed Project. This evaluation is an important component informing the Ministers' decision regarding the decision on whether to approve the proposed Project. In weighing the proposed Project benefits with the impacts on Aboriginal Interests, EAO holds the view that the following factors regarding the proposed Project are relevant to consider:

- Importance of the proposed Project to the local, regional, and Provincial economy,
- Nature of the proposed Project;
- Resources or values that may no longer be available for future generations; and
- Benefits of the proposed Project to affected Aboriginal communities.

EAO has summarized the estimated Project benefits during construction and operations in section 2.3 and 21.3 of this report.

### **21.1.1 Project Importance to the Provincial Economy**

The BC government set its vision for an LNG industry in BC in September 2011 with the release of *Canada Starts Here: The BC Jobs Plan*. The government saw an opportunity for unprecedented economic growth and jobs for British Columbians and set a goal of three LNG facilities in operation by 2020.

According to MNGD, LNG-related projects have the potential to bring tens of billions of dollars in investment to BC between 2014 and 2022. As many as 100,000 jobs to construct and operate these plants could be created, injecting more than \$1 trillion into our province. This will lead to long term jobs and contracting opportunities for Aboriginal Groups and communities.

The proposed Project would provide a key link between natural gas produced from the WCSB and growing global LNG markets. It also offers an opportunity for Provincial economic growth and job creation. Over the five to six year construction phase, the Proponent proposes to spend up to \$7.1 billion dollars in BC. During the approximately 25 years of operation, the project would create up to 800 jobs. If all four LNG trains are constructed, the Proponent anticipates contributing between \$205 million and \$292 million to provincial government revenue, including PST and carbon tax.

## 21.2 Resources or Values That May No Longer Be Available for Future Generations

Traditional subsistence activities, such as hunting, fishing, gathering and trapping may be altered as a result of construction, operation, and shipping activities of the proposed Project, which could manifest itself through changes to local harvesting locations, behavioural alteration or sensory disturbance of environmental resources.

Although EAO believes there could be potential impacts to resources or values of importance to Aboriginal Groups, the majority of this disturbance and impact would be expected to be low to moderate in magnitude. EAO is of the view that the Proponent has made efforts to demonstrably avoid high value areas for Aboriginal Groups, by building on existing industrial lands, minimizing clearing wherever possible, and providing appropriate mitigation measures to reduce the potential effects of project shipping.

## 21.3 Benefits of the Project to Affected Aboriginal Communities

For Aboriginal Groups, the proposed Project would have the potential to provide important economic opportunities, including capacity-building initiatives to support employment, contracting and business development.

The Proponent has provided and would continue to provide economic benefits to support capacity-building opportunities specific to Aboriginal Groups prior to and during the construction phase of the Project. These opportunities include:

- Providing capacity funding to support meaningful participation in consultation activities with the Proponent and in the regulatory process;
- Identifying training and capacity building partnerships or other arrangements for potentially affected Aboriginal Groups and local communities that will increase opportunities for participation;
- Encouraging and supporting the use of Aboriginal and local businesses by encouraging suppliers and subcontractors to adopt local procurement ;
- Support for scheduled transportation between Terrace and the Project site (e.g., scheduled crew transportation) would be provided to facilitate residents of the Greater Terrace area and nearby Aboriginal communities to participate in the Project while maintaining residence in home communities;
- The Proponent would continue to communicate its employment and subcontracting opportunities that are available;
- The Proponent is actively engaged with the Aboriginal Groups, listed in Schedules B and C of the Section 11 Order, to ensure that local First Nation communities benefit directly from the Project. These benefits include opportunities related to employment, training and contracting and form part of an overall commitment by the proponent to engage local First Nation communities on an ongoing basis in the Project; and

- As part of the request for proposal process, contractors have to provide a local implementation plan as part of their bid. This will describe how they will employ local businesses and suppliers.

## **PART D – CONCLUSIONS**

Based on:

- Information contained in the Proponent's Application and the supplemental information provided during Application review;
- The Proponent's and EAO's efforts at consultation with Aboriginal Groups, government agencies, including local governments, and the public, and its commitment to ongoing consultation;
- Comments on the proposed Project made by Aboriginal Groups and government agencies, including local governments, as members of EAO's Working Group, and the Proponent's and EAO's responses to these comments;
- Comments on the proposed Project received during the public comment period, and the Proponent's responses to these comments;
- Issues raised by Aboriginal Groups regarding potential impacts of the proposed Project and the Proponent's responses and best efforts to address these issues;
- The design of the proposed Project as specified in the proposed Schedule A (Certified Project Description) of the EA Certificate to be implemented by the Proponent during all phases of the proposed Project; and,
- Mitigation measures identified as proposed conditions in Schedule B (Table of Conditions) of the EA Certificate to be undertaken by the Proponent during all phases of the proposed Project.

EAO is satisfied that:

- The EA process has adequately identified and assessed the potential adverse environmental, economic, social, heritage and health effects of the proposed Project, having regard to the proposed conditions set out in Schedule B (Table of Conditions) to the EA Certificate;
- Consultation with Aboriginal Groups, government agencies, and the public, and the distribution of information about the proposed Project have been adequately carried out by the Proponent and that efforts to consult with Aboriginal Groups will continue on an ongoing basis;
- Issues identified by Aboriginal Groups, government agencies and the public, which were within the scope of the EA, were adequately and reasonably addressed by the Proponent during the review of the Application;
- Practical means have been identified to prevent or reduce any potential adverse environmental, social, economic, heritage or health effects of the proposed Project such that no direct or indirect significant adverse effect is predicted or expected, with the exception of a significant adverse effect to GHG emissions;
- The potential for adverse effects on the Aboriginal rights and title of Aboriginal Groups has been avoided, minimized or otherwise accommodated to an acceptable level;

- The provincial Crown has fulfilled its obligations for consultation and accommodation to Aboriginal Groups relating to the issuance of an EA Certificate for the proposed Project.

The provincial Minister of Environment and the Minister of Natural Gas Development will consider this Summary assessment report, the full assessment report and other accompanying materials in making their decision on the issuance of an EA Certificate to the Proponent under the Act.

## Appendix 1: Summary Assessment of Alternatives

**Table A-0-1: Marine Access Route Alternatives**

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



**Table A-0-2: Marine Terminal and LNG Loading and Circulation System Alternatives**

Evaluation Criteria		Modification and Enhancement of the Existing RTA Wharf “B” and Connecting LNG Loading Line	Construction of Two New Wharves (along Lot 88/89 on the West Side of Kitimat Arm), Modifications to the Existing Methanex jetty and Construction of the LNG Loading Line around the North and West Side of the RTA facility site
Technical Criteria	Feasible	Yes	Yes
	Suitable Route for LNG Loading Line	Yes, direct route south of facility	Yes, but with significant technical challenges, including construction of a tunnel
	Sufficient Land Available	Yes, existing wharf	Yes, but requires blasting to expand available land
Economic Criteria	Land Acquired	Yes	Not acquired
	Length/Cost	Shorter/lower	Longer/higher
Existing Use or Zoning Criteria	Suitable Land Zoning	Yes, industrial zoning	Yes, but would remove Hospital Beach
	Existing or Proposed Land Use Conflicts	None expected	Yes, LNG loading corridor conflicts with numerous other proposed ROWs
Environmental and Heritage Resources Criteria	Archaeological Resources Encountered	Yes	Yes
	Sensitive Environmental Areas Affected	Yes	Yes
Industrial or other Safety Criteria	Safety Issues with Existing Land Uses	None expected	Potentially
Selection	Preferred	Yes	No

**Table A-0-3: Power Supply Alternatives**

Evaluation Criteria		All Electrical Power Sourced from the BC Hydro Power Grid for the Entire facility	Hybrid – Electrical Power Sourced from BC Hydro Power Grid for Auxiliary Power	All Power Generated at the LNG Facility Site
Technical Criteria	Feasible Option for LNG Canada	Yes	Yes	Yes
	Power Availability	No, requires expansion of power grid and installation of new generating capacity	Yes	
	Power Reliability Concerns	Potential challenges if system is not built with normal redundancy of supply	Potentially	No
Economic Criteria	Power Cost	Highest	Medium	Lowest
Existing Use or Zoning Criteria	Existing or Proposed Land Use Conflicts	None expected	None expected	None expected
Environmental and Heritage Resources Criteria	Environmental Constraints	Potentially (BC Hydro scope)	Air emissions expected	Higher air emissions
	Combined GHG Footprint	Lowest	Medium	Highest
	Archaeological Resources	A Potentially (BC Hydro scope)	None expected	None expected
Industrial or other Safety Criteria	Safety Issues with Existing Land Uses	None expected	None expected	Power Generation Regulation
Selection	Preferred	No	Yes	No

**Table A-0-4: Disposal of Dredge Material Alternatives**

Evaluation Criteria		Deep Water Disposal at or Near Kitimat Arm	Shallow Water Disposal (Log Capping) at or Near Kitimat Arm	On-land Disposal of all Dredge Sediments at One or More Sites within 10 km of the Dredge Area
Technical Criteria	Feasible	Yes	Yes	Yes
	Suitable Sites Available	Yes	Yes	Unknown, technical challenges with volume
Economic Criteria	Cost	Lowest	Medium, depends on number of sites	Highest
	Follow-up Cost	Low, monitoring	Medium, depends on number of sites	High, ongoing management of disposal site
Existing Use or Zoning Criteria	Existing or Proposed Land Use Conflicts	Not Applicable	Not Applicable	
Environmental and Heritage Resources Criteria	Environmental Constraints	Potential depending on site selection	Potential depending on site selection	Dewatering of dredge material
Industrial or other Safety Criteria	Safety Concerns	None expected	None expected	Potential, ongoing management of disposal site
Selection	Preferred	Yes	No	No

**Table A-0-5: Workforce Accommodation Centre Location Alternatives**

Evaluation Criteria		Adjacent to LNG Site	Sandhill Materials Site
Technical Criteria	Feasible	Yes	Yes, but available area would limit capacity
	Land available	Yes	Yes, but limited to approximately 30 a
	Water supply	Kitimat River	Kitimat River
	Sewage treatment	Onsite treatment, marine disposal	Onsite treatment, marine disposal
Economic criteria	Cost	Lower	Higher
	Length of worker commute	Not applicable	Slightly longer
Existing use or zoning criteria	Suitable land zoning	Yes	Yes
Environmental or heritage resources criteria	Environmental constraints	Non expected	None expected
Industrial or other safety criteria	Interaction of crew bus traffic with Town of Kitimat	During crew changes to and from regional airport	During crew changes to/from regional airport
Selection	Preferred	Yes	No

**Table A-0-6: Disposal at Sea Alternatives**

	Potential DAS Site				
	DSA-1A	DSA-1B	DSA-1C	DSA-2	DSA-3
Distance from Project	3.94 km	5.97 km	2.97 km	16.93 km	17.15 km
Approx Water Depth	200 m	200 m	200 m	300 m	225 m
Potential Disposal Equipment/M methods	Hydraulic dredger with floating pipe directly to disposal site  Split-hull barge with surface release or subsurface discharge pipe	Split-hull barge with surface release or subsurface discharge pipe	Hydraulic dredger with floating pipe directly to disposal site  Split-hull barge with surface release or subsurface discharge pipe	Split-hull barge with surface release or subsurface discharge pipe	Split-hull barge with surface release or subsurface discharge pipe
Substrate Type	Soft mud/silt; <1% woody debris.  Undulated complex terrain.	Soft mud/silt; <1% woody debris.  Gentle downgrading slope	Soft mud/silt; <1% woody debris.  Undulated complex terrain	Soft mud/silt; <1% woody debris.  Gentle downgrading slope.	Mixture of soft mud/silt with a hard bottom with some cobble.  Areas of bedrock in SE – base of steep wall extending from eastern shoreline
Sensitive Habitats	No sensitive habitats were observed.  Sensitive habitats in the vicinity include: <ul style="list-style-type: none"> <li>• Salmon holding area (west shore of Kitimat Arm) – 1.5 km W</li> <li>• Herring spawning area (east shore of Kitimat Arm – low to minor spawn habitat index) – 2.25 km E</li> <li>• Salmon migration to surrounding watersheds</li> </ul>	No sensitive habitats were observed.  Sensitive habitats in the vicinity include: <ul style="list-style-type: none"> <li>• Salmon holding area (west shore of Kitimat Arm) – 1.5 km W</li> <li>• Herring spawning area (east shore of Kitimat Arm – low to minor spawn habitat index) – 2.25 km E</li> <li>• Salmon migration to surrounding</li> </ul>	No sensitive habitats were observed.  Sensitive habitats in the vicinity include: <ul style="list-style-type: none"> <li>• Salmon holding area (west shore of Kitimat Arm) – 1.12 km W</li> <li>• Herring Spawning Area (eastshore of Kitimat Arm – low to minor spawn habitat index) – 1.5km</li> <li>• Salmon migration to surrounding watersheds</li> </ul>	No sensitive habitats were observed.  Sensitive habitats in the vicinity include: <ul style="list-style-type: none"> <li>• North end of Coste Island – Herring spawn area (minor spawn habitat index) – 2.25 km W</li> <li>• Salmon migration to surrounding watersheds – closest salmon</li> </ul>	No sensitive habitats were observed. Two cloud sponge skeletons collected during sediment sampling.  Sensitive habitats in the vicinity include: <ul style="list-style-type: none"> <li>• North end of Coste Island – Herring spawn (minor spawn habitat index) – 1.12 km NW</li> <li>• Salmon migration to surrounding watersheds – closest salmon bearing creek 3 km NE</li> </ul>

	Potential DAS Site				
	DSA-1A	DSA-1B	DSA-1C	DSA-2	DSA-3
	<p>– closest salmon bearing creek is 2.25 km NE (Walhl Creek) Kitimat River estuary – 5.25 km N</p> <ul style="list-style-type: none"> <li>• Walhl Creek estuary – 2.25 km NE</li> <li>• Wathlsto Creek estuary – 2.25 km SE</li> <li>• Bish Creek estuary – 6 km SW</li> </ul>	<p>watersheds – closest salmon bearing creek 1.5 km NE (Walhl Creek)</p> <ul style="list-style-type: none"> <li>• Kitimat River estuary – 5 km N</li> <li>• Walhl Creek estuary – 1.5 km NE</li> <li>• Wathlsto Creek estuary – 3.75 km SE</li> <li>• Bish Creek estuary – 7.5 km SW</li> </ul>	<p>– closest salmon bearing creek 2.25 km NE (Wathlsto Creek)</p> <ul style="list-style-type: none"> <li>• Kitimat River Estuary – 6 km N</li> <li>• Walhl Creek Estuary – 5.25 km NE</li> <li>• Wathlsto Creek Estuary – 2.25 km NE</li> <li>• Bish Creek Estuary – 5.25 km SW</li> </ul>	<p>bearing creek 5.25 km NW (Emsley Cove)</p> <ul style="list-style-type: none"> <li>• Close proximity to Emsley Cove – identified as high-use area by Haisla Nation – 5.25 km NW.</li> <li>• Coste Rocks Provincial Park (south of DSA site) – breeding site for pelagic cormorants, pigeon guillemots, surf scoters. Marbled murrelets also utilize the area – 7.12 km S</li> </ul>	<p>(Gobeil Bay).</p> <ul style="list-style-type: none"> <li>• Coste Rocks Provincial Park (south of DSA site) – breeding site for pelagic cormorants, pigeon guillemots, surf scoters. Marbled murrelets also utilize the area – 6.75 km SW</li> <li>• Eagle Bay Provincial Park (south of DSA site) – overwintering habitat for waterfowl – 6 km S</li> <li>• Detached cloud sponge was collected opportunistically at the base of a rock wall during sediment sampling conducted in SE corner of grid – 0.75 km SE</li> </ul>
Species at Risk	<p>No <i>species at risk</i> were observed during field studies.</p> <p>The following species at risk may occur in or near the site:</p> <ul style="list-style-type: none"> <li>• Eulachon</li> <li>• Bocaccio rockfish</li> <li>• Canary rockfish</li> <li>• Darkblotched rockfish</li> <li>• Quillback rockfish</li> <li>• Rougheyeye rockfish</li> <li>• Yelloweye rockfish</li> <li>• Longspine thornyhead</li> </ul>	<p>No <i>species at risk</i> were observed during field studies.</p> <p>The following species at risk may occur in or near the site:</p> <ul style="list-style-type: none"> <li>• Eulachon</li> <li>• Bocaccio rockfish</li> <li>• Canary rockfish</li> <li>• Darkblotched rockfish</li> <li>• Quillback rockfish</li> <li>• Rougheyeye rockfish</li> <li>• Yelloweye rockfish</li> <li>• Longspine thornyhead</li> </ul>	<p>No <i>species at risk</i> were observed during field studies.</p> <p>The following species at risk may occur in or near the area:</p> <ul style="list-style-type: none"> <li>• Eulachon</li> <li>• Bocaccio rockfish</li> <li>• Canary rockfish</li> <li>• Darkblotched rockfish</li> <li>• Quillback rockfish</li> <li>• Rougheyeye rockfish</li> <li>• Yelloweye rockfish</li> </ul>	<p>No <i>species at risk</i> were observed during field studies.</p> <p>The following species at risk may occur in or near the area:</p> <ul style="list-style-type: none"> <li>• Eulachon</li> <li>• Bocaccio rockfish</li> <li>• Canary rockfish</li> <li>• Darkblotched rockfish</li> <li>• Quillback rockfish</li> <li>• Rougheyeye rockfish</li> <li>• Yelloweye rockfish</li> </ul>	<p>Eulachon (5 individuals) and North Pacific spiny dogfish (1 individual) observed.</p> <p>The following species at risk may also occur in or near the area:</p> <ul style="list-style-type: none"> <li>• Bocaccio rockfish</li> <li>• Canary rockfish</li> <li>• Darkblotched rockfish</li> <li>• Quillback rockfish</li> <li>• Rougheyeye rockfish</li> <li>• Yelloweye rockfish</li> </ul>

	Potential DAS Site				
	DSA-1A	DSA-1B	DSA-1C	DSA-2	DSA-3
	<ul style="list-style-type: none"> <li>• Green sturgeon</li> <li>• Bluntnose sixgill shark</li> <li>• Tope</li> <li>• North Pacific spiny dogfish</li> <li>• Northern abalone</li> <li>• Olympia oyster</li> </ul>	<ul style="list-style-type: none"> <li>• Green sturgeon</li> <li>• Bluntnose sixgill shark</li> <li>• Tope</li> <li>• North Pacific spiny dogfish</li> <li>• Northern abalone</li> <li>• Olympia oyster</li> </ul>	<ul style="list-style-type: none"> <li>• Longspine thornyhead</li> <li>• Green sturgeon</li> <li>• Bluntnose sixgill shark</li> <li>• Tope</li> <li>• North Pacific spiny dogfish</li> <li>• Northern abalone</li> <li>• Olympia oyster</li> </ul>	<ul style="list-style-type: none"> <li>• Longspine thornyhead</li> <li>• Green sturgeon</li> <li>• Bluntnose sixgill shark</li> <li>• Tope</li> <li>• North Pacific spiny dogfish</li> <li>• Northern abalone</li> <li>• Olympia oyster</li> </ul>	<ul style="list-style-type: none"> <li>• Longspine thornyhead</li> <li>• Green sturgeon</li> <li>• Bluntnose sixgill shark</li> <li>• Tope</li> <li>• Northern abalone</li> <li>• Olympia oyster</li> </ul>
Hazards	<p>Sedimentary instabilities not expected.</p> <p>Risk for sediment slope failure assessed as low.</p> <p>Stratigraphy suitable for loading.</p> <p>Submarine sediment flow resulting from slope failures near the head of Kitimat Arm have resulted in flow features that are evident in the current bathymetric dataset covering BSA-1; although shear strength of these sediment units is expected to be low, placement in this basin may still be possible.</p> <p>Floating pipe may present navigational hazard.</p>	<p>Sedimentary instabilities not expected.</p> <p>Risk for sediment slope failure assessed as low.</p> <p>Stratigraphy suitable for loading.</p> <p>Submarine sediment flow resulting from slope failures near the head of Kitimat Arm have resulted in flow features that are evident in the current bathymetric dataset covering BSA-1; although shear strength of these sediment units is expected to be low, placement in this basin may still be possible.</p>	<p>Sedimentary instabilities not expected.</p> <p>Risk for sediment slope failure assessed as low.</p> <p>Stratigraphy suitable for loading.</p> <p>Submarine sediment flow resulting from slope failures near the head of Kitimat Arm have resulted in flow features that are evident in the current bathymetric dataset covering BSA-1; although shear strength of these sediment units is expected to be low, placement in this basin may still be possible.</p> <p>Floating pipe may present navigational hazard.</p>	<p>Sedimentary instabilities not expected.</p> <p>Risk for sediment slope failure assessed as low.</p> <p>Stratigraphy suitable for loading.</p>	<p>Geotechnical information not available to allow for hazard assessment.</p>
Economics	Second closest of the five potential DSA sites to the Project site.	Third closest of the five potential DSA sites to the Project site.	Closest of the five potential DSA sites to the Project site.	Closest of the five potential DSA sites to the Project site.	Fourth closest of the five potential DSA sites to the Project site.

	Potential DAS Site				
	DSA-1A	DSA-1B	DSA-1C	DSA-2	DSA-3
	<p>No physical (oceanography, geophysical, geotechnical, marine sediment, weather) constraints were identified.</p> <p>Biological constraints included benthic invertebrates and fish, which may require mitigation.</p> <p>Social/cultural constraints include land and resource uses (navigation and proximity to parks), CRA fisheries.</p>	<p>No physical (oceanography, geophysical, geotechnical, marine sediment, weather) constraints were identified.</p> <p>Biological constraints included benthic invertebrates and fish, which may require mitigation.</p> <p>Social/cultural constraints include land and resource uses (navigation and proximity to parks), commercial, recreational, and Aboriginal fisheries.</p>	<p>No physical (oceanography, geophysical, geotechnical, marine sediment, weather) constraints were identified.</p> <p>Biological constraints included benthic invertebrates and fish, which may require mitigation.</p> <p>Social/cultural constraints include land and resource uses (navigation and proximity to parks), CRA fisheries.</p>	<p>No physical (oceanography, geophysical, geotechnical, marine sediment, weather) constraints were identified.</p> <p>Biological constraints included benthic invertebrates, fish, and marine mammals, which may require mitigation.</p> <p>Social/cultural constraints include land and resource uses (navigation and proximity to parks), CRA fisheries.</p>	<p>No physical (oceanography, geophysical, geotechnical, marine sediment, weather) constraints were identified.</p> <p>Biological constraints included benthic invertebrates, fish, marine mammals and marine birds, which may require mitigation.</p> <p>Social/cultural constraints include land and resource uses (navigation and proximity to parks), CRA fisheries.</p>
Exclusion of Future Uses	No exclusion of future uses is anticipated.	No exclusion of future uses is anticipated.	No exclusion of future uses is anticipated.	No exclusion of future uses is anticipated.	No exclusion of future uses is anticipated.
Preferred	Yes	Yes	Yes	No	No



## **Appendix 2: List of Working Group Members**

### **Provincial Government**

BC Oil and Gas Commission  
Ministry of Community, Sport and Cultural Development  
Ministry of Environment  
Ministry of Environment – Climate Action Secretariat  
Ministry of Forests, Lands and Natural Resources Operations  
Ministry of Jobs, Tourism and Skills Training  
Ministry of Transport and Infrastructure  
Northern Health

### **Federal Government**

Department of Fisheries and Oceans Canada  
Environment Canada  
Health Canada  
Natural Resources Canada  
Transport Canada

### **Local Government**

District of Kitimat  
City of Terrace  
Kitimat-Stikine Regional District  
Skeena-Queen Charlotte Regional District

### **Aboriginal Groups**

Haisla Nation  
Gitga'at First Nation  
Gitxaala Nation  
Kitselas First Nation  
Kitsumkalum First Nation  
Lax Kw'alaams Band  
Metlakatla First Nation