WCC LNG

Draft Application Information Requirements

ExxonMobil Imperial

Revision History

Revision	Date	Distribution	Comments
0	May 8, 2015	Environmental Assessment Office/Working Group	Draft Application Information Requirements for distribution to the Working Group for review
1	November 13, 2015	Environmental Assessment Office	Draft Application Information Requirements for Public Comment Period

PREFACE TO THE APPLICATION INFORMATION REQUIREMENTS

The Application Information Requirements (AIR) specifies the information that WCC LNG Project Ltd. (the Proponent) is required to provide in its Application for an Environmental Assessment Certificate (EAC) (the Application) under Section 16(2) of the British Columbia *Environmental Assessment Act* (BC EAA 2002a) and the *Canadian Environmental Assessment Act, 2012* (CEAA 2012).

The Proponent is proposing the development and operation of the WCC LNG Project (the Project), as described in the Project Description (WCC LNG Project Ltd. 2015), available at the following link on the British Columbia Environmental Assessment Office (BC EAO) website: http://www.eao.gov.bc.ca.

The Project would be located at Tuck Inlet, on District Lot (DL) 444 (zoned for industrial use), within the City of Prince Rupert, British Columbia, Canada. The Project will include production, storage, transfer, and loading of liquefied natural gas (LNG) into LNG vessels for marine transport to offshore markets. The Project will involve the development of an LNG plant and export facility and the use of shipping routes in BC coastal waters.

The BC EAO issued a Section 10 (1)(c) Order for the Project on January 7, 2015, confirming that the Project constitutes a reviewable project pursuant to Part 4 (Electricity Projects; Petroleum and Natural Gas Projects) and Part 8 (Marine Port Facilities – other than Ferry Terminals) of the *Reviewable Projects Regulation* (BC EAA 2002b). The Project is considered a "reviewable project" because it exceeds the *Reviewable Projects Regulation* (BC EAA 2002b) thresholds for:

- Electrical power generation of >50 megawatts;
- Storage of an energy resource in a quantity that can yield by combustion ≥3 petajoules of energy; and
- Development of a new marine port facility involving the direct physical disturbance of ≥2 hectares of foreshore or submerged land below the natural boundary of a marine coastline or marine estuary.

To proceed, the Project will require an EAC. The Project is also subject to a federal environmental assessment (EA) because the Project activities exceed thresholds of the CEAA 2012 Regulations Designating Physical Activities Schedule Section 14(d).

The BC EAO submitted a request on January 7, 2015, to substitute the CEAA 2012 process with the BC EAA process under Section 3 of the federal-provincial Memorandum of Understanding on Substitution of Environmental Assessments (BC MOE 2013a). On February 26, 2015, the federal Minister of the Environment granted approval for substitution of the federal EA process with the provincial regulatory review to satisfy federal review requirements (CEA Agency 2015a).

The BC EAO issued a Section 11 Order under the BC EAA on April 27, 2015. Representatives of the following government agencies and identified Aboriginal Groups (Schedule B) were invited by the BC EAO to become Working Group members for the proposed Project to review and provide comments on the draft Valued Component (VC) Selection Document and draft AIR:

- Provincial agencies – Ministry of Environment; Ministry of Forests, Lands and Natural Resource Operations; Oil and Gas Commission; Ministry of Health; Ministry of Transportation and Infrastructure; Northern Health Authority; Ministry of Jobs, Tourism, and Skills Training; Ministry of Community, Sport and Cultural Development;
- Federal agencies – Canadian Environmental Assessment Agency (CEA Agency), Environment Canada, Health Canada, Transport Canada, Fisheries and Oceans Canada (DFO), Natural Resources Canada, Prince Rupert Port Authority;
- Municipal and regional governments – City of Prince Rupert, Skeena Queen Charlotte Regional District, District of Port Edward; and
- Aboriginal Groups identified in the Section 11 Order:
    - Schedule B Aboriginal Groups:
        - Lax Kw'alaams Band;
        - Metlakatla First Nation;
        - Gitxaala Nation;
        - Kitselas First Nation; and
        - Kitsumkalum Indian Band.
    - Schedule C Aboriginal Groups are identified for notification of key Project information and are provided opportunities to comment on key documents:
        - Gitga'at Nation; and
        - Métis Nation British Columbia.

The final AIR document will be prepared with consideration of the comments received from the BC EAO, Working Group, and the public on this draft AIR. The Proponent will be responsible for responding to the comments received during the review period and incorporating them into the final AIR, as appropriate. In addition to the draft AIR, a VC Selection Document was also prepared. The VC Selection Document provides additional information on the VC selection process and the proposed environmental, economic, social, heritage and health components to be assessed in the Application.

Once the review of the draft AIR is complete and comments are incorporated, the BC EAO will approve the final AIR. The Application will be prepared in accordance with the approved AIR, as well as the requirements outlined in the Section 11 Order.

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TABLE OF CONCORDANCE

The Application will include a Table of Concordance that uses the format shown in Table 1, where all requirements for content and methodological approaches in the approved AIR will be presented. The Table of Concordance will indicate where these details are located within the Application, including volume, section, and page references.

Table 1: Format for Table of Concordance between Approved Application Information Requirements and Application Documentation

AIR Section	AIR Title	AIR Section Language	Application Section Title	Application Volume, Section, Sub-section, and Page Reference	Relevant Appendix

ABBREVIATIONS

A list of abbreviations used in the Application will be provided. The abbreviations used in the AIR are presented in Table 2.

Table 2: Abbreviations

Abbreviation	Definition
%	Percent
AIR	Application Information Requirements
Application	Application for an Environmental Assessment Certificate
ASA	Acid Sensitivity Area
ATK	Aboriginal Traditional Knowledge
BC EAA	British Columbia *Environmental Assessment Act*
BC	British Columbia
BC CDC	British Columbia Conservation Data Centre
BC EAO	British Columbia Environmental Assessment Office
BC MOE	British Columbia Ministry of Environment
BC FLNRO	British Columbia Ministry of Forests, Lands, and Natural Resource Operations
BC OGC	British Columbia Oil and Gas Commission
BMP	Best Management Practice
CABIN	Canadian Bio-Monitoring Network
CALPUFF	California PUFF Air Dispersion Model
CCME	Canadian Council of Ministers of the Environment
CEA Agency	Canadian Environmental Assessment Agency
CEAA 2012	*Canadian Environmental Assessment Act, 2012*
CIÉ	Commission Internationale de l'Éclairage
CO	Carbon Monoxide
CO_2	Carbon Dioxide
COPC	Constituents of Potential Concern
COSEWIC	Committee on The Status of Endangered Wildlife in Canada
CRA fishery	Commercial, Recreational, or Aboriginal Fishery
dBA	A-weighted Decibels
DERA	Detailed Ecological Risk Assessment
DFO	Fisheries and Oceans Canada
DL	District Lot
DWT	Deadweight Tonnage
EA	Environmental Assessment
EAC	Environmental Assessment Certificate
EC	Environment Canada
EMP	Environmental Management Plan
ESA	Eutrophication Sensitive Area
FCSAP	Federal Contaminated Sites Action Plan
FEED	Front End Engineering Design

Abbreviation	Definition
FPTCCCEA	Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment
bcfd	Billion Cubic Feet per Day
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GIS	Geographic Information System
H_2S	Hydrogen Sulphide
ha	Hectare
HCA	*Heritage Conservation Act*
Hz	Hertz
IESNA	Illuminating Engineering Society of North America
kHz	Kilohertz
KI	Key Indicator
km	Kilometres
km^2	Square Kilometre
LNG	Liquefied Natural Gas
ksps	Kilo Samples Per Second
LSA	Local Study Area
m^3	Cubic Metres
masl	Metres Above Sea Level
MLS	Multiple Listing Service
MTA	Million Metric Tonnes Per Annum
MW	Megawatts
N	Nitrogen
N/A	Not Applicable
NAD	North American Datum
NH_3	Ammonia
NO	Nitrogen Oxide
NO_x	Nitrogen Oxides
NO_2	Nitrogen Dioxide
NWWG	National Wetlands Working Group
O_3	Ozone
OGAA	*Oil and Gas Activities Act*
PC	Pathway Component
PEM	Predictive Ecosystem Mapping
PJ	Petajoule
PM	Particulate Matter
PQRA	Preliminary Quantitative Risk Assessment
Project	WCC LNG Project
Proponent	WCC LNG Project Ltd.
PRPA	Prince Rupert Port Authority
RDEA	Regional District Electoral Area
RISC	Resource Information Standards Committee

Abbreviation	Definition
RSA	Regional Study Area
SAR	Species at Risk
SARA	*Species at Risk Act,* Canada
SBEB	Science-Based Environmental Benchmark
SIMP	Social Impact Management Plan
SO_x	Sulphur Oxides
SO_2	Sulphur Dioxide
TEM	Terrestrial Ecosystem Mapping
TRV	Toxicity Reference Values
TSS	Total Suspended Solids
US EPA	United States Environmental Protection Agency
UTM	Universal Transverse Mercator
VC	Valued Component

APPLICATION SUMMARY

The Application summary will provide an overview of the Application and will include the following:

- A summary description of the proposed Project, including the Project scope, Project benefits, and applicable permits;
- A brief overview of the assessment process, including Project reviewability and the pre-application and application review stages of the EA;
- A summary of the Aboriginal and public consultation approaches and activities undertaken;
- A summary of the key issues raised by Aboriginal Groups, the public, and government agencies;
- A summary of the key issues and potential adverse Project effects;
- A summary of the recommended mitigation measures;
- A summary of the potential residual and cumulative effects on VCs;
- A summary of the follow-up programs proposed (if applicable); and
- Proponent conclusions resulting from the EA regarding potential for significant adverse effects on VCs.

PART A – INTRODUCTION

1 PROPOSED PROJECT OVERVIEW

1.1 Proponent Description

For the purposes of the Pre-Application stage, a description of WCC LNG Project Ltd. (the Proponent) is included in the Project Description (WCC LNG Project Ltd. 2015) (available at the following link on the British Columbia Environmental Assessment Office (BC EAO) website: http://www.eao.gov.bc.ca).

This Proponent description section of the Application for an Environmental Assessment Certificate (EAC) (the Application) will include the names and contact information for the Proponent. In addition to the Proponent information provided below, the Application will provide a detailed description of the Proponent, including history, type of company, affiliations, headquarters location, and contact information. The contact information will in turn include contact names, addresses, telephone numbers, fax numbers, and email addresses.

The Proponent is a federal corporation, with its current shareholder being WCC LNG Holdings Ltd. The shareholders of WCC LNG Holdings Ltd. are ExxonMobil Canada Ltd. and Imperial Oil Resources Limited and are described as follows:

- ExxonMobil Canada Ltd. is a federal corporation, and is a wholly owned Canadian affiliate of Exxon Mobil Corporation.
- Imperial Oil Resources Limited is an Alberta corporation and is a significant operating affiliate of Imperial Oil Limited, one of Canada's largest public corporations. While a public company, Imperial Oil Limited is a related entity of Exxon Mobil Corporation.

The headquarters address and contact information for the Proponent is provided in Table 3.

Table 3: Proponent Contact Information

Proponent	WCC LNG Project Ltd.
Address	237 Fourth Avenue SW Calgary, AB, Canada T2P3M9
President	C.T. Khoo
Principal Contact	Mike Bigler WCC LNG Safety, Health and Environment / Regulatory Manager Toll free: 1-855-338-9931 Email: info@wcc-lng.ca
Alternate Contact	Paul Ericsson WCC LNG Environmental and Regulatory Lead Toll free: 1-855-338-9931 Email: info@wcc-lng.ca
Website	www.exxonmobil.com/wcclng

The Application will include the name and contact information for the firm managing the Environmental Assessment (EA) of the proposed WCC LNG Project (the Project) and a list of the parties involved in the preparation of the Application, their qualifications, and the section(s) for which they were responsible.

1.2 Project Description

The Project will involve the development of a liquefied natural gas (LNG) production, storage, and offloading facility and the use of shipping routes in British Columbia (BC) coastal waters. The Project comprises an LNG facility with an initial capacity of up to 15 MTA and ultimately a maximum production of up to approximately 30 MTA, or approximately 180,000 m^3 of LNG per day. The Project will transfer LNG to LNG carriers operated by third-party prequalified shipping companies engaged in the business of LNG transport.

The Project is located in Tuck Inlet, at the northern end of Prince Rupert harbour, on District Lot (DL) 444. DL 444 is within the City of Prince Rupert, BC (Figure 1), and is zoned for industrial use. The Project Site corresponds to the proposed developed area within DL 444 and proposed marine infrastructure. The Project Area corresponds to DL 444, marine infrastructure, and the shipping routes from the Project Site to the Triple Island Pilotage Station.

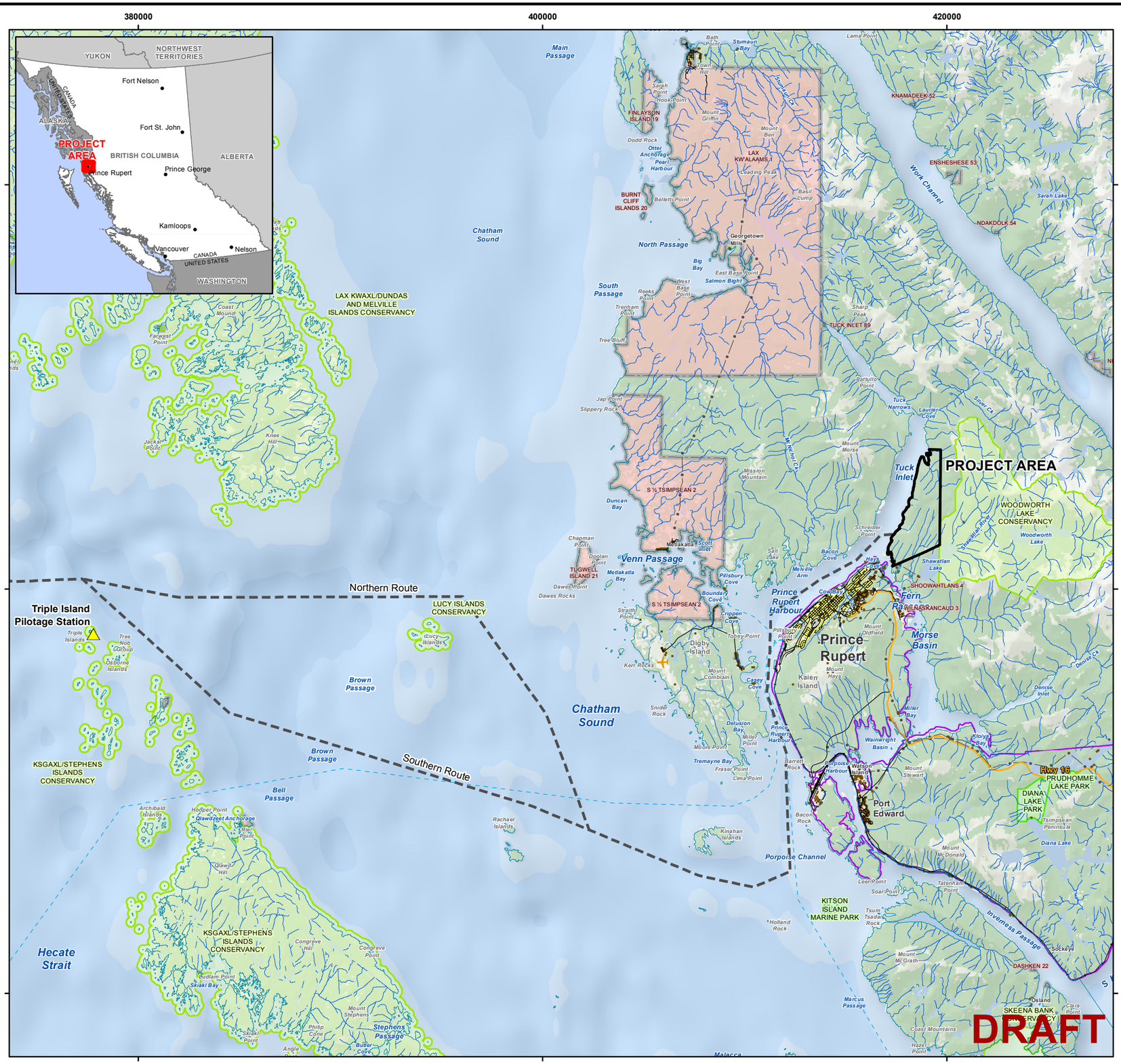
Project-related information is based on a conceptual design for the Project. Ongoing development of the Project will confirm and expand on the expected design, Project activities, and scheduling. The conceptual configuration and artist's rendering of the Project are presented in Figure 2 and Figure 3. Additional details regarding the Project are available in the Project Description (WCC LNG Project Ltd. 2015).

The Application will provide the following:

- A statement that the Project is subject to review under the British Columbia *Environmental Assessment Act* (BC EAA 2002a) and identification of the thresholds in the *Reviewable Projects Regulation* (BC EAA 2002b);
- A statement that the Project is subject to review under the *Canadian Environmental Assessment Act, 2012* (CEAA 2012) pursuant to the Regulations Designating Physical Activities;
- A statement that the federal Minister of the Environment has granted substitution to the BC EAO for the review required under CEAA 2012, a description of the conditions for the substitution process, and a summary of how CEAA 2012 requirements have been fulfilled;
- A statement that the Application has been developed pursuant to the approved Application Information Requirements (AIR) and complies with the requirements of the Section 11 Order issued by the BC EAO;
- A description of the purpose of the Project from the perspective of the Proponent, and the objectives that are related to, or contribute to, broader private or public sector policies, plans, or programs;
- A description of the location of the Project and the longitude and latitude of the site, along with maps showing both regional context (identifying nearby communities) and site-specific setting;
- Identification of the distance to nearby communities, noting the communities on a regional map;
- Identification of the Aboriginal Groups that may be potentially affected by the Project;
- A description of the relevant history of the Project;

- A description of all on-site components and associated on-site and off-site infrastructure and other facilities associated with the Project, including figures displaying components;
- A description of the activities associated with construction, operations, and decommissioning of the Project that also provides figures of activities;
- A description of the capital construction phase and the length or lifetime of the Project in years;
- A summary of existing land and marine uses that overlap, or may be potentially affected by, the Project components and activities, including:
    - Land ownership;
    - Local government zoning or plans;
    - Tenures, licences, permits, or other authorizations;
    - Non-tenured current land uses, including a description of Aboriginal Groups' asserted traditional territories and associated uses;
    - Provincial land use plans and provincial land use designations;
    - Aboriginal Group land use plans and marine use plans;
    - Any other development or activities, whether or not directly related to the Project;
    - Maps showing location of other uses referenced above in relation to the Project, including maps of Aboriginal Groups' asserted traditional territories; and
    - References to the Application section that assess land use and potential overlaps or effects in more detail.
- A description of the Project's economic benefits including:
    - Capital cost estimates, including:
        - Breakdown of costs associated with the Project;
        - Estimated operating costs over the life of the Project, including breakdown of costs by category; and
        - Estimated costs for decommissioning and reclamation.
    - Employment estimates including:
        - Direct employment to be created, by job category and by Project phase, in number of person year jobs for construction and decommissioning and full-time equivalent jobs for operations; direct employment estimates will be broken down into full-time, part-time and seasonal jobs;
        - Average wages, by major job category, for the construction and operations phases;
        - Breakdown of jobs that will be filled from local, provincial, national, or international labour markets;

        - Indirect and induced employment to be generated by Project phase; and
        - Information about employment strategies, where applicable.
    - Contractor supply services estimates, including:
        - List of the major types of businesses/contractors to be used, broken down at the local, provincial, and national level, by Project phase;
        - Value of supply of service contracts expected by Project phase; and
        - Information about a local purchasing strategy, if applicable.
- Annual government revenues, by type for all phases of the Project;
- Any benefits the Project may have to the five pillars of assessment or to Aboriginal Interests;
- Dollar estimates, where applicable, provided in real dollars, with an explanation of how they are measured; and
- A statement of assumptions and references for all the above information, including who prepared the Project economic benefits section.



LEGEND

- PROJECT AREA
- PROPOSED NAVIGATION ROUTE
- PILOTAGE STATION
- AIRPORT
- HIGHWAY
- ROAD
- RAILWAY
- FERRY ROUTE
- PIPELINE
- TRANSMISSION LINE
- COASTLINE
- WATERCOURSE
- CITY / TOWN
- INDUSTRIAL BUILDING
- INDIAN RESERVE
- CONSERVANCY AREA
- PARK OR PROTECTED AREA
- RESIDENTIAL AREA
- VEGETATION
- WATERBODY

NOTES:
LOCATIONS OF PROPOSED NAVIGATION ROUTES ARE APPROXIMATE.

SOURCE:
ROADS, FERRY ROUTES, RAILWAYS, WATERCOURSES, VEGETATION, RESIDENTIAL AREA, INDUSTRIAL BUILDINGS AND NAMED FEATURES, OBTAINED FROM CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED. PARKS, PROTECTED AREA OR CONSERVANCY, HILLSHADE, WATERBODIES AND INDIAN RESERVE DATA OBTAINED FROM THE PROVINCE OF BRITISH COLUMBIA DATA DISTRIBUTION SERVICE. COPYRIGHT © 2013. PROVINCE OF BRITISH COLUMBIA. ALL RIGHTS RESERVED. POTENTIAL NAVIGATION ROUTES COLLECTED BY GOLDER (2013). PILOTAGE STATION OBTAINED FROM PACIFIC PILOTAGE AUTHORITY CANADA. INSET MAP DATA OBTAINED FROM ESRI.

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WCC LNG PROJECT

DRAFT APPLICATION INFORMATION REQUIREMENTS

PROJECT LOCATION

REV	DESCRIPTION	DATE	INITIALS
0	DRAFT	15-04-28	J.W.

N

0 1,500 3,000 6,000
METRES
1:200,000
UTM NAD83 ZONE 9

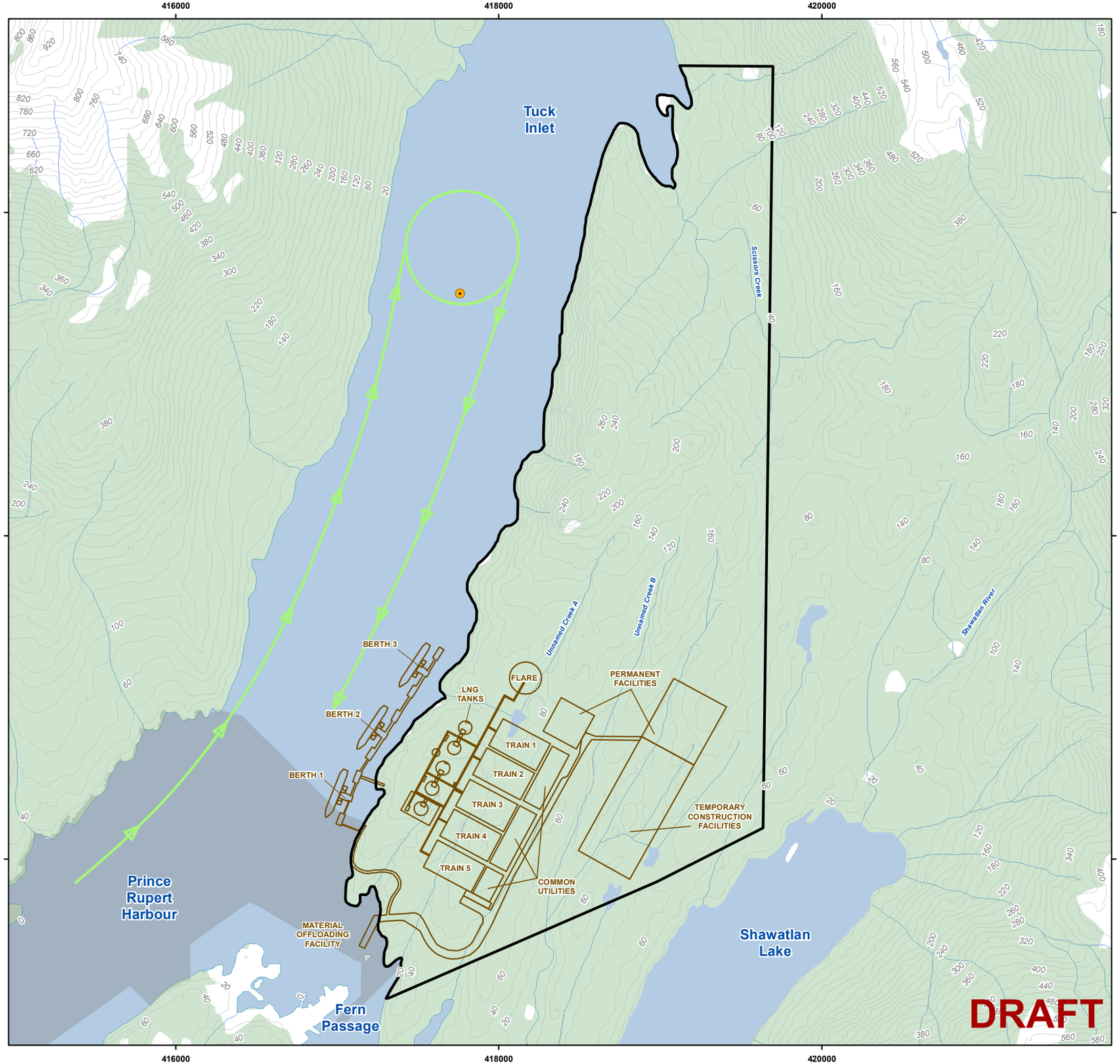
PROJECT 1314220010

FIGURE 1

REV. 0

SERVICE LAYER CREDITS: Esri, DeLorme, GEBCO, NOAA NGDC, and other contributors

Y:\burnaby\CAD-GIS\Client\Exxon\Prince_Rupert\99_PROJECTS\1520369_WCLNG_Tuck_Inlet\02_PRODUCTION\3000_3001\MXD\Report\daIR1536185_01_WC_LNG_PROJECT_SITE.mxd



LEGEND

- PROJECT AREA
- INACTIVE DISPOSAL AT SEA SITE
- PRINCE RUPERT PORT AUTHORITY BOUNDARY
- CONCEPTUAL FACILITY ARRANGEMENT
- PROPOSED APPROACH AND TURNING BASIN
- CONTOUR (20m)
- COASTLINE
- WATERCOURSE
- VEGETATION
- WATERBODY

SOURCE:
PRINCE RUPERT AUTHORITY JURISDICTION AREA BOUNDARY PROVIDED BY PRINCE RUPERT PORT AUTHORITY ON MARCH 26, 2014. WATERBODY OBTAINED FROM CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED. DISPOSAL AT SEA SITES ACTIVE OBTAINED FROM ENVIRONMENT CANADA, INACTIVE FROM CANADIAN HYDROGRAPHIC SERVICES, FISHERIES AND OCEANS CANADA, FEB 2009. OTHER BASE DATA OBTAINED FROM EXXONMOBIL AUGUST 2014. ONSHORE FACILITY PROVIDED FROM EXXONMOBIL NOVEMBER 2015.

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WCC LNG PROJECT

DRAFT APPLICATION INFORMATION REQUIREMENTS

PROPOSED PROJECT CONFIGURATION

REV	DESCRIPTION	DATE	INITIALS
1	DRAFT 2	15-11-10	J.W.
0	INITIAL DRAFT	15-04-28	J.W.

N

0 150 300 600
METRES
1:25,000
UTM NAD83 ZONE 9

PROJECT 1314220010

FIGURE 2

REV. 1

NOTES:
IMAGE IN THIS FIGURE IS FOR ILLUSTRATION PURPOSES ONLY AND IS NOT TO SCALE.
RENDERINGS ARE CONCEPTUAL ARTISTS IMPRESSIONS.

SOURCE:
3D IMAGE PROVIDED BY EXXONMOBIL DECEMBER 2014.

DRAFT

Imperial

ExxonMobil

WCC LNG PROJECT

DRAFT APPLICATION INFORMATION REQUIREMENTS

CONCEPTUAL ARTIST'S RENDERING OF THE PROJECT

REV	DESCRIPTION	DATE	INITIALS
0	INITIAL DRAFT	15-04-28	J.W.

PROJECT 1520369

FIGURE 3

REV.

0

SERVICE LAYER CREDITS:

1.2.1 Project Purpose

The Application will include a section that describes the purpose of the Project.

The purpose of the Project is to receive, process, and liquefy natural gas, and to store and transfer LNG to marine carriers for export to offshore markets. The Project Site is located within a deep-water harbour and is advantageously located to ship LNG to international markets through existing marine shipping and navigation channels from Tuck Inlet to the Pacific Ocean.

1.2.2 Project Location

The Application will include information about the location of the Project, including the Universal Transverse Mercator (UTM) coordinates and proximity to nearby communities.

The Project Site is located on the eastern shore of Tuck Inlet on the Tsimpsean Peninsula, within DL 444, currently owned by Prince Rupert Legacy Inc., and within the limits of the City of Prince Rupert (Figure 1). The southern boundary of DL 444 is approximately 0.5 km across Fern Passage from the northern edge of the City of Prince Rupert town site. The Project Site will lie to the south and west within DL 444, with forested land adjacent to the north and east toward the Woodworth Lake Conservancy Area near DL 444's eastern boundary (Figure 1). Coordinates for the centre of the Project Site are provided in Table 4.

Table 4: Project Coordinates

Geographic Coordinate System	Location
Latitude and Longitude (NAD 83)	Lat: 54.354936 N Long: 130.251114 W
Universal Transverse Mercator (UTM)	NAD 83, Canadian Spatial Reference System UTM 9N Easting: 418691 Northing: 6023734

The Project Site will comprise the aforementioned freehold lands, either owned or leased by the Proponent, and water lots along the eastern shore of Tuck Inlet and the northern shore of Fern Passage. The Proponent will seek to acquire the necessary permits from the provincial government for use of these water lots.

The Project Site is located in the municipality of the City of Prince Rupert, which in turn is located within the Skeena-Queen Charlotte Regional District, in northwestern BC, Canada. The following Aboriginal Groups identified on Schedule B of the Section 11 Order have asserted traditional territories that are near or may overlap the Project Site:

- Lax Kw'alaams Band;
- Metlakatla First Nation;
- Gitxaala Nation;
- Kitselas First Nation; and
- Kitsumkalum Indian Band.

The Project Site is approximately 148 km by road from the main community of the Kitselas First Nation, located at Kitselas 1; approximately 144 km by road from the main community of the Kitsumkalum Indian

Band, located at Kitsumkalum 1; and approximately 75 km by water and 63 km by air from the main community of the Gitxaala Nation, located at Kitkatla on Dolphin Island 1.

The Project Site is approximately 12 km (by water) from the main community of the Metlakatla First Nation, located on S 1/2 Tsimpsean 2, and 29 km (by road and ferry) from the main community of the Lax Kw'alaams Band, located on and adjacent to Lax Kw'alaams 1. The closest Indian Reserves to the Project Site, all originally set aside for the Metlakatla First Nation for fishing purposes, are as follows:

- Shoowahtlans 4 adjacent to DL 444 at the outlet of Shawatlan Lake (about 3 km from the south end of the proposed Project Site by water via Fern Passage);
- Wilnaskancaud 3 on northeastern Kaien Island (about 4 km from the south end of the proposed Project Site); and
- Tuck Inlet 89 at the head of Tuck Inlet (approximately 9 km from the north end of the Project Site).

The Project Site is identified as fee simple land in the North Coast Land and Resource Management Plan. The land portion of the Project Site will be within the 848 ha of DL 444 (parcel identifier number 014-961-130) within the City of Prince Rupert jurisdictional limits. Prince Rupert Legacy Inc. is the current owner of DL 444, and the City of Prince Rupert approved a zoning application for DL 444 to zone the lot for LNG industrial purposes on December 3, 2014. The Project has an option agreement for land acquisition within DL 444 from Prince Rupert Legacy Inc. The nearest residence to the Project boundary is approximately 900 m away from the most southern point of DL 444.

1.2.3 Project History

The Application will include a description of the history of the Project and the Project's exploratory and investigative activities relating to the Project Site. The Application will contain a site map showing the current site features and proposed facilities that are referenced in the Application. The Application will include detail on the site alternative screening and selection process undertaken for the current Project Site, including a summary of engagement activities with Aboriginal Groups and stakeholders.

1.2.4 Project Components

The Application will contain an overview of the Project components, based on the ongoing design for the Project.

The preliminary layout for the Project illustrating the component locations and configurations will be provided in the Application and is presented in Figure 2 and Figure 3.

The LNG facility will consist of inlet gas receiving, natural gas treatment (carbon dioxide [CO_2] and hydrogen sulphide [H_2S] removal, heavy hydrocarbon removal, mercury removal, dehydration), liquefaction, and LNG storage and offloading facilities. An illustration of the facility components, natural gas flow path, and supporting utilities and buildings is provided in Figure 4. The Project's major components are summarized in Table 5.

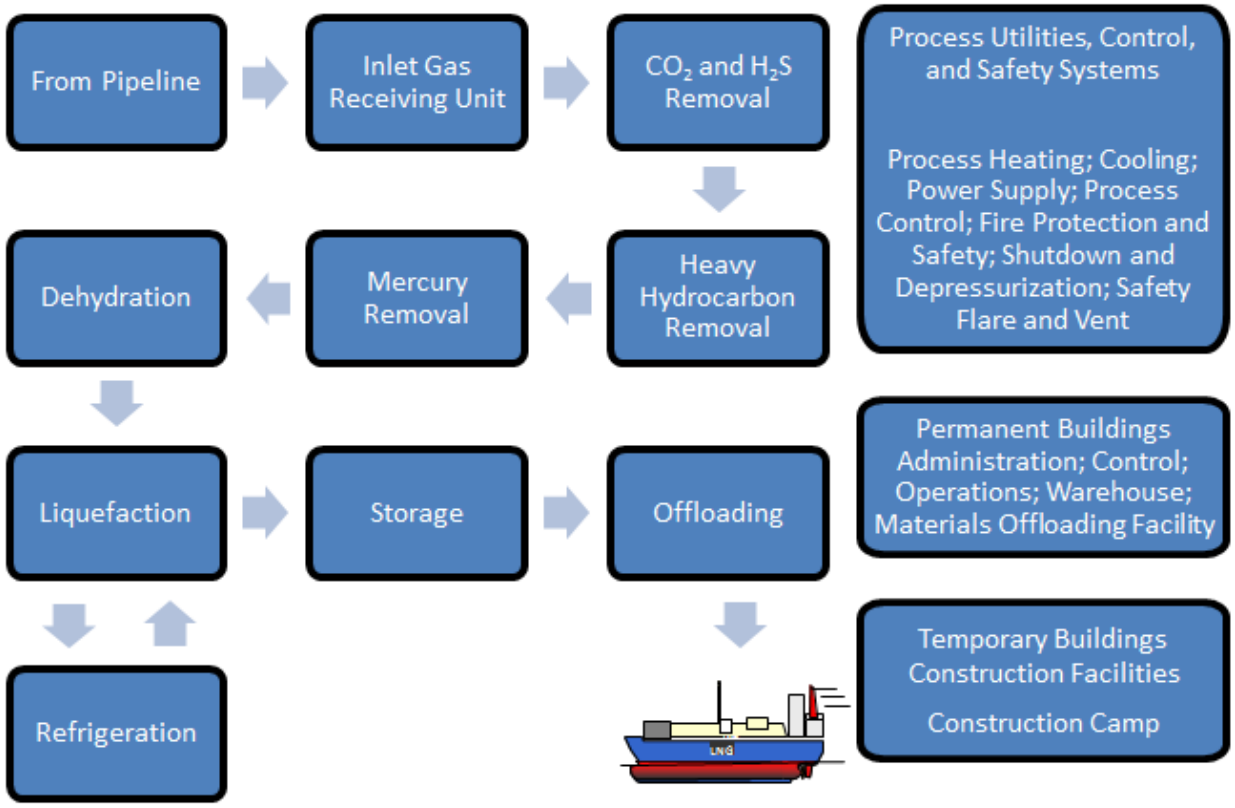

Figure 4: Illustration of the LNG Facility Components, Natural Gas Flow Path, Supporting Utilities, and Buildings

Table 5: Major Components of the Project

Facility	Project Component
LNG facility	Natural gas supply from third-party pipeline
	Inlet gas receiving system
	Natural gas pre-treatment process to remove CO_2, H_2S, water, heavy hydrocarbons, and mercury from the pipeline gas
	Natural gas liquefaction trains producing up to approximately 30 MTA
	LNG storage of up to five 200,000 m^3 onshore storage tanks
	Process heat and cooling systems
	Power supply system
	Process control systems
	Fire protection and safety systems
	Safety, shut-down, and depressurization systems
	Safety flare and vent systems

Facility	Project Component
Support facilities and infrastructure	Road or marine access to Project Site
	Boundary fencing and cleared perimeter area
	Drainage system
	Solid and liquid waste management
	Materials storage
	Administration building
	Emergency response facilities
	Central control room
	Maintenance workshops
	Permanent camp
	Access road and bridge (optional, primary access option via marine access)
Marine infrastructure	LNG transfer and offloading infrastructure (access trestle and berths for berthing and loading LNG carriers)
	LNG shipping including route, navigation approach, vessel berthing, and operational safety zones
	Materials offloading facility (permanent docks used to transfer personnel, materials, and equipment to the facility)
Temporary facilities	Temporary or pioneer docks
	Surface sediment run off controls
	Laydown areas and module haul road
	Construction offices
	Emergency response facilities
	Construction camp supplemented by flotel if required
	Fuel storage
	Workshops and warehouses
	Construction power generation and supply
	Potable and fire water systems
	Concrete batch plant
	Solid and liquid waste management

1.2.5 Project Activities

The Application will provide a description of the activities associated with site preparation, construction, operations, and decommissioning of the Project, and will provide figures to support the descriptions for proposed major activities.

The Project activities that will be discussed in the Application are summarized below.

The following activities are considered part of site preparation:

- Site Clearance:
    - Establishment of surface sediment runoff controls and securing of the Project Site perimeter;
    - Vegetation removal;

  - Evaluation and testing of all current in situ materials for potential reuse as aggregate fill material; suitable materials will be harvested, processed and stockpiled for use as building materials; and
  - Detailed studies to determine existing site soil and rock quality conditions for excavation and blasting.
- Installation of storm water drainage system and erosion and sediment control measures;
- Installation and commissioning of a sanitary sewage treatment plant;
- Development of a waste management plan;
- Site access development; and
- Design and construction of storage areas for fuel and other potentially hazardous chemicals.

Construction activities may include, but are not limited to, the following major areas:

- Site preparation;
- Construction of the materials offloading facility;
- Localized dredging, blasting and/or seabed conditioning of materials offloading facility and disposal of dredged materials (including potential on-land disposal and re-use, and disposal at sea options);
- Marine and land-based transportation of workers, material and equipment;
- Onshore facilities, including:
  - Temporary construction facilities, camp, module haul road, and other infrastructure;
  - Administration, control, and operations buildings;
  - Permanent camp;
  - Utility and power facilities;
  - Process and storage facilities;
  - Erection of other onshore facilities and structures; and
  - Gas inlet facilities.
- Marine facilities including:
  - Pile installation (including blasting);
  - Localized dredging, blasting and/or seabed conditioning of LNG vessel berthing areas to facilitate construction and installation of marine infrastructure, and disposal of dredged materials, (including potential on-land disposal and re-use, and disposal at sea options);
  - Erection of the jetties;

  - Installation of interface piping, electrical, and instrumentation;
  - Installation of remaining operational systems equipment; and
  - Mechanical and electrical installation.
- Systems pressure and integrity testing.

The Application will include an assessment of the maximum expected dredge volume and areal extent of any dredging, underwater blasting, and/or underwater grading. The Application will include an assessment of the potential effects to the marine environment, and human health of sediment dispersion based on the physical and chemical characteristics of the sediment and oceanographic conditions at the site. The Application will outline the methods under consideration for dredging, underwater grading, and/or underwater blasting.

During the construction phase, the Project will have temporary facilities and infrastructure including:

- A construction camp and associated facilities, which include waste collection and disposal (including options such as incineration and on-and-off site landfilling), power generation, and water and food storage;
- Fuel and water storage;
- Power supply facility for construction;
- Marine offloading facilities;
- Laydown area for staging construction materials; and
- On-site concrete batch plant.

The LNG operation will include the following:

- LNG production and storage;
- LNG carrier cool down and loading;
- Offloading of LNG refrigerants, fuel oil, chemicals, and other production materials;
- Shipping between the Project Area and the Triple Island Pilotage Station; and
- Tugboats, supply vessels, ferryboats, and other marine crafts needed to support the LNG facility.

Routine maintenance and inspection activities will be performed systematically. These activities include the following:

- Maintenance of equipment for safe and reliable operation;
- Inspection of equipment and facilities so that mechanical integrity is maintained;
- Inspection and maintenance of safety, civil structures, and environmental monitoring devices; and
- Road and Project Site maintenance.

The Proponent expects that decommissioning and reclamation requirements will be established as part of the EA and review process. The Application will discuss how these decommissioning requirements will be followed at the end of the Project's operational life.

The marine infrastructure, including the mooring facilities, LNG transfer and offloading facilities, access trestle, mooring, and breasting dolphins, will be removed. Affected areas will be restored to an ecologically productive and safe condition, consistent with terms and conditions of applicable regulatory permits and approvals. Post-closure monitoring and follow-up will also be implemented as a component of the decommissioning phase.

The Project decommissioning and reclamation will comply with applicable federal and provincial legislation and requirements at that time. The Proponent has Decommissioning General Practices (Exxon Mobil Corporation 2012) that the Project will apply to the development of a Decommissioning and Reclamation Plan prepared in consultation with the federal and provincial regulatory authorities, the City of Prince Rupert, and potentially affected Aboriginal Groups. The ultimate objective of the Project's Decommissioning and Reclamation Plan will be to return the land to productive and stable condition when the Project is complete.

1.2.6 Project Schedule

The Application will include information on expected timelines, Project design, and construction; a description of the capital construction phase; and the length or lifetime of the Project in years. The expected start timelines for construction and operations will be provided.

The preliminary schedule, including the construction, operations, and decommissioning and reclamation phases of the Project, is summarized in Table 6. All activities will be completed in accordance with the EAC and with the terms and conditions of applicable federal and provincial regulatory approvals and local government bylaws.

Table 6: Project Preliminary Schedule

Project Phase	Year
Data acquisition and engineering studies, including Front End Engineering Design	2014 – 2017
Field studies and EA process	2014 – 2016
Construction of initial phase	2017 – 2024
Operations and maintenance • Minimum of 25-year design life • Extended operating life	 2024 – 2048 2048 – 2058
Construction of remaining phases	2025 – 2030
Decommissioning and reclamation	2048 or later

1.3 Applicable Authorizations

Per the *Oil and Gas Activities Act* (OGAA; BC OGC 2008), the main regulator for construction and operation of the Project is the British Columbia Oil and Gas Commission (BC OGC). This section of the Application will provide an overview of the OGAA regulatory framework, how it is managed by the BC OGC, and its relationship to the Project. The Application will present a list of key applicable federal, provincial, and municipal licences, permits, authorizations, and approvals required for the construction and operation of the Project and identify the associated responsible regulatory body. The Application will also identify the type of permitting options considered (i.e., concurrent or synchronous).

A list of required authorizations, to the extent that was known at the time, is included in the Project Description (WCC LNG Project Ltd. 2015; available at http://www.eao.gov.bc.ca).

The Application will list in tabular format the applicable licences, permits, or approvals that have already been received or are required for each phase of the Project, along with the associated regulatory body (Table 7).

Table 7: Authorization Table

Name of Authorization	Statute and Authorizing Agency	Description of Need for Authorization

1.4 Alternative Means of Carrying out the Project

The Application will include a description of alternative means of carrying out the Project that were considered by the Proponent and the methods and criteria used to evaluate each alternative. Alternative means of undertaking the Project and the environmental effects of any such alternative means will include specific reference to environmental effects as they are identified in Section 5 of CEAA 2012. The Application will present the following:

- A brief description of the alternative means of carrying out the Project and identification of the alternative means that will be assessed in the Application, including but not limited to the following:
    - Site selection;
    - Design concept selection (onshore land-based versus nearshore marine-based);
    - Alternative technologies; and
    - Alternative locations and concepts for worker accommodation facilities.
- A description of the methods and criteria used to evaluate alternatives. Alternatives will be evaluated using the same criteria, and a rationale will be provided for why each criterion was selected.

The criteria used to evaluate the alternative means of carrying out the Project will be described in the Application and will include the following:

- Technical feasibility;
- Economic feasibility;
- Environmental, social, heritage, and health considerations, including the effects as identified in Section 5 of CEAA 2012;
- Aboriginal Interests considerations; and
- Industry safety standards and regulatory requirements.

2 ENVIRONMENTAL ASSESSMENT PROCESS

This section of the Application will include a description of the scope of the Project that will be assessed in the provincial EA (pursuant to the Section 11 Order). It will also include a description of the federal information requirements that are contained in Section 19(1) of CEAA 2012, including environmental effects as defined in Section 5 of CEAA 2012.

This section of the Application will describe the assessment process, including a list of applicable federal and provincial milestones (including any milestones under substitution). Milestones will include, but are not limited to, issuance of the Section 10 and 11 Orders, Working Group meetings, and public comment periods. The Application will describe the consultation that occurred with regulatory agencies, Aboriginal Groups, and the public during the pre-Application period, including the method used for tracking issues. The Application will also include detail on the consultation efforts planned during the Application review period.

2.1 Provincial Environmental Assessment Process

The Project triggers a provincial EA pursuant to BC EAA because it exceeds the following threshold under Part 4 (Table 8) of the *Reviewable Projects Regulation* (BC EAA 2002b):

> "*A new energy storage facility with the capability to store an energy resource in a quantity that can yield by combustion >3 PJ of energy*"

This three PJ threshold is equivalent to approximately 118,000 m^3 of LNG. At full build-out, the Project is expected to require a minimum storage capacity of approximately 1,000,000 m^3 of LNG.

The Project is expected to process natural gas a rate of approximately 141.5 million m^3/day or 5.0 bcfd at full build-out.

Other potentially applicable thresholds for a provincial EA include:

- A marine port facility, other than a ferry terminal, as set out in Part 8 (Table 14) of the *Reviewable Projects Regulation* (BC EAA 2002b):

  If construction of the facility entails dredging, filling or other direct physical disturbance of:

  (a) >1,000 m of linear shoreline, or
  (b) >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."

- A power plant, as set out in Part 4 (Table 7) of the *Reviewable Projects Regulation* (BC EAA 2002b), if it has a rated nameplate capacity of greater than 50 MW.

The Project constitutes a reviewable project, pursuant to Part 4 (Electricity Projects; Petroleum and Natural Gas Projects) and Part 8 (Marine Port Facilities – other than Ferry Terminals) of the *Reviewable Projects Regulation* (BC EAA 2002b). The Project may generate at least 50 MW of electrical power, and will have the capability to store an energy resource, other than electricity, in a quantity that can yield by combustion ≥3 PJ of energy. It would also comprise a new marine port facility, or a modification to an existing marine port facility, the construction of which will entail dredging, filling, or other direct physical

disturbance of ≥2 ha of foreshore or submerged land, below the natural boundary of a marine coastline or marine estuary.

The Application will describe the scope of the Project to be assessed in the provincial EA, pursuant to Section 2 of the Section 11 Order. The provincial scope of the Project consists of all components and activities described in Section 2.1 of the AIR, and Section 2 of the Section 11 Order. Key provincial EA milestones will be summarized as shown in Table 8.

Table 8: Key Provincial Environmental Assessment Milestones

EA Milestone	Date	Status

2.2 Federal Environmental Assessment Process

The Project is also subject to the federal EA process under CEAA 2012 because it exceeds the following thresholds of the Regulations Designating Physical Activities:

> Section 2(a): "*A new fossil fuel-fired electrical generating facility with a production capacity of 200 MW or more*."

The Project is expected to require development of natural gas-fired or steam turbine generators to meet the electrical power supply requirements of the liquefaction process. Based on current definition, at full build-out, the power supply system will provide approximately 500 MW of electricity. The Proponent may consider other options for normal or backup power from third party sources, such as the BC Hydro electrical transmission grid.

> Section 14(d): *"Facility for the liquefaction, storage or regasification of liquefied natural gas, with a liquefied natural gas processing capacity of 3 000 t/day or more or a liquefied natural gas storage capacity of 55 000 t or more."*

The Project is expected to have an LNG processing capacity of approximately 100,000 tonnes/day, or 5.0 bcfd of natural gas, and a minimum storage capacity of approximately 500,000 tonnes, which exceeds the thresholds set out in the regulation.

> Section 24(c): "*Marine terminal designed to handle ships larger than 25 000 DWT* [deadweight tonnage] *unless the terminal is located on lands that are routinely and have been historically used as a marine terminal or that are designated for such use in a land-use plan that has been the subject of public consultation*."

The threshold would apply since the Project is being designed to accommodate vessels weighing 70,000 to 140,000 tonnes and it is not located on lands that are routinely and have been historically used as a marine terminal or that are designated for such use in a land-use plan that has been the subject of public consultation.

The Project has been approved for substitution under the Memorandum of Understanding between the Canadian Environmental Assessment Agency (CEA Agency) and the BC EAO. The provincial review will satisfy all conditions outlined in the substitution decision document (CEA Agency 2015a) for the scope of the Project and the scope of the assessment, including meeting all information requirements outlined in CEAA 2012, specifically Section 19(1) factors and environmental effects as defined in Section 5 of CEAA

2012. The Application will include a table outlining the approach used to address CEAA 2012 requirements (e.g., how the federal requirements align with the Valued Component [VC] selection and assessments). Key federal EA milestones will be summarized as shown in Table 9.

Table 9: Key Federal Environmental Assessment Milestones

Milestone	Date	Status

2.3 Environmental Assessment Participants

The Application will include the following information:

- A list of the federal and provincial agencies that participated in the EA;
- A list of Aboriginal Groups identified in the Section 11 Order, namely:
    - Schedule B:
        - Lax Kw'alaams Band;
        - Metlakatla First Nation;
        - Gitxaala Nation;
        - Kitselas First Nation; and
        - Kitsumkalum Indian Band.
    - Schedule C:
        - Gitga'at Nation; and
        - Métis Nation British Columbia.
- A summary of federal and provincial agency and Aboriginal Group participation in the EA, and a list of the key issues raised by each agency or Aboriginal Group;
- A summary of key issues raised by Aboriginal Groups and provincial and federal agencies during the VC selection and the preparation of the AIR and Application, a discussion of how these issues were addressed, and the degree to which the issues are considered addressed, from the perspective of both the Proponent and Working Group members, and the status of issue resolution, with cross-references, as appropriate, to other sections of the Application that deal further with consultation and issues raised (e.g., Part C, Section 12, for Aboriginal Groups); and
- A summary of public participation in the EA, a list of the key issues raised, and the status of issue resolution, with cross-reference, as appropriate, to other sections of the Application that deal further with public consultation and issues raised (e.g., Part D, Section 13).

PART B – ASSESSMENT OF ENVIRONMENTAL, ECONOMIC, SOCIAL, HERITAGE, AND HEALTH EFFECTS

3 ENVIRONMENTAL ASSESSMENT METHODS

This section of the Application will provide details on the methods used to assess the potential effects of the Project, including environmental effects as defined under Section 5 and Section 19(1) of CEAA 2012, and described in Section 2.2 of this document. This description will include how Aboriginal Traditional Knowledge (ATK), as obtained from Aboriginal Groups through agreed-upon methods, was used in the scoping and execution of the assessment.

The proposed assessment methods for the Project are summarized in the following sections.

This section of the Application will describe the general steps in the assessment methods used to prepare the Application. These methods were developed to meet the requirements of BC EAA and CEAA 2012, as required in the Section 11 Order.

The assessment methods follow a structured approach that includes the following steps:

1) Scoping of the assessment, including:
    - Identification of Project activities with potential to interact with the environment;
    - Selection of VCs, Pathway Components (PCs), and VC indicators; and
    - Identification of the study boundaries (spatial, temporal, technical, and administrative, as applicable) for the assessment.
2) Description of existing conditions in chosen study areas for VCs and PCs;
3) A description of the quality and reliability of the existing conditions data and their applicability for the purpose used, including any gaps, insufficiencies, and uncertainties, particularly for the purpose of monitoring activities;
4) Reference to natural and/or human-caused trends that may alter the environmental, economic, social, heritage, and health setting, irrespective of the changes that may occur as a result of the Project or other projects and/or activities in the area;
5) An explanation of whether and how other past and present projects and activities in the study area have affected or are affecting each VC;
6) Prediction and evaluation of potential effects of the Project on selected VCs and PCs in the receiving environment;
7) Identification of mitigation measures, monitoring procedures, and measures to be developed and incorporated in the Project design to avoid, reduce, or offset identified potential adverse effects on the environment;
8) Identification of potential residual effects on the VCs following implementation of mitigation measures and evaluation of their significance;

9) Providing the means by which the mitigation measures will be implemented and residual effects managed, through the implementation of Environmental Management Plans (EMPs) and Social Impact Management Plans (SIMPs); these include the development of monitoring plans for the Project, and a mechanism for auditing, reviewing, and implementing corrective actions, where necessary; and

10) Identification of potential cumulative effects that result from identified potential Project-related residual effects overlapping with effects from existing and reasonably foreseeable projects in the region, which may collectively result in significant adverse effects on the environment that would not be expected in the case of a stand-alone project.

The general steps in the assessment process are illustrated in Figure 5.

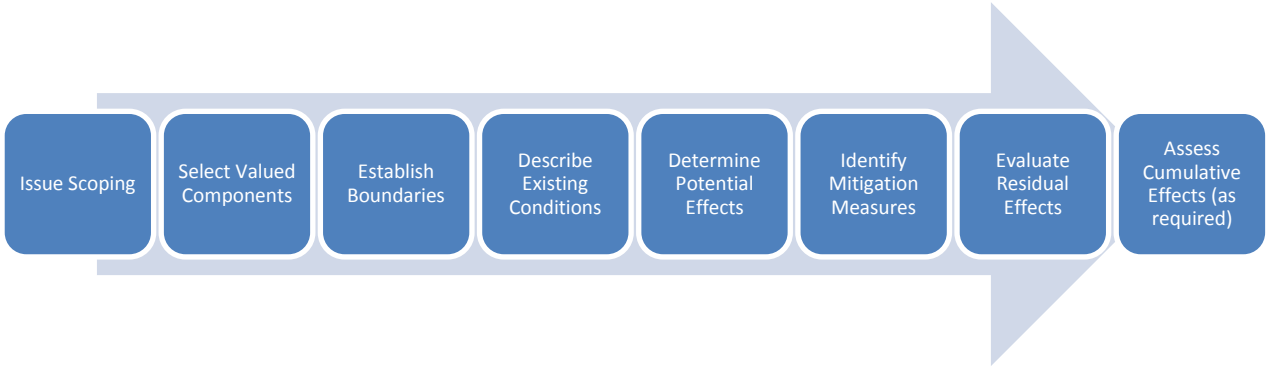

Figure 5: Environmental Assessment Framework

Source: BC EAO (2013a).

3.1 Issues Scoping and Selection of Valued Components

Applications for an EAC must consider the adverse environmental, economic, social, heritage, and health effects of a reviewable project. The BC EAO uses a values-based framework to promote a comprehensive, yet focused, assessment of potential effects while making the most effective and efficient use of resources. This framework relies on the use of VCs as a foundation for the assessment. Valued Components are components of the natural and human environment that are considered by the Proponent, the 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 (BC EAO 2013a).

For the purposes of the assessment, PCs and Key Indicators (KIs) have been used to facilitate and structure the assessment of more broadly defined VCs. The definitions for VCs, PCs, and KIs are provided below.

The Application will provide an overview of the VCs and PCs considered for assessment, and of the corresponding KIs to be used as measureable parameters for carrying out the assessment. The Application will identify whether each VC and PC has been included to address provincial EA requirements, CEAA 2012 requirements, or both. The Application will summarize the process and methods used to identify and select the VCs for assessment. The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the final AIR.

The Application will apply the following definitions, based on guidance in the *Guideline for the Selection of Valued Components and Assessment of Potential Effects* (BC EAO 2013a):

- **Valued Components (VCs)** – These are the components of the natural and human environments 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 (BC EAO 2013a).
- **Subcomponents** – Subcomponents are defined as components of a VC that will be assessed as part of the VC assessment. As stated in the VC selection guidance, VCs can be either broadly defined (lumped) or narrowly defined (split). For broadly defined VCs, it may be appropriate to use subcomponents and KIs, where subcomponents are used to facilitate the assessment (BC EAO 2013a). For example, a broadly defined VC such as Wildlife may include Marine Birds as a subcomponent.
- **Pathway Components (PCs)** – These environmental components are part of a larger effects pathway that can be assessed under a related or more appropriate VC. For example, light assessment may support the assessment of the Wildlife VC and the Community Health and Wellbeing VC. Results of Project-related effects on PCs will be presented in the Application as technical information to inform the assessment of effects on ultimate receptor VCs.
- **Key Indicators (KIs)** – Key indicators are used to measure and evaluate the potential effects of the Project on a particular VC. Per the BC EAO's VC selection guidance, indicators should be relevant, practical, measurable, responsive, accurate, and predictable (BC EAO 2013a). Valued Components that have been selected for assessment in the EA are associated with measurable indicators to enable a meaningful and informative assessment of effects of the Project on each VC.

The VCs are identified for each of the following five key pillars referenced in the BC EAA:

- Environmental;
- Economic;
- Social;
- Heritage; and
- Health.

The process of selecting VCs under each of these pillars has included consideration of the environmental effects that are to be taken into account as required in Section 5(1) and Section 5(2) of CEAA 2012, including the following factors identified under Section 5(1)(c) and 5(2)(b) of CEAA 2012:

- Health and socio-economic conditions;
- Physical and cultural heritage;
- The current use of lands and resources for traditional purposes; and
- Any structure, site, or thing that is of historical, archaeological, paleontological, or structural significance.

The Project has the potential to affect the ability of Aboriginal Groups to exercise Aboriginal Interests, defined by the BC EAO as "asserted or proven Aboriginal rights, including Aboriginal title, or treaty rights" (BC EAO 2013b). The assessment of potential adverse effects of the Project on the ability of Aboriginal Groups to exercise Aboriginal Interests will occur in Part C of the Application, and will consider the results of the Part B assessment for environmental, economic, social, heritage, and health VCs that are directly linked to the exercise of Aboriginal Interests.

To be effective and useful, VCs must have the following attributes (BC EAO 2013a):

- **Relevant** to at least one of the five pillars and clearly linked to the values reflected in the issues raised in respect of the Project;
- **Comprehensive**, so that taken together, the VCs selected for an assessment should enable a full understanding of the important potential effects of the Project (including all five pillars);
- **Representative** of the important features of the natural and human environment likely to be affected by the Project;
- **Responsive** to the potential effects of the Project; and
- **Concise**, so that the nature of the Project-VC interaction and the resulting effect pathway can be clearly articulated and understood, thereby avoiding redundant analysis.

The BC EAO (2013a) defines KIs as "metrics used to measure and report on the condition and trend of a VC." The KIs are an aspect of the VC that are "important to its integrity and can be used to evaluate the potential effect on the VC" (BC EAO 2013a). The BC EAO (2013a) advises that to be effective and useful, KIs must have the following attributes:

- **Relevant** – indicators must relate directly or indirectly to the selected VC;
- **Practical** – there must be a practical way to evaluate the indicator, using existing or achievable data, predictive models, or other means;
- **Measureable** – the measurement of the selected indicator must generate useful data that inform understanding of the potential effect on the VC;
- **Responsive** to potential effects of a project;
- **Accurate** in reflecting changes to the VC; and
- **Predictable** in terms of their response to a project.

The selection of appropriate VCs for an EA is undertaken through the following steps (BC EAO 2013a):

1) **Issues scoping** – compile and analyze available information to identify environmental, economic, social, heritage, and health issues that may be related to the Project based on local and regional values held by identified Aboriginal Groups, public stakeholders, and regulatory agencies;
2) **Identification of candidate VCs** – select candidate VCs to represent resource interests and issues of concern identified through issues scoping;

3) **Evaluation of candidate VCs** – determine whether environmental, economic, social, heritage, or health components related to the issues scoping should be included as candidate VCs through a series of questions to determine whether the components are likely to be affected by the Project; and

4) **Selection of appropriate VCs** – based on the evaluation of each candidate VC, determine whether it is carried forward as a VC, a PC, or not considered further in the EA.

3.1.1 Summary of Methodological Steps

The proposed VCs and PCs and the rationale for their inclusion are presented in Table 10. The process for identifying and selecting candidate VCs followed the *Guideline for the Selection of Valued Components and Assessment of Potential Effects* (BC EAO 2013a). The proposed VCs will be reviewed, refined, and confirmed by the Working Group through a VC Selection Document and Working Group discussions during the pre-application stage. Additional information on the VC selection methods and guidance utilized in the initial development of WCC LNG's VC Selection Document is provided in the Valued Component Guideline (BC EAO 2013a), available at http://www.eao.gov.bc.ca/VC_Guidelines.html.

Comments on the draft AIR received from the BC EAO and the Working Group have informed the final VC selection process. The Application will identify the final selected VCs and PCs and summarize the selection rationale. Linkage diagrams that show the relationships between the PCs and the VCs will be included in the Application.

A preliminary list of potential Project-related interactions, subcomponents, and KIs is provided for each VC in Sections 4 through 8.

Table 10: List of Proposed Valued Components and Pathway Components

Component	Rationale for Inclusion/Exclusion	CEAA 2012 Requirement
Environment		
Air Quality	Included as **Valued Component** Air emissions resulting from the Project and associated shipping activities have the potential to change ambient air quality and acid deposition rates in the Prince Rupert and Tuck Inlet airshed, and the Project Area. Air quality is important for the health of humans, wildlife and vegetation, and the current use of lands and resources for traditional purposes. Air quality can be a pathway for transportation of contaminants; for example, air can be a pathway for acidification and eutrophication of soil and surface water.	Yes
Greenhouse Gas (GHG) Management[(a)]	Included as **Valued Component** The construction and operation of the Project will result in emissions of GHGs. Greenhouse gas management is an important provincial issue.	Yes 5(1)
Acoustic Environment (in-air noise)	Included as **Pathway Component** The acoustic environment (in-air noise) has Aboriginal, regulatory, and human and ecological health importance. Changes to the acoustic environment primarily represent a pathway through which other environmental components (such as wildlife, community health and wellbeing, and the current use of lands and resources for traditional purposes) will be assessed. Therefore, in-air noise is considered a Pathway Component.	Yes 5(1)
Acoustic Environment (underwater noise)	Included as a **Pathway Component** Underwater noise has Aboriginal, regulatory, and ecological health importance. It has the potential to affect primarily marine resources. The potential effects of Project-generated underwater noise are considered under the Marine Resources VC and are included as a Pathway Component.	Yes 5(1) and 5(2)
Light	Included as **Pathway Component** The light environment has Aboriginal, regulatory, and conservation importance. Changes to the light environment represent a pathway through which other environmental components (such as marine resources, visual quality, wildlife, community health and wellbeing, and the current use of lands and resources for traditional purposes) will be assessed. Therefore, light is considered a Pathway Component..	Yes 5(1) and 5(2)
Geology and Terrain	Included as **Pathway Component** Geology and terrain have Aboriginal, regulatory, conservation, and other stakeholder importance. Changes to the geology and terrain (which includes marine geology and terrain) primarily represent a pathway through which other environmental components (such as wildlife, vegetation, land and resource use, marine resource use, and the current use of lands and resources for traditional purposes) will be assessed. Therefore, geology and terrain is considered a Pathway Component.	Yes 5(1) and 5(2)
Groundwater Quality	Included as **Pathway Component** Groundwater quality has Aboriginal, regulatory, conservation, and other stakeholder importance. Changes to the groundwater quality primarily represent a pathway through which other environmental components (such as wildlife, vegetation, fish and fish habitat, human and ecological health, and the current use of lands and resources for traditional purposes) will be assessed. Therefore, groundwater quality is considered a Pathway Component.	Yes 5(1) and 5(2)
Soils	Included as **Pathway Component** Soils have Aboriginal, regulatory, conservation, and other stakeholder importance. Changes to the soils primarily represent a pathway through which other environmental components (such as wildlife, vegetation, and the current use of lands and resources for traditional purposes) will be assessed. Therefore, soils is considered a Pathway Component.	Yes 5(1) and 5(2)
Marine Water Quality	Included as **Valued Component** Marine water quality has Aboriginal, regulatory, conservation, and other stakeholder importance. Project activities have the potential to affect chemical properties of marine water in Tuck Inlet. Marine water quality is important for the health of marine wildlife and vegetation, and human uses that rely on those resources.	Yes 5(1) and 5(2)
Surface Water Quality	Included as **Valued Component** Surface water quality has Aboriginal, regulatory, conservation, and other stakeholder importance. The Project Site covers five small watersheds, the majority of which drain west into Tuck Inlet. There are a number of small lakes, wetlands, and unnamed watercourses within the Project Site boundary. For these watersheds, surface water quality is important for the health of human, wildlife (including fish), and vegetation, as well as the current use of lands and resources for traditional purposes.	Yes 5(1) and 5(2)
Surface Water Quantity	Included as **Valued Component** Surface water quantity has Aboriginal, regulatory, and conservation importance. Within the watersheds on the Project Site, any potential change to surface water quantity is important for the health of other environmental components (such as surface water quality, vegetation, and current use of lands and resources for traditional purposes).	Yes 5(1) and 5(2)
Marine Resources	Included as **Valued Component** Marine resources have Aboriginal, regulatory, conservation and other stakeholder importance. The Project Area also has the potential to affect marine resources that have associated commercial, recreational or Aboriginal uses, or that support commercial, recreational, or Aboriginal (CRA) fisheries. The Project activities, including shipping, have the potential to affect marine resources through direct and indirect effects (e.g., changes in marine water quality, increased underwater noise).	Yes 5(1) and 5(2)
Freshwater Fish and Fish Habitat	Included as **Valued Component** Freshwater fish and fish habitat have Aboriginal, regulatory, conservation, and other stakeholder importance. A number of watercourses within the Project Site have the potential to be affected by Project activities. The Project Site could potentially support fish that have associated CRA fisheries.	Yes 5(1) and 5(2)
Vegetation	Included as **Valued Component** Vegetation has Aboriginal, regulatory, conservation, and other stakeholder importance. Populations of species-based subcomponents may be reduced through Project direct and indirect effects including vegetation clearing, alteration of abiotic conditions sustaining plant populations, or the introduction of invasive and noxious plant species. The spatial extent of ecosystem-based subcomponents may be reduced through direct and indirect effects, including vegetation clearing, alteration of hydrological regimes, eutrophication, or habitat fragmentation.	Yes 5(1) and 5(2)

Component	Rationale for Inclusion/Exclusion	CEAA 2012 Requirement
Wildlife	Included as **Valued Component** Wildlife has Aboriginal, regulatory, conservation, and other stakeholder importance. The Project activities have the potential to affect wildlife through direct and indirect effects (e.g., changes to acoustic environment, ambient light, marine navigation, surface water quality and quantity, air quality, vegetation clearing, and the presence of traffic and infrastructure).	Yes 5(1) and 5(2)
Economic		
Economy/ Economic Conditions	Included as **Valued Component** Economic effects of the Project are of Aboriginal and other stakeholder importance. The Project will potentially provide long-term demand for local staff, providing employment opportunities for local residents. It could also encourage people to migrate to the area for employment. Positive economic effects will potentially be experienced through the increased employment, income, economic diversification, and the associated demand for local goods and services. Governments will have increased tax revenues. Other potential effects could be changes in the cost of living, income disparities, and boom-bust economic cycles. Closure and decommissioning of the Project will create short-term employment but will reduce the local Project-related employment, the demand for local goods and services, and government tax revenues.	Yes 5(1) and 5(2)
Social		
Community Health and Wellbeing	Included as **Valued Component** Community health and wellbeing have Aboriginal and other stakeholder importance. The Project will provide employment opportunities for some residents of the study area and may result in some new workers moving into the region. The potential change in regional demographics and new Project-related income may affect the social determinants of health, increase inequities, alter other socio-economic and health VCs, and place pressure on the health care system, all of which may affect the health and wellbeing of individuals, families, and communities.	Yes 5(1) and 5(2)
Infrastructure and Services	Included as **Valued Component** Infrastructure and services have Aboriginal and other stakeholder importance. Project activities and workforce may create additional pressure on infrastructure and services that may or may not be within their designed capacity. The additional demand and/or pressure created by the Project on Infrastructure and Services may affect the availability, accessibility and sometimes the affordability of these services (e.g., housing).	Yes (5)1 and 5(2)
Land and Resource Use	Included as **Valued Component** Land and resource uses have Aboriginal, regulatory, conservation, and other stakeholder importance. The Project activities have the potential to affect land and resource use through Project footprint, land transportation activities, and increased population associated with the Project.	Yes 5(1)
Marine Use and Transportation	Included as **Valued Component** Marine use and transportation have Aboriginal, regulatory, conservation, and other stakeholder importance. The Project activities have the potential to affect Marine Use and Transportation through the Project footprint, marine transportation activities, and increased population associated with the Project.	Yes 5(1) and 5(2)
Visual Quality	Included as **Valued Component** Visual quality has Aboriginal, regulatory, and other stakeholder importance. Visual quality of the surrounding landscape could potentially be adversely affected by the presence of industrial LNG processing infrastructure, the marine infrastructure, and by the presence of shipping vessels. The addition of these visible disturbances could alter the visual landscape from receptor sites in and around the Project Area.	Yes 5(1)
Current Use of Lands and Resources for Traditional Purposes	Included as **Valued Component** Project components and activities have the potential to adversely affect current use of locations and resources that support traditional diets, economies, social and spiritual life, governance, and cultural transmission (e.g., transfer of traditional language, laws, stories, and beliefs associated with places and sites on the landscape, harvesting of resources, and formation and maintenance of cultural identity).	Yes 5(1)
Heritage		
Archaeology and Heritage Resources	Included as **Valued Component** Archaeology and heritage resources have Aboriginal, regulatory, conservation, and other stakeholder importance. The Project has the potential to affect heritage resources through disturbance of archaeological or historical sites, or through indirect effects related to Project development.	Yes 5(1) and 5(2)
Health		
Human and Ecological Health	Included as **Valued Component** Human and ecological health have Aboriginal, regulatory, conservation, and other stakeholder importance. The Project has the potential to adversely affect the physical health of human and ecological receptors through its emissions, which may influence environmental media both directly and indirectly.	Yes 5(1) and 5(2)

[(a)] No VC has been identified for climate change. While changing climate can have an effect on the proposed Project and the other disciplines assessed in this EA, it is not in itself considered a VC. The effects of climate change on the Project will be evaluated within the effects assessment.

3.2 Assessment Boundaries

The Application will provide an overview of how the selection of spatial boundaries, temporal boundaries, and where applicable, administrative boundaries have been determined for each VC and PC.

3.2.1 Spatial Boundaries

The Application will describe the spatial boundaries that encompass the geographic extent of potential environmental, economic, social, heritage, and health effects of the Project. This section will describe the methods and rationale for selecting spatial boundaries of the assessment. The Application will include the rationale for any differences in spatial boundaries from those presented in the final AIR.

Spatial boundaries selected for the assessment include those areas within which the Project is expected to have potential effects on the selected VCs and PCs. Spatial boundaries for the Project are based on the following criteria:

- Physical extent of the Project;
- Physical extent of predicted Project-related direct and indirect effects;
- Spatial distribution of VCs and PCs in the Project Area relevant to Project activities; and
- Physical extent of key environmental systems.

Spatial boundaries considered in the effects assessment are categorized as follows:

- **Project Site** – corresponds to the proposed development area within the DL 444 and Project marine infrastructure.
- **Project Area** – corresponds to the DL 444 and the shipping routes from the Project Site to the Triple Island Pilotage Station.
- **Local Study Area (LSA)** – encompasses the area within which potential Project effects are expected to occur and is defined for each VC.
- **Regional Study Area (RSA)** – is the area surrounding and including the LSA and is used to provide context for assessment of the potential Project effects and to assess cumulative effects. The RSA is defined for each VC.

The expected boundaries for the assessment of the Project-related effects on each VC have been determined to encompass the physical scope of environmental and socio-economic effects that could occur due to Project-related construction, operations, and decommissioning activities (Table 11). Additional rationale for the selection of the boundaries will be included in Sections 4 through 8 for each PC and VC. Should boundaries change during the course of the preparation of the EA, a rationale for the change will be presented.

The figures for the proposed LSAs and RSAs for each VC are provided in Appendix A.

Table 11: Proposed Local and Regional Study Area Boundaries

Proposed Valued Component (VC)	Figure Number (Appendix A)	Local Study Area (LSA)	Regional Study Area (RSA)
Environment			
Air Quality	A-1	The LSA will be approximately 30 km by 30 km, centred on the Project. The northeastern corner of the LSA is bounded by mountain ranges along the eastern bank of Work Channel. An extension was also added to the west of the LSA, encompassing the shipping routes to Triple Island Pilotage Station.	The RSA corresponds to the airshed that will be used for the air quality dispersion modelling domain, approximately 65 km in east-–west direction by 65 km in north-–south direction, centred on the Project. This boundary was derived through feedback and guidance provided by British Columbia Ministry of Environment (BC MOE) air quality specialists and informed by the Prince Rupert airshed study. The eastern extent of RSA boundary was reduced due to topographic features that reduce potential for eastward dispersion of Project emissions.
Greenhouse Gas Management	N/A	For the GHG Management VC, spatial boundaries will not be defined since GHG emissions are, by nature, a provincial and federal issue. Administrative boundaries for GHG management (the area within which GHG emissions will be quantified) will be correlated with the emission inventory boundaries defined by the relevant provincial and federal GHG policies, regulations, and legislation, and the area defined by the proposed Air Quality LSA.	
Marine Water Quality	A-2	The LSA has been defined as an approximate 6.5 km^2 marine area centred around the proposed marine infrastructure.	The RSA is the same as the Marine Resources RSA which has been defined as an approximate 1,979 km^2 marine area that encompasses Prince Rupert Harbour and Chatham Sound and encompasses Grassy Point to the north.
Surface Water Quality	A-3	The LSA includes the five small watersheds that are intersected by the Project Site in addition to the Shawatlan River watershed area, and includes the Woodworth Lake Conservancy. The LSA also includes the City of Prince Rupert.	**Acid Sensitivity Area (ASA)**: the area with water bodies located within the potential acidic deposition zone, and the potential for cumulative effects with regard to acidification will be assessed in this area. The ASA boundary aligns with the Air Quality LSA boundary, minus the shipping route and the northern extent of the boundary also includes Grassy Point. **Eutrophication Sensitive Area (ESA)**: the area with water bodies located in the potential nutrient nitrogen deposition area, and the potential for cumulative effects with regard to eutrophication will be assessed in this area. The ESA boundary aligns with the Air Quality LSA boundary, minus the shipping route, and the northern extent of the boundary also includes Grassy Point.
Surface Water Quantity	A-4	The LSA includes the five small watersheds that are intersected by the Project Site in addition to the Shawatlan River watershed area, and includes the Woodworth Lake Conservancy.	The RSA is the same as the LSA.
Marine Resources – Marine Mammals	A-5	The Marine Mammal LSA encompasses the area in which there is potential for direct measurable Project effects on marine mammals, including direct physical effects (i.e., injury or mortality) from vessel strikes and/or Project-generated underwater noise during construction, operations, and decommissioning. The LSA has been defined as an approximate 389 km^2 marine area, which includes a 5 km buffer around the proposed terminal footprint and a 2 km buffer on either side of the Project navigation route between Tuck Inlet and the Triple Island Pilotage Station.	The Marine Mammal RSA encompasses the area within which direct and indirect effects have the potential to occur and within which cumulative effects are assessed. This includes the area for which there is potential for marine mammal behavioural responses due to Project-generated underwater noise. The RSA has been defined as an approximate 1,979 km^2 marine area that encompasses Prince Rupert Harbour and Chatham Sound. In the proposed terminal area, the RSA extends north to the north end of Tuck Inlet, southeast in Fern Passage to Butze Rapids, and southwest along the proposed navigational route in Prince Rupert harbour (including the north and west sides of Kaien Island and the east side of Digby Island). Along the proposed Project navigational route in Chatham Sound, the RSA is bounded to the north by the south end of Dundas Island extending eastward to the northwest tip of the Tsimpsean Peninsula (encompassing Grassy Point), to the south by the north end of Stephens, Prescot, and Porcher islands, and to the east by land and the mouth of the Skeena River. The western boundary of the RSA extends 2.5 km west of the Triple Island Pilotage Station.
Marine Resources – Marine Fish and Fish Habitat	A-6	The Marine Fish and Fish Habitat LSA encompasses the area in which there is potential for direct measurable Project effects that may result in serious harm to fish that are part of or support CRA fisheries (i.e., death of fish and/or permanent alteration or removal of marine fish habitat). The LSA has been defined as an approximate 31 km^2 marine area, which includes a 1.5 km buffer around the proposed terminal footprint. The LSA boundary extends north to Osborne Cove and southwest along the proposed navigation route to the entrance of Prince Rupert Harbour (south end of Kaien and Digby islands).	The Marine Fish and Fish Habitat RSA encompasses the area within which direct and indirect effects have the potential to occur and within which cumulative effects are assessed. This includes the area for which there is potential for Project-induced changes in water quality. The RSA has been defined as an approximate 1,988 km^2 marine area that encompasses Prince Rupert Harbour and Chatham Sound. In the proposed terminal area, the RSA extends north to the north end of Tuck Inlet, southeast in Fern Passage to the bottom of Fern Passage, and southwest along the proposed navigational route in Prince Rupert harbour (including the north and west sides of Kaien Island and the east side of Digby Island). Along the proposed Project navigational route in Chatham Sound, the RSA is bounded to the north by the south end of Dundas Island extending eastward to the northwest tip of the Tsimpsean Peninsula (encompassing Grassy Point), to the south by the north end of Stephens, Prescot, and Porcher islands, and to the east by land and the mouth of the Skeena River. The western boundary of the RSA extends 2.5 km west of the Triple Island Pilotage Station.

Proposed Valued Component (VC)	Figure Number (Appendix A)	Local Study Area (LSA)	Regional Study Area (RSA)
Freshwater Fish and Fish Habitat	A-7	The LSA covers drainages that may be directly affected by physical components of the Project: • slopes of the LSA along the east shore of Prince Rupert Harbour and Fern Passage; • Scissors Creek draining into Osborn Cove; • Shawatlan Lake and north shore tributaries to the lake.	The RSA corresponds to the Air Quality RSA based on the air quality dispersion modelling domain, approximately 65 km in east-–west direction by 65 km in north-–south direction centered on the Project. This boundary was derived through feedback and guidance provided by BC MOE air quality specialists and informed by the Prince Rupert airshed study, The eastern extent of RSA boundary was reduced due to topographic features that reduce potential for eastward dispersion of Project emissions.
Vegetation Wildlife (Terrestrial study areas)	A-8	The Vegetation and Wildlife (i.e., Terrestrial) LSA incorporates the terrestrial portion of the Project Site and a 500 m wide buffer of terrestrial areas. The LSA overlaps the Scissors Creek, Shawatlan River, and WORCWSD001172 watersheds. The Vegetation and Wildlife VCs will use the same Terrestrial LSA of 7 km^2. The Terrestrial LSA encompasses the area in which the majority of direct and indirect measurable Project effects on Vegetation and Wildlife are expected during construction, operations, and decommissioning.	The Vegetation and Wildlife (i.e., Terrestrial) RSA comprises 37 watersheds. The Terrestrial RSA is bounded by the WORCWSD000124 watershed to the north, by Work Channel and Lachmach River watershed to the east, by the Skeena River to the south, and by Chatham Sound to the west. The Vegetation and Wildlife VCs will use the same Terrestrial RSA of 913 km^2 due to their ecological interdependence. The Terrestrial RSA is large enough to assess direct and indirect Project-related effects, as well as cumulative effects on Vegetation and Wildlife VC subcomponents. The Terrestrial RSA was selected to include: • general environmental features present in the Terrestrial LSA to facilitate a comparison of habitat types; • topographical breaks and watersheds that provide natural landscape barriers; and • the home range of the wildlife species with the largest home range at the Project Site (i.e., 220 km^2 or 22,000 ha for a coastal male grizzly bear [MacHutchon et al. 1993]), and therefore covers a scale appropriate for assessing the effects of the Project on wildlife.
Wildlife (Marine Bird study areas)	A-9	The Marine Bird LSA incorporates the northern and southern shipping route options in Chatham Sound and a 2 km wide buffer of marine areas. The approximately 414 km^2 Marine Bird LSA encompasses the area in which the majority of direct and indirect Project-related effects on marine birds are expected during construction, operations, and decommissioning.	The Marine Bird RSA incorporates the northern and southern shipping route options in Chatham Sound. In the proposed terminal area, the RSA extends north to the north end of Tuck Inlet, southeast through Fern Passage to Port Edward. Along the proposed Project navigational route in Chatham Sound, the RSA is bounded to the north by the south end of Dundas Island extending eastward to the northwest tip of the Tsimpsean Peninsula (encompassing Grassy Point), to the south by the north end of Stephens, Prescot, and Porcher islands, and to the east by land and the mouth of the Skeena River. The western boundary of the Marine Bird RSA extends 2.5 km west of the Triple Island Pilotage Station. The Marine Bird RSA encompasses approximately 2,055 km^2 and is large enough to assess direct and indirect Project-related effects, as well as cumulative effects.
Economic			
Economy/ Economic Conditions	A-10	The Project Site is located in the City of Prince Rupert, located within the Skeena-Queen Charlotte Regional District. The LSA includes the following: • City of Prince Rupert; • District of Port Edward; • Lax Kw'alaams Band community; • Metlakatla First Nation community; • Gitxaala Nation community (Lach Klan); • Kitselas First Nation community; • Kitsumkalum Indian Band community; • City of Terrace; • Skeena-Queen Charlotte Regional District Electoral area (RDEA) A.	The RSA boundary is consistent with the administrative boundaries of the Skeena-Queen Charlotte Regional District, excluding Haida Gwaii, but including the City of Terrace and the adjacent Kitsumkalum Indian Band and Kitselas First Nation communities.

Proposed Valued Component (VC)	Figure Number (Appendix A)	Local Study Area (LSA)	Regional Study Area (RSA)
Social			
Community Health and Wellbeing	A-10	The Project Site is located in the City of Prince Rupert, within the Skeena-Queen Charlotte Regional District. The LSA includes the following: • City of Prince Rupert; • District of Port Edward; • Lax Kw'alaams Band community; • Metlakatla First Nation community; • Gitxaala Nation community (Lach Klan); • Kitselas First Nation community; • Kitsumkalum Indian Band community; • City of Terrace; • Skeena-Queen Charlotte Regional District Electoral area (RDEA) A.	The RSA boundary is consistent with the administrative boundaries of the Skeena-Queen Charlotte Regional District excluding Haida Gwaii, but including the City of Terrace and the adjacent Kitsumkalum Indian Band and Kitselas First Nation communities. The focus in the City of Terrace and surrounding area is on transportation and housing.
Infrastructure and Services	A-10		
Land and Resource Use	A-12	The LSA consists of the terrestrial areas within 5 km of the centre of the Project Site. The non-terrestrial areas (i.e., marine coastal waters) will be part of the Marine Use and Transportation VC study area. The LSA will also include a 2 km corridor centred on Highway 16 from Prince Rupert to Terrace.	The RSA will include the terrestrial areas within 10 km of the centre of the Project Site.
Marine Use and Transportation	A-12	The LSA has been expanded to include Tuck Inlet and the entire PRPA boundary, south to Smith Island and west to Stephens Island, and includes a 5 km buffer on both sides of the LNG shipping route. The LSA has also been expanded to 10 km west of Triple Island to account for the area where the exchange of marine pilots may occur.	The RSA is the same as marine mammal RSA. The RSA has been defined as an approximate 1,979 km^2 marine area that encompasses Prince Rupert Harbour and Chatham Sound. The RSA has been expanded to 10 km west of Triple Island to account for the area where the exchange of marine pilots may occur.
Visual Quality	A-13	The LSA boundary includes the area within an 8 km viewing distance of the Project Area.	The RSA boundary includes the area beyond a minimum viewing distance of 8 km and a maximum viewing extent of 15 km from the Project Area.
Current Use of Lands and Resources for Traditional Purposes	Subject to consultation with Aboriginal Groups.	The LSA corresponds to each Aboriginal Group's asserted traditional territory or otherwise defined area of use (where known) that overlaps with the LSAs (and RSAs, if applicable) for VCs linked or interrelated to the current use of lands and resources for traditional purposes. This area of overlap serves as the focal area for the assessment of potential effects on the current use of lands and resources for traditional purposes associated with those VCs.	The RSA is the same as the LSA.
Heritage			
Archaeology and Heritage Resources	A-14	The LSA corresponds to DL 444, as well as immediately adjacent marine areas in Tuck Inlet and Fern Passage.	The RSA is the same as the LSA.
Health			
Human and Ecological Health	A-15	The LSA corresponds to the Air Quality LSA, which is 30 km by 30 km, centred on the Project Site. It includes an extension to the west of the LSA, encompassing the shipping routes to Triple Island Pilotage Station. The LSA boundary includes the Marine Surface Water Quality and Marine Resource LSA and RSA boundaries.	The RSA corresponds to the Air Quality RSA based on the air quality dispersion modelling domain, approximately 65 km in east-–west direction by 65 km in north-–south direction centered on the Project. This boundary was derived through feedback and guidance provided by BC MOE air quality specialists and informed by the Prince Rupert airshed study, The eastern extent of RSA boundary was reduced due to topographic features that reduce potential for eastward dispersion of Project emissions.

3.2.2 Temporal Boundaries

Temporal boundaries considered in the effects assessment encompass the periods during which the Project is expected to have potential effects on selected VCs. The temporal boundaries of the Project will include the construction, operations, and decommissioning and reclamation phases of the Project.

This section will describe the methods and rationale for selecting temporal boundaries based on the phases of the Project. The Application will include the rationale for any differences in temporal boundaries from those presented in the final AIR. Based on the existing Project schedule (Table 6), the temporal boundaries for the Project stages are identified as follows:

- **Construction** – approximately 2017 to 2024;
- **Operations** – minimum of 25 years after completion of construction (2024 to 2048), with extended operation life of 2048 to 2058; and
- **Decommissioning and reclamation** to 2048 or later.

3.2.3 Administrative Boundaries

The Application will identify administrative boundaries for each VC and PC, where applicable, and will provide an explanation of their relevance to the assessment boundaries.

Administrative boundaries refer to the limitations on the assessment imposed by political, economic, or social constraints, and may not be applicable to all VCs (BC EAO 2013a). Where administrative boundaries have constrained the assessment of potential effects, the nature of the administrative boundaries and their influence on the assessment will be documented in the Application.

3.2.4 Technical Boundaries

Technical boundaries refer to constraints on the assessment imposed by limitations in the ability to predict effects (BC EAO 2013a). Where applicable for some VCs, the use of models may also impose technical limitations on the analysis, such as through margin of error. Where technical boundaries have constrained the assessment of potential effects, the nature of the technical boundaries and their influence on the assessment will be documented in the Application.

3.3 Description of Existing Conditions

The Application will summarize the overall process and methods used to identify and study the existing conditions. The description of existing conditions may include 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 Project or other projects or activities in the area.

For each VC, the existing conditions within the assessment areas will be described in sufficient detail to enable potential Project-VC interactions to be identified, understood, and assessed. The description will include the characteristics of the VC, as well as characteristics of subcomponents within the VC, and reference to the characteristics of any supporting PCs upon which the VC relies. Existing conditions information will focus on the indicators defined for the VC. The Application will describe the current or existing conditions in each VC and PC section that will include existing disturbances and land and marine uses. Publically available information on the VCs and PCs, and data collected over a long enough period of

time to establish annual norms, natural, and/or human-caused trends that may alter the environmental, economic, social, heritage or health setting, and extremes, will be included, where applicable. The Application will describe the quality and reliability of these data and their applicability for the purpose used, including any gaps, insufficiencies, and uncertainties, particularly for the purposes of monitoring activities. The Application will include an explanation of whether and how other past and present projects and activities in the study area have affected or are affecting each VC. Each VC and PC section of the Application will include a summary of the following information sources used to inform the assessment, along with a reference to any appended technical reports that provide details regarding standards used, sampling and analytical methods, and relevant guidance and quality control measures, as applicable:

- Existing available databases, remote-sensing imagery and data, literature and monitoring programs, and discussion of the quality and relevance of such information;
- Previous EAs for similar projects or other types of projects in the same region;
- Available ATK, as obtained through consultation with Aboriginal Groups; and
- Project-specific data collection, analysis, and presentation, including field studies, following appropriate provincial or federal standards (e.g., Resource Information Standards Committee [RISC] 2001).

A summary of the information to be provided and field studies to be used in the description of existing conditions is provided within each PC and VC section of this document. Where methods used for the assessment deviate from applicable published guidance, the rationale for the variance will be provided in the Application. Table 12 presents the format for outlining standards and guidance documents and preliminary list of those to be used, and will be updated, as required, and included in the Application.

Table 12: Standards and Guidance Table

Subject	Survey	Standards and Guidance
Air Quality	• Air quality and meteorological monitoring program at selected locations.	• 2014 *British Columbia Ambient Air Quality Objectives* (BC MOE 2014a). • *Guidelines for Air Quality Dispersion Modelling in British Columbia* (BC MOE 2008a). • *Canada-Wide Standards for Particulate Matter (PM) and Ozone* (CCME 2000). • *British Columbia Field Sampling Manual for Continuous Monitoring and the Collection of Air, Air-Emission, Water, Wastewater, Soil, Sediment, and Biological Samples* (BC MOE 2013b).
Greenhouse Gas Management	N/A	• *Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners* (FPTCCCEA 2003). • *Greenhouse Gas Reduction Targets Act* (Government of BC 2007). • *Emission Offsets Regulation* under the *Greenhouse Gas Reduction Targets Act* (Government of BC 2008). • *Greenhouse Gas Industrial Reporting and Control Act* (Government of BC 2014).
Acoustic Environment (in-air noise) and Acoustic Environment (underwater noise)	Acoustic Environment (in-air noise) • Field measurements at noise-sensitive receptors. Acoustic Environment (underwater noise) • Field measurements at three representative locations in the proposed terminal / shipping corridor area	• *British Columbia Noise Control, Best Practices Guideline* (BC OGC 2009). • *Useful Information for Environmental Assessments* (Health Canada 2010a). • The Prince Rupert Noise Control Bylaw No. 2430 (City of Prince Rupert 1982) • Fisheries and Oceans Canada (DFO)'s *Best Management Practices for Pile Driving and Related Operations* (DFO 2003); • *Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters* (Wright and Hopky 1998); • *Marine Mammal Noise Exposure Criteria: Initial Scientific Recommendations* (Southall et al. 2007); • National Oceanic and Atmospheric Administration (NOAA) *Draft Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammals: Acoustic Threshold Levels for Onset of Permanent and Temporary Threshold Shifts* (NOAA 2013); • NOAA *Interim Sound Threshold Guidance for Marine Mammals* (NOAA 2014); and • Sound Exposure Guidelines for Fishes and Sea Turtles: A Technical Report (Popper et al. 2014).
Light	• Field measurements at selected receptors.	• Commission Internationale de l'Éclairage (CIÉ) *Guide on the Limitation of the Effects of Obtrusive Light from Outdoor Lighting Installations* (CIÉ 2003). • The Illuminating Engineering Society of North America (IESNA) *Light Trespass: Research, Results and Recommendations* (IESNA 2000). • BC Ministry of Forests *Visual Landscape Inventory: Procedures & Standards Manual* and *Visual Impact Assessment Guidebook* (BC MOF 1997, 2001).
Groundwater Quality	• Selected groundwater monitoring and sampling.	• *British Columbia Field Sampling Manual for Continuous Monitoring and the Collection of Air, Air-Emission, Water, Wastewater, Soil, Sediment, and Biological Samples* (BC MOE 2013b).
Soils	• Selected soil quality sampling and soil mapping.	• *British Columbia Field Sampling Manual for Continuous Monitoring and the Collection of Air, Air-Emission, Water, Wastewater, Soil, Sediment, and Biological Samples (BC MOE 2013*b).
Marine Water Quality	• Selected marine water quality sampling. • Selected marine sediment quality sampling.	• Federal *Fisheries Act* (Government of Canada 1985a). • Provincial *Environmental Management Act* (Government of BC 2003). • The *Disposal at Sea Regulations* (Government of Canada 2001a). • *British Columbia Field Sampling Manual for Continuous Monitoring and the Collection of Air, Air-Emission, Water, Wastewater, Soil, Sediment, and Biological Samples* (BC MOE 2013b). • BC MOE and CCME Water Quality Guidelines. • BC MOE and CCME Sediment Quality Guidelines.
Surface Water Quality	• Selected water quality sampling.	• *British Columbia Field Sampling Manual for Continuous Monitoring and the Collection of Air, Air-Emission, Water, Wastewater, Soil, Sediment, and Biological Samples* (BC MOE 2013b). • BC MOE and CCME Water Quality Guidelines. • BC MOE *Guidance for the Assessment of Sensitivity to Acidification and Eutrophication* (BC MOE forthcoming 2015).
Surface Water Quantity	• Selected surface water quantity survey.	• *Assessment Methods for Fish, Fish Habitat and In-stream Flow Characteristics in Support of Application to Dam, Divert or Extract Water From Streams in British Columbia* (BC MOE 2004).
Marine Resources	• Marine mammal surveys. • Marine fish sampling and hydroacoustic surveys. • Marine water quality and sediment quality sampling. • Intertidal and subtidal biophysical transect surveys. • Plankton/nutrient sampling. • Benthic infaunal sampling. • Underwater video surveys. • Underwater noise monitoring and acoustic modelling.	• Federal *Fisheries Act* (Government of Canada 1985a). • The *Species at Risk Act* (Government of Canada 2002). • BC Conservation Data Centre *BC Species and Ecosystems Explorer* (BC CDC 2015). • *Fisheries Productivity Investment Policy: A Proponent's Guide to Offsetting* (DFO 2013a). • *Fisheries Protection Policy Statement* (DFO 2013b). • *Marine Mammal Regulations* (Government of Canada 1993). • *An Applicant's Guide to Submitting an Application for Authorization under Paragraph 35(2)(b) of the Fisheries Act* (November 2013).
Freshwater Fish and Fish	• Freshwater fish sampling.	• Federal *Fisheries Act* (Government of Canada 1985a).

Subject	Survey	Standards and Guidance
Habitat	• Freshwater fish habitat mapping and assessment.	• Resources Information Standards Committee (RISC) standards (RISC 1997, 2001). • The Canadian Bio-Monitoring Network (CABIN) standards (CABIN 2012, 2014). • *Fisheries Productivity Investment Policy: A Proponent's Guide to Offsetting* (DFO 2013a). • *Fisheries Protection Policy Statement* (DFO 2013b). • *An Applicant's Guide to Submitting an Application for Authorization under Paragraph 35(2)(b) of the Fisheries Act* (November 2013).
Vegetation	• Vegetation surveys. • Vegetation/vegetation communities mapping.	• The *Species at Risk Act* (Government of Canada 2002). • Committee on the Status of Endangered Wildlife in Canada (COSEWIC). • *Canadian Wetland Classification System* (NWWG 1997). • Resources Information Standards Committee (RISC) standards (RISC 1997, 2001).
Wildlife	• Marine bird surveys. • Terrestrial wildlife surveys. • Habitat suitability mapping/modelling.	• *Species at Risk Act* (Government of Canada 2002). • *Migratory Birds Convention Act* (Government of Canada 1994). • BC *Wildlife Act* (Government of BC 1996a). • Resources Information Standards Committee (RISC) standard (RISC 1999). • BC Conservation Data Centre (BC CDC 2015).
Visual Quality	• Field visit and photo survey from selected key viewpoints.	• BC Ministry of Forest's *Visual Landscape Inventory: Procedures & Standards Manual* and *Visual Impact Assessment Guidebook* (BC MOF 1997, 2001).
Archaeology and Heritage Resources	• Field survey of the Project Site to confirm sites identified through review of existing data and identify additional sites.	• BC *Heritage Conservation Act* (HCA; Government of BC 1996b). • The *British Columbia Archaeological Impact Assessment Guidelines* (Government of BC 1989), and under a Heritage Inspection Permit, issued under Section 14 of the HCA.
Human and Ecological Health	• Review of predicted effects on PCs and VCs that may affect human and ecological health.	Human health • *Protocol 13 for Contaminated Sites, Screening Level Risk Assessment* (BC MOE 2008b). • 2014 *British Columbia Ambient Air Quality Objectives* (BC MOE 2014a). • *Technical Guidance on Contaminated Sites 7, Supplemental Guidance for Risk Assessments* (BC MOE 2012). • *Useful Information for Environmental Assessments* (Health Canada 2010a). • *Federal Contaminated Site Risk Assessment in Canada, Part I: Guidance on Human Health Preliminary Quantitative Risk Assessment (PQRA), Version 2.0* (Health Canada 2010b). • *Federal Contaminated Site Risk Assessment in Canada, Part II: Health Canada Toxicological Reference Values (TRVs) and Chemical-Specific Factors, Version 2.0* (Health Canada 2010c). • *Federal Contaminated Site Risk Assessment in Canada. Part V. Guidance on Human Health Detailed Quantitative Risk Assessment for Chemicals* (Health Canada 2010d) • *Federal Contaminated Site Risk Assessment in Canada. Supplemental Guidance on Human Health Risk Assessment for Country Foods* (HHRA Foods). (Health Canada 2010e) Terrestrial wildlife health • Federal Contaminated Sites Action Plan (FCSAP) *Ecological Risk Assessment Guidance* (FCSAP 2012). • *A Framework for Ecological Risk Assessment* (CCME 1996/1997). • *Detailed Ecological Risk Assessment (DERA) in British Columbia – Technical Guidance* (SABCS-BC 2008). Aquatic health • *Detailed Ecological Risk Assessment (DERA) in British Columbia – Technical Guidance* (SABCS-BC 2008). • *A Protocol for the Derivation of Water Quality Guidelines for the Protection of Aquatic Life* (CCME 2007).

3.4 Potential Effects

This section of the Application will summarize and outline the general steps that will be used for the effects assessment. The Application will present an assessment of potential Project-specific effects on and interactions with identified VCs and PCs, and will describe proposed measures to mitigate these effects. Residual adverse effects will be characterized and the significance of residual adverse effects, including cumulative effects, will be determined for each VC, as applicable. The Application will include an interaction table.

3.4.1 Identification and Analysis of Potential Effects

This section of the Application will describe the methods for the identification of Project-VC interactions. For each VC, the Application will identify, describe, and present an analysis of the potential adverse effects resulting from the Project. Where PCs and KIs have been identified, these will be used to assess the effects on the VC. For each VC, the Application will describe the mechanisms whereby environmental, economic, social, heritage, or health effects are expected to occur. Where possible, the spatial and temporal extent of these expected effects (i.e., where and when an effect may occur) will also be described. The Project-VC interactions will be evaluated to help focus the effects assessment on those interactions that have potential to result in significant adverse residual effects.

The scope of assessment for each VC will be established through an interactions table so that the interactions between the Project activities and VCs can be adequately identified. Project interactions with VCs will be assessed in the Application's VC assessment sections. Project-related effects associated with each identified interaction and the mechanisms by which specific Project activities are expected to result in effects will be discussed. Potential Project-VC interactions will be identified in the interaction table. Lower risk interactions may not be carried forward into the effects assessment and analysis. If an interaction is omitted from further analysis, the methods and criteria used and the rationale for this determination will be documented in the Application.

An initial evaluation will be undertaken to characterize potential Project-VC interactions across all listed Project activities, such as:

- Negligible adverse effects expected – no further consideration warranted; or
- Potential adverse effect requiring mitigation – warrants further consideration.

For those Project-VC interactions carried forward in the assessment, potential effects arising from those interactions will be clearly described.

For all environmental components listed in Section 5(1) or 5(2) of CEAA 2012, the Application will describe whether potential environmental effects, including cumulative effects, have been identified. If no adverse effects are identified for an environmental component listed in Section 5(1) or 5(2) of CEAA 2012, the Application will provide analysis to substantiate that conclusion.

3.5 Mitigation Measures

Mitigation is considered to be any practical means or measures taken to avoid, reduce, restore on-site, or offset the potential adverse effects of the Project (BC EAO 2013a). Mitigation measures that will reduce or eliminate an adverse effect, or enhance a positive effect, will be described in the assessment section for each VC. Where possible, indicative information will be provided on the expected time required for mitigation measures to become effective, and the predicted effectiveness of the proposed mitigation measure(s) in terms of the VC indicator for the effect. Mitigation measures may include monitoring to verify results and standard mitigation measures such as best management practices (BMPs), including mitigation that results in changes to the means in which the Project will be designed, constructed, operated, or decommissioned. Mitigation will also consider the views of Aboriginal Groups and key stakeholders.

The Application will describe the approach used to identify and analyze proposed mitigation measures, including any proposed management and offsetting plans implemented to address potential effects. The Application will clearly indicate how the mitigation measures will mitigate potential adverse effects on the VC and will provide rationale for the mitigation measures, including feasibility, and the need for and scope of any proposed offset plan.

A description of the proposed mitigation measures that have been incorporated into the Project site selection and design of the Project will be provided in Section 1.2 (Project Description) of the Application. All mitigation measures will be summarized in the Application in Section 16.2 (see example Table 40).

3.6 Characterization of Residual Effects

Residual effects are those measurable or detectable effects remaining after the implementation of all mitigation measures, and therefore are the expected consequences of the Project on the selected VCs (BC EAO 2013a). The Application will include a summary of the process and methods proposed to characterize adverse effects. Potential residual adverse effects of the Project will be characterized, in a table format, using the following standard criteria (BC EAO 2013a):

- **Magnitude** – measurement of the expected intensity or severity of the residual effect, or the degree of change caused by the Project relative to existing conditions or a guideline value. The criteria used to classify magnitude as either *negligible*, *low*, *medium*, or *high* will be developed for each VC.
- **Extent** – the spatial scale over which the residual physical, ecological, or social effect is expected to occur. Extent is typically classified as the LSA and the RSA. The LSA effects mostly represent changes that are directly related to the Project Site and activities, but also include indirect Project effects. Changes at the regional scale are largely associated with indirect effects from the Project and represent the maximum predicted spatial extent of effects from the Project (zone of influence). The RSA is often used as the spatial area for the cumulative effects assessment. Effects beyond the regional scale can occur and are mostly associated with VCs that have large spatial distributions and are influenced by cumulative effects from the Project and other developments.
- **Duration** – the length of time the residual effect persists. The duration of an effect can be short term, medium term, or long term. Duration thresholds are typically defined relative to a project timeline. Short term refers to the construction phase, medium term to the full period of operations, and long term to beyond the Project life.

- **Reversibility** – indicating whether the effect is low – reversible, medium – partially reversible, or high – permanent. Reversible effects may have lower effect than irreversible or permanent effects.
- **Frequency** – how often the residual effect occurs, typically classified as low frequency, medium frequency, or high frequency.

The above criteria will be defined in the Application to include VC-specific definitions where applicable.

The context within which the Project residual effects are expected to occur will also be qualitatively described for each VC. Context considers the current and future sensitivity and resilience of the VC to change caused by the Project. Consideration of context draws on the description of existing conditions of the VC, which may reflect the cumulative effect of other projects and activities that have been carried out, as well as information about the natural and/or human-caused trends in the condition of the VC.

3.7 Likelihood of Residual Effects

Likelihood refers to whether or not a residual effect is likely to occur (BC EAO 2013a). The basis for likelihood will be defined in the Application. The assessment will indicate the likelihood of the predicted residual effect using appropriate quantitative or qualitative terms, with sufficient description to understand how the conclusions were reached. If qualitative terms such as low, moderate, or high are used, they will be defined to clarify interpretations. Likelihood and confidence are shown after each effect is assessed.

3.8 Proponent's Determination of Significance of Residual Effects

This section of the Application will discuss the methods for determination of the potential significance of residual adverse effects following application of mitigation measures for all VCs included in the assessment. Determination of significance of residual adverse effects on a VC will consider the changes to the linked PCs and KIs of the VC. For all environmental components listed in Section 5(1) or 5(2) of CEAA 2012, the Application will describe the significance of any residual adverse effects, including residual cumulative effects. The Application will include a significance determination for every residual effect, even if the likelihood is determined to be low.

The Application will identify the criteria used to characterize any predicted adverse effects for each of the VCs and will define a threshold to assign significance ratings to any predicted adverse residual effects for each of the VCs. It will contain clear and sufficient information to enable the BC EAO and Working Group members, Aboriginal Groups, and the public to review the Proponent's analysis of the significance of effects. The Proponent will define the terms used to describe the level of significance.

The following criteria will be used in characterizing residual effects:

- Magnitude;
- Extent;
- Duration;
- Reversibility;
- Frequency; and
- Context.

In characterizing residual adverse effects against these criteria, the Application will, where possible, employ relevant existing regulatory documents, environmental standards, guidelines, or objectives such as prescribed maximum levels of emissions or discharges into the environment. The Application will contain a section that explains the assumptions, definitions, and limits to the criteria mentioned above to maintain consistency between the effects on each VC.

The determination of significance of residual adverse effects will be rated as not significant or significant, which are generally defined as follows:

- **Not significant** – Potential residual adverse effects determined to be not significant are those that are greater than negligible but that do not meet the definition of significant.
- **Significant** – Potential residual adverse effects determined to be significant are those that surpass the defined threshold based on the integrity or sustainability of the VC.

In addition, the Application will summarize the significant adverse environmental effects identified in relation to CEAA 2012 requirements:

- Changes to components of the environment within federal jurisdiction;
- Changes to the environment that would occur on federal or transboundary lands;
- Changes to the environment that are directly linked or necessarily incidental to federal decisions; and
- Effects of changes to the environment on Aboriginal peoples.

3.9 Confidence and Risk

The Application will state the confidence in the effects predictions and any risks associated with the assessment. The level of confidence for each predicted residual Project-related effect will be discussed to characterize the level of uncertainty associated with both the significance and likelihood determinations. Level of confidence is based on expert/professional judgement. The Application will also describe any measures to reduce uncertainty through monitoring, adaptive management, or other follow-up programs. The sources and nature of uncertainty associated with residual effect predictions will be described to provide the basis for the stated level of confidence. The Application will summarize the process and methods used to determine whether additional risk analysis is required. If additional risk analysis is required, the Application will summarize the process and methods used for this analysis and the conclusions, including the range of likely, plausible, and possible outcomes with respect to likelihood and significance.

The basis for assigning confidence in the assessment of an effect will be described in the Application in sufficient detail to understand how the conclusions were reached. The determination of confidence will be based on the following:

- Scientific certainty relative to the quantification of the effect, including the quality or quantity of data and the understanding of effect mechanisms;
- Scientific certainty relative to the effectiveness of the proposed mitigation; and
- Professional judgment from prior experience predicting effects and proven mitigation measures.

3.10 Cumulative Effects

3.10.1 Assessment

The Application will assess potential cumulative environmental, economic, social, heritage, and health effects resulting from Project-specific residual effects interacting with similar effects of existing and reasonably foreseeable future projects and activities. The cumulative effects assessment will be presented in each VC assessment section. For each VC with an identified residual effect requiring a cumulative effects assessment, the list of other existing and reasonably foreseeable projects and activities will be considered for potential cumulative effects.

Those VCs with negligible Project-related residual effects rankings will not be carried forward into the cumulative effects assessment, as they are not considered to result in a detectable or measurable residual effect.

The Application will follow the same method for characterizing cumulative effects as is outlined in Section 3.4. Each VC requiring a cumulative effects assessment will undertake the following process:

- Identify:
    - The Project-related residual effects;
    - The overlap of Project-related residual effects temporally and spatially with the residual effects from other existing, approved, and reasonably foreseeable projects and activities; and
    - Whether there is a reasonable expectation that the contribution of the Project-related residual effects will cause a cumulative change that could affect the quality or sustainability of the VC.
- Provide mitigation measures to reduce the extent of cumulative effects;
- Characterize residual cumulative effects in terms of magnitude, geographic extent, frequency, duration, reversibility, and context;
- Determine significance of residual cumulative effects;
- Determine likelihood of residual cumulative effects occurring; and
- Identify the confidence level in the cumulative effects predictions and associated consequences.

The Application will incorporate the cumulative effects into a summary table (Table 40) in accordance with BC EAO reporting requirements and will reference information sources used to identify reasonably foreseeable future developments and activities. The Application will include a map showing the location of the projects and activities described in the inclusion list. The Application methods for cumulative effects assessment will meet the requirements of CEAA 2012.

3.10.2 Projects and Activities Inclusion List

Existing projects and activities will be considered with regard to whether they will continue to affect VCs into the future and how those effects may differ from those captured under existing conditions. Reasonably foreseeable future projects and activities to be considered in the cumulative effects assessment are defined as those that:

- Have been publicly announced with a defined schedule and with sufficient detail that they can be included in the assessment;
- Are currently undergoing an EA, and that are posted to the BC EAO's and/or CEA Agency's websites; or
- Are in a permitting process.

The initial list of projects and activities that will be considered is provided in Table 13. Reasonably foreseeable projects that may yet be proposed following finalization of the AIR and prior to submission of the Application will be discussed with the BC EAO to determine whether their inclusion is required. Once a third party gas pipeline operator is chosen, the connecting pipeline will be considered in the Project's cumulative effects assessment. A date for finalization of the list of potential projects and activities to be included in the cumulative effects assessment will be determined through consultation with the BC EAO. The Application will include a map showing the locations of the projects and activities to be included in the cumulative effects assessment.

Table 13: List of Existing and Reasonably Foreseeable Projects for Inclusion in the Cumulative Effects Assessment

Project Name	Description
Aurora LNG Digby Island	This is a proposed LNG export facility on Digby Island, in the Prince Rupert area, with a full build-out capacity to process up to 24 MTA of LNG, including up to four LNG processing units, LNG storage tanks, and marine terminal for loading of LNG vessels.
Atlin Terminal	The Atlin Terminal is a tourism centre / dock for small ships in Prince Rupert, and is currently in operation.
Douglas Channel LNG	This is a proposed barge-based LNG facility and marine berth within Douglas Channel for production of up to 1.8 MTA over 20 years. LNG shipping, socio-economic effects, and CEAA 5(1) and 5(2) effects only included in WCC LNG assessment.
Canpotex Potash Export Terminal	The Canpotex Potash Export Terminal and Rail, Road, and Utilities Loop is an approved project. This project is currently in the permitting stage.
Canada Coast Guard base	This is an operating base for Canada Coast Guard at Seal Cove.
CN Rail Line	The CN Rail line is currently in operation.
Fairview Container Terminal Phase I	The Fairview Container Terminal is a conversion from a bulk and break-bulk terminal to an intermodal container terminal. This is currently operational.
Fairview Container Terminal Phase II	This is the container terminal expansion to Phase I of the project. It is approved and is in the permitting stage.
Fishing and aquaculture	This consists of CRA fishing, and aquaculture activities and operations.
Forestry activities	These consist of existing and future forestry activities by forest licensees operating in the region.
Grassy Point LNG	This is a proposed LNG export facility and associated marine terminal at Grassy Point, 30 km north of Prince Rupert, with a maximum production of 20 MTA of LNG.
Kitimat LNG	Kitimat LNG is an approved LNG export facility and marine terminal at Bish Cove currently under construction. LNG shipping, socio-economic effects, and CEAA 5(1) and 5(2) effects only included in WCC LNG assessment.
Lax Kw'alaams Ferry	This ferry servicing the Lax Kw'alaams Band community operates out of Seal Cove.
LNG Canada (Kitimat)	This is an approved LNG export facility and marine terminal in Kitimat with a maximum production of 24 MTA. LNG shipping, socio-economic effects and CEAA 5(1) and 5(2) effects only included in WCC LNG assessment (i.e., does not include LNG production).

Project Name	Description
Mount McDonald Wind Power Project	This wind energy project has an EAC but has not proceeded into the permitting or development phase.
Naikun Wind Energy Project	The cable landing for this offshore wind energy project is in the Prince Rupert area. This wind energy project has an EAC but has not proceeded into the permitting or development phase.
Northland Cruise Terminal	The cruise ship terminal is operational.
Odin Seafood	This commercial seafood packaging facility is operational.
Pacific Northwest LNG Project	This is a proposed LNG export facility on Lelu Island at the Port of Prince Rupert with a production capacity of up to 19 MTA of LNG, including three trains (production units), a storage capacity of 540,000 m^3, and a marine terminal for loading of LNG vessels.
Pinnacle Pellet Inc.	This is a wood pellet storage and transfer facility on Ridley Island.
Prince Rupert Airport	This is an operating airport on Digby Island.
Prince Rupert Industrial Park	This area includes Wainwright Marine tug and barge operations, a recycling depot, and various operating light industrial activities.
Prince Rupert LNG Facility	This is a proposed LNG export facility on Ridley Island, within the Port of Prince Rupert, with production capacity of around 21 MTA of LNG, including three trains (production units), storage capacity of 540,000 m^3, and a marine terminal for loading LNG vessels.
Prince Rupert Gas Transmission Project (TransCanada)	Approved incoming pipeline to supply natural gas directly to the Pacific NorthWest LNG Project. This project is in the permitting stage.
Prince Rupert Ferry Terminal	This ferry terminal for BC Ferries and Alaska Ferries is operational.
Prince Rupert Grain Limited	This grain storage and handling terminal is operational.
Ridley Island Dry Land Sort	This dry land sort is operational.
Ridley Island Terminals Inc.	This coal, petroleum coke, and wood pellets storage and handling terminal is operational.
Rupert Coast Sort Ltd.	This is an operating log sort at Tuck Inlet.
Seal Cove Seaplane Base	This is an operating floatplane terminal at Seal Cove.
WatCo Pulp Mill	This project is for the proposed reuse of Skeena China Cellulose pulp mill, which is currently not operational but would ship metallurgical coal, grain, potash, and other commodities.
Westcoast Connector Gas Transmission Project (Spectra)	This is the proposed incoming pipeline to supply natural gas directly to the proposed Prince Rupert LNG Project.

3.11 Follow-Up Strategy

The Application will describe the approach for identifying and developing follow-up strategies and, as required, a description of follow-up strategies (including monitoring plans) for each VC that undertakes the following:

- Identifies the measures to evaluate the accuracy of original prediction of effects;
- Identifies the measures to evaluate the effectiveness of proposed mitigation measures; and
- Proposes an appropriate strategy to apply in the event that the original predictions of effects and mitigation effectiveness are not as expected.

Rationale will be provided where a follow-up strategy may not be needed (e.g., where there is an existing monitoring program). Follow-up strategies will also be summarized in the appropriate management plans, and compliance monitoring will be summarized in Part E.

4 ASSESSMENT OF POTENTIAL ENVIRONMENTAL EFFECTS

4.1 Environmental Background

This section of the Application will provide a general description of the existing biophysical environment of the area in which the Project will be located. A more detailed description of existing conditions will be presented under each of the VC and PC sections.

For each VC, any potential effects as defined in Sections 5(1) and 5(2) of CEAA 2012 will be considered and reported in a manner that will enable a conclusion to be reached on the significance of any adverse effect, after taking into consideration mitigation, for the purposes of CEAA 2012 decision-making. Technical analysis will include consideration of CEAA 5(1) and 5(2) requirements; specific effects on CEAA 5(1) and 5(2) will be summarized in Section 11 and Appendix B.

4.2 Pathway Components

Changes to PCs and the characterization of effects on PCs are intended to inform the potential adverse effects on VCs. Where PCs are affected by Project activities, these changes to PCs will be characterized.

A cumulative effects assessment will not be conducted for the PCs; rather, the cumulative effects of developments in the RSA will be evaluated through the assessment of the cumulative effects on VCs that interact with, and are affected by, changes to the PCs. The spatial extent to be considered for the assessment of the potential effects on PCs is identified where appropriate, and in relation to VCs for which study areas are defined.

4.2.1 Acoustic Environment (In-Air and Underwater Noise)

4.2.1.1 *Scoping and Rationale*

Acoustic Environment (in-air and underwater noise) are proposed as PCs because there is a potential for industrial equipment and vehicles used for construction, operations, and decommissioning of the Project to increase in-air and underwater noise levels in the Project vicinity.

Construction noise sources for in-air noise include land clearing and site preparation machinery and activities, such as blasting, grading, and pile-driving, Construction noise sources for underwater noise considered include pile driving, dredging, and underwater blasting and/or underwater grading. Operational in-air noise sources include LNG production onshore operational noise, LNG carriers standing by during loading, and active berthing of carriers using tugs, and normal vessel noise produced by onboard machinery. Operational underwater noise includes LNG carriers and tugs during loading and active berthing, including vessel engine and propeller noise.

In-Air Noise and Underwater Noise are proposed as a PCs rather than a VCs since they are an intermediate environmental component that will be considered as part of the assessment for the Terrestrial Wildlife, Community Health and Wellbeing, Marine Resources, and Current Use of Lands and Resources for Traditional Purposes VCs. The Application will consider noise levels suggested in the following:

In-Air Noise

- The BC OGC best practice standards in the *British Columbia Noise Best Practices Guideline* (BC OGC 2009);
- Recommendations from Health Canada's *Useful Information for Environmental Assessments* (Health Canada 2010a) on noise effects for projects requiring review under CEAA 2012; and
- The Prince Rupert Noise Control Bylaw No. 2430 (City of Prince Rupert 1982), which addresses nuisance noise and allows for issuing of noise permits.

Underwater Noise

- Fisheries and Oceans Canada (DFO)'s *Best Management Practices for Pile Driving and Related Operations* (DFO 2003);
- *Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters* (Wright and Hopky 1998);
- *Marine Mammal Noise Exposure Criteria: Initial Scientific Recommendations* (Southall et al. 2007);
- National Oceanic and Atmospheric Administration (NOAA) *Draft Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammals: Acoustic Threshold Levels for Onset of Permanent and Temporary Threshold Shifts* (NOAA 2013);
- NOAA *Interim Sound Threshold Guidance for Marine Mammals* (NOAA 2014); and
- *Sound Exposure Guidelines for Fishes and Sea Turtles: A Technical Report* (Popper et al. 2014).

The Application will include a quantification of noise emissions generated by Project activities as part of facility construction, facility operation, and shipping activities.

The Application will include a description of legislation, guidelines, BMPs, and guidance documents that are relevant to the management of the Acoustic Environment PC. The Application will also describe how ATK, as obtained through agreed-upon methods from Aboriginal Groups, was used in the assessment, and efforts made to obtain ATK information from Aboriginal Groups.

The Application will describe any environmental effect defined in Section 5(1) or 5(2) of CEAA 2012 that is of relevance to the Acoustic Environment PC. If it is determined that the Project will not result in an environmental effect defined in Section 5(1) or 5(2) of CEAA 2012, a rationale to substantiate this conclusion will be provided in the Application.

4.2.1.2 *Assessment Boundaries*

4.2.1.2.1 Spatial Boundaries

In-Air Noise

The LSA considered encompasses the area within which in-air noise effects from the Project are expected, and is defined as a 3.5 km area in all directions from the Project Site boundary. The proposed RSA extends 10 km in all directions from the Project Site and includes a 2 km buffer surrounding the shipping route corridor. Since noise attenuates with distance, this boundary is expected to capture the entire area over which direct or cumulative effects from the Project could potentially be observed.

Underwater Noise

The proposed LSA boundary, which encompasses 35,340 ha (5 km around terminal, 2 km on either side of the shipping corridor), captures all areas within which there is potential for direct physical effects from

underwater noise on marine mammals and fish. The proposed RSA boundary, which encompasses 187,875 ha (10 km around terminal, plus >10 km on either side of shipping corridor), captures all areas within which there is potential for disturbance effects from underwater noise on marine mammals, as well as the entire area over which direct or cumulative underwater noise effects from the Project on marine mammals and fish could potentially be observed.

The proposed RSA extends 10 km in all directions from the Project Site and includes a 2 km buffer surrounding the shipping route corridor. For the shipping corridor, a preliminary characterization of underwater ship noise was assessed using a standard spreading loss model to estimate the potential range of behavioural effects on marine mammals from shipping noise. Since noise attenuates with distance, this boundary is expected to capture the entire area over which direct or cumulative effects from the Project could potentially be observed. Preliminary acoustic modelling results were compared against NOAA thresholds and used to determine the LSA and RSA boundaries for marine mammals and fish.

4.2.1.2.2 Temporal Boundaries

The temporal boundaries for the assessment of effects on the Acoustic Environment (in-air noise and underwater noise) PC will include the construction, operations, and decommissioning phases of the Project.

4.2.1.2.3 Administrative Boundaries

The Application will describe the methods used in identifying administrative boundaries for the assessment of effects on the Acoustic Environment.

4.2.1.2.4 Technical Boundaries

The Application will describe the methods used in identifying technical boundaries for the assessment of effects on the Acoustic Environment.

4.2.1.3 *Existing Conditions*

In-Air Noise

The Application will include the rationale and a description of the methods used for characterization of existing conditions for in-air noise. The existing acoustic environment will be quantified by conducting field measurements at noise-sensitive receptors within the in-air noise spatial boundary described above. At each measurement location, monitoring will consist of at least 24 to 48 hours of one-minute equivalent energy sound levels ($L_{eq,1\ min}$) in A-weighted decibels (dBA) accompanied by noise recordings and meteorological measurements to validate the data. The existing conditions assessment will provide an overview of background information, environmental setting, and characteristics for the Acoustic Environment PC.

Underwater Noise

Three autonomous multichannel acoustic recorders were deployed in the Project Area over a six-month period in 2015. Acoustic data from the recorders were analyzed to quantify the ambient sound levels in the Project Area to detect the occurrence and sound levels of existing shipping in the Project Area and to detect the presence of different marine mammal species in the Project Area over the deployment period. The objective of the ambient sound analysis is to document the range of sound levels encountered and their relative rate of occurrence. Three graphical presentations of ambient noise will be prepared for each recording location: band level plots, spectrograms, and spectral density percentiles.

The sampling system included two sampling rates for detection of marine mammal calls. A sampling rate of 16 ksps allows for detection of low frequency calls (<8 kHz) present in the data sampled. A 375 ksps sampling rate used on a cycled schedule allows for detection of higher frequency echolocation clicks from porpoise and dolphins. The recording system was extended down to 10 Hz to detect possible fin and blue whale calls. Underwater noise from shipping and industrial activity is limited to 10 kHz and below; therefore, the 16 ksps sampling rate will provide suitable data for ambient and anthropogenic noise monitoring.

4.2.1.4 *Effects Assessment and Proposed Mitigation Measures*

The Application will consider potential Project-related effects on the Acoustic Environment PC as described in Section 3 of this document.

The Application will describe the specific approach and methods used to determine the Project effects on the acoustic environment. A summary of the potential changes of the Project on the Acoustic Environment PC and the parameters that will be used to quantify these effects are provided in Table 14. The parameters used to study the potential effects are based on the recommendations in the guidance documents noted in Table 12.

The Acoustic Environment assessment will identify and evaluate potential in-air and underwater noise levels, establish major sources of noise from the Project, and determine noise emissions from major sources using the Project description data, vendor data, noise source determination studies of similar facilities, and empirical formulae. Because the PC is a component of an effects pathway, the information regarding changes to acoustic environment levels will be used to assess the effects on VCs, and thresholds for in-air and underwater noise effects and proposed mitigations will be determined as part of the assessments for VCs, including the Marine Resources, and the Community Health and Wellbeing VC.

The Acoustic Environment study for the Community Health and Wellbeing VC will compare the cumulative sound levels during the Project operation to the permissible sound level noted in the BC OGC guidelines (BC OGC 2009). Existing in-air noise levels used in the assessment will be based on BC OGC-recommended daytime and nighttime ambient levels and the results of the field program. In keeping with the BC OGC guideline (BC OGC 2009), Project-related in-air noise levels will be predicted using a computer noise model developed in accordance with accepted international standards on the propagation of environmental noise. In particular, the computer noise model will account for the sound power levels of the Project source equipment, losses associated with geometric spreading and atmospheric absorption, and reflection and diffraction from structures and terrain.

Table 14: Potential Effects and Proposed Indicators and Measurable Parameters for the Acoustic Environment

Potential Project Effects	Indicators for Assessment of Project Effects	Measurable Parameters for Assessment of Project Effects
Acoustic Environment (in-air and underwater noise) Construction • Change in ambient noise in the vicinity of the Project. • Change in low frequency noise. • Change in underwater noise levels. Operations • Change in ambient noise in the vicinity of the Project. • Change in low frequency noise. • Change in underwater noise levels. Decommissioning • Change in ambient noise in the vicinity of the Project. • Change in low frequency noise. • Change in underwater noise levels.	<u>In-air noise</u> • Project-related changes in in-air noise levels. <u>Underwater noise</u> • Project-related changes in underwater noise levels. • Pressure-related injury threshold for fish. • Marine mammal injury from impulsive sounds. • Marine mammal behavioural disturbance from impulsive sounds. • Marine mammal behavioural disturbance from continuous sounds.	• Energy equivalent sound level (LAeq). • Low Frequency Noise (dBC – dBA). • Change in percent highly annoyed (%HA). • Sound pressure level (SPL) [dB re: 1 µPa]; represented as either root-mean-square (SPLrms) or peak sound pressure level (SPLpeak). • Sound exposure level (SEL) [dB re: 1 µPa2s].

4.2.1.5 *Conclusion*

The Application will include a summary of the potential effects of the Project to the Acoustic Environment PC and confirm the VC assessments that are linked to the Acoustic Environment PC (e.g., Wildlife, Community Health and Wellbeing, and Current Use of Lands and Resources for Traditional Purposes).

4.2.2 Light

4.2.2.1 *Scoping and Rationale*

Light is proposed as a PC because there is potential for an increase in light levels in the Project Area due to the construction and operation of the Project. Light guidelines are provided by the Commission Internationale de l'Éclairage (CIÉ) (CIÉ 2003) and the Illuminating Engineering Society of North America (IESNA) (IESNA 2000). Light is proposed as a PC rather than a VC because it is an intermediate component that will be considered as part of the assessment of receptor VCs, such as Wildlife and Current Use of Lands and Resources for Traditional Purposes. The Application will include a quantification of light emissions associated with the operation of the Project and an analysis to predict the light trespass and sky glow due to facility operation. The Application will also include a description of legislation, guidelines, BMPs, and guidance documents that are relevant to the management of the Light PC. In addition, the Application will also describe how ATK, as obtained through agreed-upon methods from Aboriginal Groups, was used in the scoping and execution of the assessment. The Application will describe any environmental effect defined in Section 5(1) or 5(2) of CEAA 2012 that is of relevance to the Light PC. If it is determined that the Project will not result in an environmental effect defined in Section 5(1) or 5(2) of CEAA 2012, a rationale to substantiate this conclusion will be provided in the Application.

4.2.2.2 *Assessment Boundaries*

4.2.2.2.1 Spatial Boundaries

The proposed local extent boundary considers 8 km in all directions from the Project Area boundary. This area will be established to assess the potential effects of the Project from foreground and middle-ground viewing distances where visual details are most easily discernible (BC MOF 1997, 2001) and is consistent with the Visual Quality VC.

The proposed regional boundary extends 15 km in all directions from the Project Area boundary, which encompasses the modelling domain used for evaluating the effects of the Project on light levels.

4.2.2.2.2 Temporal Boundaries

The temporal boundaries for the assessment of effects on the Light PC will include the construction, operations, and decommissioning phases of the Project.

4.2.2.2.3 Administrative Boundaries

The Application will describe the methods used in identifying administrative boundaries for the assessment of effects on the Light PC.

4.2.2.2.4 Technical Boundaries

The Application will describe the methods used in identifying technical boundaries for the assessment of effects on the Light PC.

4.2.2.3 *Existing Conditions*

The Application will include the rationale and a description of the methods used for characterization of existing conditions. Existing light measurements will be undertaken during a new moon to measure light levels at sites near the Project. The measurements will be used to characterize the existing conditions for values of light trespass (light output from the Project perimeter on vertical surface receptors) and levels of sky glow (ratio of upward-directed light of total lighting) at the Project Site. Measurements will be completed using specialized digital photographic and photometric equipment and a sky quality meter. In addition, nighttime photographs will be taken of the local night sky to help establish the existing sky glow and star visibility levels in the direction of the Project Site from various vantage points around the Project Area. The light measurements will be conducted in accordance with IESNA and CIÉ recommendations and best practices, such as the CIÉ *Guide on the Limitation of the Effects of Obtrusive Light from Outdoor Lighting Installations* (CIÉ 2003).

4.2.2.4 *Effects Assessment and Proposed Mitigation Measures*

The Application will consider potential Project-related effects on the Light PC as described in Section 3 of this document.

The Application will describe the specific approach and methods used to determine the Project-related effects on light. Potential adverse changes may occur during the construction, operations, and decommissioning phases of the Project. A summary of the potential changes of the Project on light and the parameters that will be used to quantify these changes are provided in Table 15. The parameters used to study the potential effects are based on the CIÉ guidelines (CIÉ 2003).

The Light assessment will use the light data obtained during field measurements and manufacturer's IESNA data sheets (i.e., photometric data) to predict the off-site light trespass levels at the identified

sensitive points of reception, using computer software and well-established light propagation algorithms. The sky glow contribution will be measured with the sky quality meter as well as estimated from the total luminous output of the facility. Sky glow will be modelled using proprietary software, which uses the sky glow model currently accepted as the standard in the field.

As the Light PC is a component of an effects pathway, the information regarding changes to light will be used to assess the effects on receptor VCs. Thresholds for light effects, proposed mitigation measures, and characterization of residual effects will be determined as part of the VC assessments (e.g., Wildlife, Community Health and Wellbeing, and Current Use of Lands and Resources for Traditional Purposes).

Table 15: Potential Effects and Proposed Indicators and Measurable Parameters for Light

Potential Project Effects	Indicators for Assessment of Project Effects	Measurable Parameters for Assessment of Project Effects
Construction • Change in light trespass in the vicinity of the Project. • Change in sky glow in the vicinity of the Project. Operations • Change in light trespass in the vicinity of the Project. • Change in sky glow in the vicinity of the Project. • Changes to light represent a pathway that could potentially affect terrestrial and marine wildlife of conservation concern. • Changes to light represent a pathway that could potentially affect community health and wellbeing. Decommissioning • Change in light trespass in the vicinity of the Project. • Change in sky glow in the vicinity of the Project.	• Project-related changes in light levels.	• Change in Environmental Light Classification, light trespass (lux). • Change in Sky Glow Zone Classification, sky glow (mag/arcsec^2 and % above natural dark sky background).

4.2.2.5 *Conclusion*

The Application will include a summary of the potential effects of the Project to the Light PC and confirm the VC assessments that are linked to the Light PC (e.g., Marine Resources, Visual Quality, Wildlife, Community Health and Wellbeing, and Current Use of Lands and Resources for Traditional Purposes).

4.2.3 Geology and Terrain

4.2.3.1 *Scoping and Rationale*

Geology and Terrain is proposed as a PC because there is potential for Project-related activities to affect other VCs. Changes to geology and terrain could affect vegetation and wildlife of conservation concern. Project activities could also expose rock having acid rock drainage / metal leaching potential, either in situ

or in spoil storage areas, which in turn could adversely affect freshwater or marine environments. Changes to marine geology and terrain could affect marine habitats and resources. This PC section will also present existing conditions information that will be used in Section 10 of the Application to assess potential for natural hazards due to upland terrain stability, landslides, and earthquakes.

The Application will include references to applicable legislation, guidelines, BMPs, and guidance documents that are relevant to the management of the Geology and Terrain PC. The Application will also describe how ATK, as obtained through agreed-upon methods from Aboriginal Groups, was used in the scoping and execution of the assessment.

The Application will describe any environmental effect defined in Section 5(1) or 5(2) of CEAA 2012 that is of relevance to the Geology and Terrain PC. If it is determined that the Project will not result in an environmental effect defined in Section 5(1) or 5(2) of CEAA 2012, a rationale to substantiate this conclusion will be provided in the Application.

The potential risks and effects associated with natural hazards are addressed in Section 10. The Project design will incorporate applicable standards and follow existing engineering and geoscience practices appropriate to development projects in BC.

4.2.3.2 *Assessment Boundaries*

4.2.3.2.1 Spatial Boundaries

The potential effects of the Project on geology and terrain are considered within the Project Site.

4.2.3.2.2 Temporal Boundaries

The temporal boundaries for the assessment of effects on the Geology and Terrain PC will include the construction, operations, and decommissioning phases of the Project.

4.2.3.2.3 Administrative Boundaries

The Application will describe the methods used in identifying administrative boundaries for the assessment of effects on the Geology and Terrain PC.

4.2.3.2.4 Technical Boundaries

The Application will describe the methods used in identifying technical boundaries for the assessment of effects on the Geology and Terrain PC.

4.2.3.3 *Existing Conditions*

The Application will provide information on existing geological conditions and terrain.

The Project Site is located in the geomorphic region known as the Hecate Lowlands on the western extremity of the Coast Mountains (Kitimat Range) in BC. The region has been glaciated, and this has shaped the current landform. The dominant topographic lineaments are aligned in the northeast–southwest direction, reflecting the underlying bedrock structure. The region has been subjected to major sea level and isostatic changes throughout, and following, several periods of glaciation. The regional bedrock geology comprises metamorphic rocks, predominantly schists, into which younger intrusive rocks have been intruded. The foliation of the schist is inferred to have a strike aligned with the topographic lineaments, reflecting the strong bedrock control on the topography, with localized, but considerable, variations.

The Project Site slopes very steeply up from Tuck Inlet, at slopes approximately in excess of 60 degrees to the horizontal, to elevations in the range of 40 to 100 masl in the southwestern area of the Project Site, but rising to a distinct peak to the northwest at approximately elevation 240 masl. Above this steep westerly frontal slope, the topography is undulating and somewhat flatter, on average. The undulation is believed to be controlled by the underlying bedrock surface, which typically has a “saw-tooth” profile within this region in the direction of the foliation dip.

The available Canadian Hydrographic Service bathymetric information suggests that the steep shoreline slopes continue down below water level to elevations of about -30 to -50 m (Chart Datum). The base of Tuck Inlet is relatively flat at elevations in the order of -50 to -55 m. Fern Passage to the southwest of the Project Site is much shallower (minimum elevations generally in the order of -15 to -20 m), with numerous shallower areas.

The existing conditions will be described further in the Application based on literature review and geotechnical investigation conducted on the Project Site.

4.2.3.4 *Effects Assessment and Proposed Mitigation Measures*

The Application will consider potential Project-related effects on the Geology and Terrain PC as described in Section 3.

The Application will describe the specific approach and methods used to determine Project-related effects on the Geology and Terrain PC. Potential adverse effects may occur during the construction, operations, and decommissioning phases. A summary of the potential effects of the Project on geotechnical and natural hazards and the parameters that will be used to quantify these effects are provided in Table 16.

The information regarding the Geology and Terrain PC will be used to support the assessment of the effects of the environment on the Project in Section 10.

Table 16: Potential Effects and Proposed Indicators and Measurable Parameters for Geology and Terrain

Potential Project Effects	Indicators for Assessment of Project Effects	Measurable Parameters for Assessment of Project Effects
Construction/Operations/Decommissioning: • Increased potential for instability on steep slopes from construction activities. • Any increased instability could increase mass wasting loads that could affect freshwater or marine environments. • Increased soil erosion and sediment transport related to construction. • Earthquake-related ground movements (including landslides and rock falls) may damage Project facilities and cause adverse environmental effects. • Tsunamis generated as a result of remote landslides or earthquake activity may damage Project facilities and cause adverse environmental effects. • Changes to bathymetry from dredging and seabed conditioning.	• Terrain mapping. • Historical and existing conditions and potential changes to those as a result of the Project. • Bathymetry.	• Soil stability and erodibility. • Mass wasting run-out. • Natural physical hazard risk.

4.2.3.5 *Conclusions*

The Application will include a summary of the potential effects of the Project on the Geology and Terrain PC and will confirm the VC assessments that are linked to the Geology and Terrain PC (e.g., Wildlife, Vegetation, Current Use of Lands and Resources for Traditional Purposes, and Land and Resource Use).

4.2.4 Groundwater Quality

4.2.4.1 *Scoping and Rationale*

Groundwater Quality is proposed as a PC because the storage, handling, and use of chemicals and fuels on the Project Site and access roads have the potential to affect water quality during the construction, operations, and decommissioning stages of the Project. Should inadvertent liquid or solid discharges occur to groundwater, then associated effects would be regulated under the BC Contaminated Sites Regulation and potentially also under federal *Fisheries Act* (Government of Canada 1985a) regulations, should habitat have the potential to be adversely affected. The Application will include an analysis to assess potential risk of impact to receptors from discharges to groundwater through a source-pathway-receptor analysis, which will include an evaluation of groundwater flow directions and travel times. The Application will also include a description of legislation, guidelines, BMPs, and guidance documents that are relevant to the management of the Groundwater Quality PC. The Application will also describe how ATK, as obtained through agreed-upon methods from Aboriginal Groups, was used in the scoping and execution of the assessment.

The Application will describe any environmental effect defined in Section 5(1) or 5(2) of CEAA 2012 that is of relevance to the Groundwater Quality PC. If it is determined that the Project will not result in an environmental effect defined in Section 5(1) or 5(2) of CEAA 2012, a rationale to substantiate this conclusion will be provided in the Application.

4.2.4.2 *Assessment Boundaries*

4.2.4.2.1 Spatial Boundaries

The proposed local boundary includes the five small watersheds that are intersected by the extent of onshore facilities (e.g., buildings, roads) while also allowing for potential groundwater connectivity between the Project Site and Shawatlan Lake. Potential effects on groundwater quality during construction, operations, and decommissioning will be relevant to the extent of onshore facilities and downgradient (downslope) areas.

The proposed regional extent is identical to the LSA of the Surface Water Quality VC and includes the small watersheds that are intersected by the Project onshore footprint as well as the Shawatlan River Watershed. The Shawatlan River Watershed includes Woodworth Lake, which is the primary water supply for the City of Prince Rupert. Temporal Boundaries

The temporal boundaries for the assessment of effects on the Groundwater Quality PC will include the construction, operations, and decommissioning phases of the Project.

4.2.4.2.2 Administrative Boundaries

The Application will describe the methods used in identifying administrative boundaries for the assessment of effects on the Groundwater Quality PC.

4.2.4.2.3 Technical Boundaries

The Application will describe the methods used in identifying technical boundaries for the assessment of effects on the Groundwater Quality PC.

4.2.4.3 *Existing Conditions*

The Application will include the rationale and a description of the methods used for existing conditions characterization. Existing groundwater conditions data will be collected at locations within the onshore Project Site and will include characterization of bedrock as well as the shallow subsurface. Data to be collected will include groundwater level data, hydraulic conductivity values, and groundwater chemistry. This data will be sufficient to assess existing groundwater quality as well as groundwater flow directions and velocities. The groundwater data collection will be conducted in accordance with the *British Columbia Field Sampling Manual for Continuous Monitoring and the Collection of Air, Air-Emission, Water, Wastewater, Soil, Sediment, and Biological Samples* (BC MOE 2013b).

4.2.4.4 *Effects Assessment and Proposed Mitigation Measures*

The Application will consider potential Project-related effects on the Groundwater Quality PC. The assessment will determine the potential effects on groundwater quality during construction, operations, and decommissioning, and will identify potential linkages with other PCs and VCs (e.g., Vegetation, Surface Water Quantity and Quality, Freshwater Fish and Fish Habitat, Human and Ecological Health). The effects assessment will include consideration for BMPs, proposed mitigation measures and potential changes in groundwater flow directions and travel times from existing conditions due to Project construction (e.g., soil stripping, backfilling, surface water management). Potential effects on groundwater from accidental spills will be assessed in Section 9 (Accidents and Malfunctions).

The Application will describe the specific approach and methods used to determine the Project-related effects on groundwater quality. A summary of the potential effects of the Project on groundwater quality and the parameters that will be used to quantify these effects are provided in Table 17.

Because the PC is a component of an effects pathway, the information regarding changes to groundwater quality will be used to assess the effects on receptor VCs.

Table 17: Potential Effects and Proposed Indicators and Measurable Parameters for Groundwater Quality

Potential Project Effects	Indicators for Assessment of Project Effects	Measurable Parameters for Assessment of Project Effects
Construction: • The storage, handling, and use of chemicals and fuels on the site and access roads has the potential to affect water quality. Operations: • The storage, handling, and use of chemicals and fuels on the site and access roads has the potential to affect water quality. Decommissioning: • The storage, handling, and use of chemicals and fuels on the site and access roads has the potential to affect water quality.	• Change to existing groundwater quality.	• Groundwater monitoring and sampling (physical and chemical parameters).

4.2.4.5 *Conclusion*

The Application will include a summary of the potential effects of the Project to the Groundwater Quality PC and confirm the VC assessments that are linked to the Groundwater Quality PC (e.g., Wildlife, Vegetation, Freshwater Fish and Fish Habitat, Human and Ecological Health).

4.2.5 Soils

4.2.5.1 *Scoping and Rationale*

Soils is proposed as a PC to address potential changes to the soil conditions and the resulting potential changes to VCs for which soil is an effects pathway.

Soil disturbance can change the physical, biological, and/or chemical properties of soil, affecting the suitability of the soil for reclamation. It can also increase the potential for soil erosion, potentially affecting water and air quality (i.e., dust). Soil disturbance has a direct effect on vegetation and wetland resources, and hence effects on wildlife and wildlife habitat and on land and resource use. Soil erosion can cause changes to water quality, affecting fish and fish habitat, and changes to air quality, affecting vegetation and human health. The effects of acidic deposition of air emissions during the Project operations phase will also be assessed in relation to VCs such as Vegetation, Human and Ecological Health, and Wildlife that have assessment endpoints linked to soil as an effects pathway. The Application will also describe how ATK, as obtained through agreed-upon methods from Aboriginal Groups, was used in the scoping and execution of the assessment, and the efforts made to obtain ATK.

The Application will describe any environmental effect defined in Section 5(1) or 5(2) of CEAA 2012 that is of relevance to the Soils PC. If it is determined that the Project will not result in an environmental effect defined in Section 5(1) or 5(2) of CEAA 2012, a rationale to substantiate this conclusion will be provided in the Application.

4.2.5.2 *Assessment Boundaries*

4.2.5.2.1 Spatial Boundaries

The potential effects of the Project on the Soils PC are considered within the terrestrial portion of the Project Site.

4.2.5.2.2 Temporal Boundaries

The temporal boundaries for the assessment of effects on the Soils PC will include the construction, operations, and decommissioning phases of the Project.

4.2.5.2.3 Administrative Boundaries

The Application will describe the methods used in identifying administrative boundaries for the assessment of effects on the Soils PC.

4.2.5.2.4 Technical Boundaries

The Application will describe the methods used in identifying technical boundaries for the assessment of effects on the Soils PC.

4.2.5.3 *Existing Conditions*

This section of the Application will describe the existing soil conditions.

There is very limited information on the existing condition of soils on the Project Site. Current soil information for the LSA does not exist at a scale or report detail that adequately describes local soils in terms of their quantity and quality. Existing soil conditions will be described based on a soil survey of the Project Site and the results of field investigations conducted in support of other VCs, such as Vegetation, Wildlife, Geology and Terrain, and Heritage.

Soil assessment field activities will include:

- Description of soils and associated site-specific vegetation, drainage, and landscape features;
- Collection of soil samples for subsequent laboratory analyses; and
- Correlation of vegetation, drainage, and other physical conditions to soil descriptions.

The soils existing conditions will describe the soil conditions and provide the basis for determining changes and likely effects associated with the Project. This assessment of soil existing conditions includes:

- Reviewing and evaluating soil survey information collected;
- Preparing maps of existing soils conditions, mapped to the taxonomic “soil series” level, according to established soil series nomenclature for BC; and
- Estimating soil quantity and quality (physical, biological, and chemical) characteristics to enable evaluation of the soils for erosion potential and suitability for use in Project Site reclamation.

4.2.5.4 *Effects Assessment and Proposed Mitigation Measures*

The Application will describe how the potential effects of the Project on soils during construction, operations, and decommissioning are determined. The results of the effects assessment will support the assessment of potential effects on the VCs (e.g., Vegetation, Wildlife and Wildlife Habitat, Land and Resource Use, Human and Ecological Health). The effects of the Project on soils will be predicted through quantitative estimates of change produced by overlaying existing conditions soil maps in a Geographic Information System (GIS) with the Project Site. The residual effects of the Project on soils will be predicted after considering appropriate mitigation measures such as the protection, conservation, and management of specific soils or sensitive soil receptors.

A summary of the potential effects of the Project on the Soils PC, and subcomponents, indicators, and measurable parameters that will be used to quantify these effects are provided in Table 18.

Table 18: Potential Effects and Proposed Indicators and Measurable Parameters for Soils

Potential Project Effects	Indicators for Assessment of Project Effects	Measurable Parameters for Assessment of Project Effects
Construction: • Site preparation and soil salvage and stockpiling; use of soil to prepare areas for revegetation. Operations: • Maintain soil stockpiles. Decommissioning: • Placement of soils for reclamation.	• Soil series quantity and quality (physical, chemical and biological characteristics; soil erosion potential, reclamation suitability, contamination).	• Area (ha) of soil series.

4.2.5.5 *Conclusions*

The Application will include a summary of the potential effects of the Project on the Soils PC and confirm the VC assessments that are linked to the Soils PC (e.g., Wildlife, Vegetation).

4.3 Air Quality

4.3.1 Scoping and Rationale

Air Quality is proposed as a VC to address potential changes to air quality resulting from Project activities. Air Quality was selected as a VC for the Project due to its importance to regulators, Aboriginal Groups, and stakeholders, and based on additional guidance from the BC EAO.

Air emissions resulting from the Project and associated shipping activities have the potential to change air quality and aerial acid deposition rates in the Prince Rupert airshed and along the shipping route corridor. The assessment will quantify Project emissions, and an air dispersion model (CALPUFF) will be used to predict ground-level concentrations and deposition rates associated with the Project emissions. The predictions will then be compared to the applicable BC and federal ambient air quality criteria. The assessment will consider the *British Columbia Ambient Air Quality Objectives* (BC MOE 2014a) for one-hour sulphur dioxide (SO_2) and one-hour nitrogen dioxide (NO_2) objectives. Air quality is important for the health of humans, wildlife, and vegetation, and air can be a pathway for transportation of contaminants. Therefore, predicted ground-level concentrations and deposition rates of air contaminants will be used as

inputs to the assessment of other VCs (e.g., Human and Ecological Health, Vegetation, and Surface Water Quality).

The Project participated in the British Columbia Ministry of Environment (BC MOE) Prince Rupert Airshed Study. Based on the typical procedure in BC for conducting an air quality assessment using a dispersion model, the LSA and RSA boundaries were determined following BC MOE review and approval of the Project's conceptual and detailed model plans.

Meteorology data collected as part of the Project field programs (2014 to 2015) and any other publicly available meteorology data will be presented to support an understanding of atmospheric processes and how they relate to air quality.

The Application will include a description of legislation, guidelines, BMPs, and guidance documents that are relevant to the management of air quality. The Application will also describe how ATK, as obtained through agreed-upon methods from Aboriginal Groups, was used in the scoping and execution of the assessment, and the efforts made to obtain ATK.

The Application will describe any environmental effect defined in Section 5(1) or 5(2) of CEAA 2012 that is of relevance to the Air Quality VC. If it is determined that the Project will not result in an environmental effect defined in Section 5(1) or 5(2) of CEAA 2012, a rationale to substantiate this conclusion will be provided in the Application.

4.3.2 Assessment Boundaries

4.3.2.1 *Spatial Boundaries*

The proposed LSA (Appendix A, Figure A-1) will be approximately 30 km by 30 km, centred on the Project Site. The area extends to the west of the Project Site, encompassing the shipping routes to the Triple Island Pilotage Station. The BC MOE *Guidelines for Air Quality Dispersion Modelling in British Columbia* (BC MOE 2008a) recommends that Project-related effects representing 10% of the ambient air quality objective for the criteria air contaminants should be captured within the modelling domain. The proposed LSA is expected to be sufficiently large to meet this requirement.

The proposed RSA (Appendix A, Figure A-1) corresponds to the airshed that will be used for the air quality dispersion modelling domain, approximately 65 km east–west by 65 km north–south. The proposed RSA is expected to be large enough to capture the potential cumulative air quality effects resulting from the Project as well as from other existing and reasonably foreseeable projects and activities in the airshed.

Based on the typical procedure in BC for conducting an air quality assessment using a dispersion model, the LSA and RSA boundaries will be finalized after a review of the Prince Rupert Airshed Study being conducted by the BC MOE and through technical guidance documents produced by MOE (MOE 2014; 2015a).

4.3.2.2 *Temporal Boundaries*

The temporal boundaries for the assessment of effects on the Air Quality VC will include the construction, operations, and decommissioning phases of the Project.

4.3.2.3 *Administrative Boundaries*

The Application will describe the methods used in identifying administrative boundaries for the assessment of effects on the Air Quality VC.

4.3.2.4 *Technical Boundaries*

The Application will describe the methods used in identifying technical boundaries for the assessment of effects on the Air Quality VC.

4.3.3 Existing Conditions

For the Air Quality VC, available and relevant air quality and meteorological monitoring data will be obtained for the region from the BC MOE, Environment Canada (EC), and the PRPA.

Existing air quality will be characterized through a combination of existing monitoring data and site-specific monitoring data collected over a minimum of a one-year period. Project-specific monitoring will be composed of:

- At the Project Site:
    - Continuous (hourly) wind speed, wind direction, rainfall, temperature, relative humidity, barometric pressure and cloud cover by photography; and
    - Passive (monthly) monitoring of NO_2, SO_2, ammonia (NH_3), and ozone (O_3).
- At Seal Cove:
    - Continuous (hourly) monitoring of NO_2, nitrogen oxides (NO_x), $PM_{2.5}$, SO_2, temperature, wind speed, and wind direction; and
    - Passive (monthly) monitoring of NO_2, SO_2, NH_3, and O_3.

4.3.4 Effects Assessment and Proposed Mitigation Measures

The Application will consider potential Project-related effects on the Air Quality VC according to the methods outlined in Section 3 of this document.

The Application will outline the following general approach to evaluate the potential changes to air quality from the Project:

- Establish the existing air quality and meteorological conditions with a focus on the air quality in the RSA and LSA;
- Evaluate the air emissions from the Project for the phase of activity (i.e., construction, operations, and decommissioning) to identify the phase with the largest emissions and potential for the greatest change to air emissions (defined as the “bounding condition”). This will likely be the operations phase for two different emission scenarios: normal and upset conditions;
- Develop a site-specific meteorological dataset for use in the dispersion modelling assessment and compare this meteorological dataset to the existing meteorological conditions to verify that the data are a reasonable representation of the Air Quality LSA;
- Predict the concentrations and deposition rates of measurable parameter compounds released from the bounding phase of the Project using a dispersion modelling assessment.

The dispersion modelling will be undertaken with considerations to the BC MOE *Guidelines for Air Quality Dispersion Modelling in British Columbia* (BC MOE 2008a);

- Compare the predicted measurable parameter compound concentrations and the existing conditions to applicable provincial and federal air quality criteria and standards, and assess the relevant significance of these effects; and
- Predict the concentrations and deposition rates of compounds not included as measurable parameters required as inputs to other VCs affected by changes in air quality (e.g., Human and Ecological Health).

A summary of potential effects, indicators, and measurable parameters that will be considered through the assessment of the effects on air quality is provided in Table 19.

The mechanisms through which Project activities may result in potential adverse effects will be described in the Application. Mitigation measures designed to address identified potential adverse effects will be proposed according to the methods outlined in Section 3 of this document. Technically and economically feasible measures to avoid, mitigate, or otherwise offset potential effects will be described.

Table 19: Potential Effects and Proposed Indicators and Measurable Parameters for Air Quality

Potential Project Effects	Indicators for Assessment of Project Effects	Measurable Parameters for Assessment of Project Effects
Construction and decommissioning: • Air emissions will be generated from construction and decommissioning activities and the operation of equipment. • Dust or PM will be released during construction and decommissioning activities, especially during site preparation and construction activities. • Combustion of diesel and gasoline fuels from equipment will release atmospheric emissions such as NO_x, SO_2, PM, carbon monoxide (CO), and hydrocarbons. Operations: • Air emissions will be generated from operations vehicles, shipping, Project Site maintenance, and process equipment. • Combustion of natural gas from on-site equipment will release atmospheric emissions such as NO_x, SO_2, PM, CO, and hydrocarbons. • Potential fugitive emissions. • Emissions resulting from upset conditions, including emergency shut-down.	• Change to air quality.	• NO_2, SO_2, $PM_{2.5}$, PM_{10}, CO, and O_3 concentrations that have applicable BC or federal ambient air quality objectives.

4.3.5 Residual Effects and Their Significance

The residual effects of the Project on the Air Quality VC will be characterized, and an assessment of their significance and likelihood and a prediction of confidence will be provided. The significance of residual effects will be determined as outlined in Section 3.4.

4.3.6 Cumulative Effects Assessment

Where a residual effect is identified, the Application will identify the existing and reasonably foreseeable projects and activities that may affect air quality. The cumulative effects assessment will also consider the results of the Prince Rupert Airshed Study conducted by BC MOE. The cumulative effects assessment will include the rationale used to identify these projects and descriptions of potential adverse effects on air quality that may overlap temporally or spatially with Project-related residual effects. The cumulative effects will be assessed based on the methods outlined in Section 3.10 of this document.

4.3.7 Conclusion

The Application will include a summary of the Air Quality VC effects assessment, identified residual and cumulative effects, and their significance.

4.4 Greenhouse Gas Management

4.4.1 Scoping and Rationale

The management of GHGs is proposed as a VC to address potential contributions to GHG emissions from the Project, recognizing the importance of GHGs to the public, Aboriginal Groups, and regulators.

The construction, operations, and decommissioning of the Project will result in emissions of GHGs. The BC *Greenhouse Gas Reduction Targets Act* requires reporting of GHG emissions from BC facilities emitting 10,000 tonnes or more of CO_2 equivalent emissions per year (Government of BC 2007).

While changing climate can have an effect on the Project and other VCs assessed in this EA, climate is not in itself considered a VC. The federal government acknowledges that, “unlike most project-related environmental effects, the contribution of an individual project to climate change cannot be measured” (FPTCCCEA 2003). Therefore, the contribution of Project GHG emissions to an adverse effect on climate change is not measurable, and no VC has been identified for climate change. The potential effects of a changing climate on Project infrastructure will be addressed in Section 10.

The Application will include a description of legislation, guidelines, BMPs, and guidance documents that are relevant to the management of GHGs. The Application will also describe how ATK, as obtained through agreed-upon methods from Aboriginal Groups, was used in the scoping and execution of the assessment, and the efforts made to obtain ATK.

4.4.2 Assessment Boundaries

4.4.2.1 *Spatial Boundaries*

For the GHG Management VC, spatial boundaries are defined by jurisdictional policies since GHG emissions are, by nature, a provincial and federal issue. Administrative and technical boundaries for GHG management (the area within which GHG emissions will be quantified) will be correlated with the emission inventory boundaries defined by the provincial and federal GHG policies, regulations, and legislation and the area defined by the proposed Air Quality Project Area (Appendix A, Figure A-1). The emission inventory will only consider facility-related emissions. Technical boundaries also include the accuracy of datasets used as inputs to the emission inventory prepared for this assessment.

4.4.2.2 *Temporal Boundaries*

The temporal boundaries for the assessment of effects on the GHG Management VC will include the construction, operations, and decommissioning phases of the Project.

4.4.3 Existing Conditions

The Application will provide a characterization of the existing GHG emissions.

Characterization of existing conditions for the GHG emissions will include quantification of current provincial, national sector, and federal GHG emissions. To characterize current level of GHG emissions, available data on GHG emissions will be compiled from the following sources:

- Information on BC's GHG emissions reported to the BC MOE under the Greenhouse Gas Industrial Reporting and Control Act.
- Available oil and gas sector GHG emissions;
- EC's Greenhouse Gas Emissions Reporting Program; and
- The most recent EC National GHG Inventory Report.

No field program or site collection program is proposed for the GHG Management VC.

4.4.4 Effects Assessment and Proposed Mitigation Measures

The Application will consider potential Project-related effects on the GHG Management VC according to the methods outlined in Section 3 of this document.

The Application will adopt the recommendations from the Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment (FPTCCCEA 2003) guidelines on how to incorporate climate change considerations into EA by providing answers to the following questions:

- How will potential changes in climate affect the infrastructure associated with the Project?
- How will the operations of the Project contribute to GHG emissions, and how do those contributions compare with provincial, national sector and federal emissions levels?

The annual GHG emissions from the Project will be estimated for all Project phases (i.e., construction, operations, and decommissioning) using the methods described in the reporting regulations in the *Greenhouse Gas Reduction Targets Act* (Government of BC 2007) and will be compared to the provincial, national sector, and federal emissions to assess the relative contribution of the Project on each of these bases. Additionally, the Government of BC has set an emission compliance target, in the form of emission intensity, specific to LNG facilities in the *Greenhouse Gas Industrial Reporting and Control Act*, Bill 2, (Government of BC 2014). A comparison of Project GHG emissions to the BC GHG emission intensity target will be provided.

A summary of potential effects, indicators, and measurable parameters that will be considered through the assessment of the effects on GHG emissions is provided in Table 20.

The resulting effects will be described further in the Application. Mitigation measures designed to address identified potential effects will be proposed according to the methods outlined in Section 3 of this document. Technically and economically feasible measures to avoid, mitigate, or otherwise offset potential effects will be provided.

Table 20: Potential Effects and Proposed Indicators and Measurable Parameters for Greenhouse Gas Management

Potential Project Effects	Indicators for Assessment of Project Effects	Measurable Parameters for Assessment of Project Effects
Construction: • GHG emissions during construction will be generated primarily from combustion of fuels, such as diesel and gasoline. Operations: • Sources of GHG emissions during operations may include vehicle and vessel traffic, site maintenance and cleaning, and process equipment operations. Decommissioning: • GHG emissions during site closure will be generated primarily from combustion of fuels, such as diesel and gasoline.	• Project GHG emissions.	• Direct and indirect Project GHG emission rates expressed in equivalent CO_2. • Direct Project GHG emission intensity expressed in equivalent CO_2 per tonne of LNG produced.

4.4.5 Residual Effects and Their Significance

The residual effects of the Project on the GHG Management VC will be characterized, and an assessment of their significance and likelihood, and a prediction of confidence will be provided. The significance of residual effects will be determined as outlined in Section 3.4.

4.4.6 Cumulative Effects Assessment

The effects assessment for the GHG Management VC will consider the cumulative GHG emissions from comparable facilities planned within the local jurisdiction (i.e., BC), using publicly available information or prorated from publicly available information on global climate change. In addition, these cumulative GHG emissions, along with the Project GHG emissions, will be compared to the provincial and federal emission levels, as well as the BC emission compliance target, in the form of emission intensity.

4.4.7 Conclusion

The Application will include a summary of how the Project will contribute to GHG emissions and whether the GHG emissions from the Project fall within acceptable provincial limits and are consistent with federal targets. The Project GHG emissions will not have a significant adverse effect on climate change as confirmed by the federal government, which states “unlike most project-related environmental effects, the contribution of an individual project to climate change cannot be measured” (FPTCCCEA 2003). This section of the Application will include a brief summary of potential Project-related residual and cumulative effects and their likely significance on the management of GHGs.

4.5 Marine Water Quality

4.5.1 Scoping and Rationale

Marine Water Quality is proposed as a VC to address potential changes to marine water and sediment quality as a result of Project activities. Effluent discharges may be considered deleterious substances under the federal *Fisheries Act* (Government of Canada 1985a) or may cause pollution vis-à-vis the BC *Environmental Management Act* (Government of BC 2003). If a cooling system uses a cooling tower, potential air emissions include phosphates and zinc, organic polymers or phosphonates, sodium hypochlorite, polyelectrolytes, concentrated dissolved solids, calcium, and $PM_{2.5}$ or PM_{10}.

Localized dredging has the potential to re-suspend historical contaminants in the marine sediment. WCC LNG is conducting preliminary studies to characterize the marine sediment to inform the assessment of the Marine Water Quality assessment. To the extent feasible, WCC LNG will explore reuse and on-site disposal options (e.g., as fill, or use as aggregate material) as alternatives to disposal at sea for the dredged material. Disposal at sea will only be considered if no other economically and technically feasible alternatives exist. The Application will provide sufficient detail to inform the assessment of effects of effluent discharges to marine water in relation to the potential interaction with other VCs, including Human and Ecological Health, Marine Resources, and Current Use of Lands and Resources for Traditional Purposes.

The Application will include a description of legislation, guidelines, BMPs, and guidance documents that are relevant to the Marine Water Quality VC. The Application will also describe how ATK, as obtained through agreed-upon methods from Aboriginal Groups, was used in the scoping and execution of the assessment, and the efforts made to obtain ATK from Aboriginal Groups.

The Application will describe any environmental effect defined in Section 5(1) or 5(2) of CEAA 2012 that is of relevance to the Marine Water Quality VC. If it is determined that the Project will not result in an environmental effect defined in Section 5(1) or 5(2) of CEAA 2012, a rationale to substantiate this conclusion will be provided in the Application.

4.5.2 Assessment Boundaries

4.5.2.1 *Spatial Boundaries*

The proposed LSA (Appendix A, Figure A-2) has been defined as an approximate 6.5 km^2 marine area centred around the proposed marine infrastructure.

The proposed RSA (Appendix A, Figure A-2) has been defined as the marine area including the proposed marine infrastructure and Tuck Inlet, Fern Passage and Morse Basin to the south, and Prince Rupert Harbour west to a line approximately between the BC Ferries terminal and Russell Point.

The Marine Water Quality study area will include the disposal site and surrounding area, if disposal at sea is required.

4.5.2.2 *Temporal Boundaries*

The temporal boundaries for the assessment of effects on the Marine Water Quality VC will include the construction, operations, and decommissioning phases of the Project.

4.5.2.3 *Administrative Boundaries*

The Application will describe the methods used in identifying administrative boundaries for the assessment of effects on the Marine Water Quality VC.

4.5.2.4 *Technical Boundaries*

The Application will describe the methods used in identifying technical boundaries for the assessment of effects on the Marine Water Quality VC.

4.5.3 Existing Conditions

This section of the Application will describe the existing conditions of marine water quality (including sediment quality). The following data sources may be accessed for the desktop review:

- Available data in the vicinity of the Project Area provided by EC and the BC MOE;
- Publically available data from EAs conducted in the vicinity of the Project Site; and
- Available monitoring data from online databases hosted by EC and the BC MOE.

A sampling program will be conducted to provide information regarding general physicochemical characteristics of the water and sediment in the vicinity of the Project. The water quality samples will be analyzed for the following parameters: pH, hardness, conductivity, alkalinity, salinity, turbidity and total suspended solids (TSS), total organic carbon, total and dissolved metals, major ions (including sulphate, chloride, fluoride, bicarbonate), and polycyclic aromatic hydrocarbons. The chemistry data will be tabulated and compared to applicable water quality guidelines.

Where possible, the Application will outline the methods under consideration for dredging, underwater grading, and/or underwater blasting. While the Application will list the potential disposal options under consideration, details on disposal site alternatives will be provided, and an assessment of potential effects of disposal conducted, during the permitting phase, in accordance with EC's guidelines on Disposal At Sea permit applications. The Application will also describe the effects assessment of any on-land disposal or on-site reuse of dredged material. For the sediment quality subcomponent of marine Water Quality, the collected samples will be analyzed for metals, dioxins and furans, polycyclic aromatic hydrocarbons, grain size distribution, total organic carbon, and moisture. The chemistry data will be tabulated and compared to applicable marine sediment quality guidelines, as well as limits prescribed by the *Disposal at Sea Regulations* (Government of Canada 2001a) pursuant to the *Canadian Environmental Protection Act, 1999* (Government of Canada 1999) in the event that disposal at sea of dredged or other materials or marine spoils (in situ debris from underwater blasting or grading) is required.

This section of the Application will also provide a summary of oceanography processes in the Project Area based on the field data collected around the Project Site. The detailed report for the existing oceanography conditions will be provided as an appendix to the Application.

4.5.4 Effects Assessment and Proposed Mitigation Measures

The Application will consider potential Project-related effects on the Marine Water Quality VC according to the methods outlined in Section 3 of this document.

The assessment will identify and evaluate potential adverse effects of all phases of the Project on marine water quality. The effects assessment will include potential changes to marine water quality from site clearing, marine construction, in-water works (e.g., installation of shoreline infrastructure, and dredging and seabed conditioning), and operation (e.g., shipping, process water discharges, and air emissions).

Where applicable, the effects assessment will provide cross-references to the Marine Resources (Marine Fish and Fish Habitat) VC and Freshwater Fish and Fish Habitat VC sections (i.e., as the effects assessment pertains to anadromous fish), along with the Surface Water Quality VC and Current Use of Lands and Resources for Traditional Purposes VC sections of the Application.

If potential effects on marine water quality are identified as a result of existing site contamination and interactions with Project activities (e.g., disturbance and mobilization of historical contamination in marine sediments), these potential interactions and effects will be described in this section.

A summary of potential effects, indicators, and measurable parameters that will be considered through the assessment of the effects on marine water and sediment quality is provided in Table 21.

The mechanisms through which Project activities may result in potential adverse effects and the resulting effects will be described further in the Application. Mitigation measures designed to address identified potential effects will be proposed according to the methods outlined in Section 3 of this document. Technically and economically feasible measures to avoid, mitigate, or otherwise offset potential effects will be provided.

Table 21: Potential Effects and Proposed Indicators and Measurable Parameters for Marine Water Quality

Subcomponents	Potential Project Effects	Indicators for Assessment of Project Effects	Measurable Parameters for Assessment of Project Effects
Marine Water Quality Marine Sediment Quality	Construction: • Marine water quality may be temporarily affected by installation of marine infrastructure and by in-water works such as pile driving and nearshore blasting (if required), localized dredging, blasting, underwater grading. Operations: • Marine water quality may be affected by operational activities such as: – effluent discharges. – maintenance activities. – impacts from vessels. – emissions. Decommissioning: • Marine water quality has the potential to be affected by removal of marine structures.	• Contaminant concentrations in sediment and water. • TSS concentrations in water. • Eutrophication for marine water from effluent discharges.	• TSS concentrations in water. • Sanitary discharge.

4.5.5 Residual Effects and Their Significance

The residual effects of the Project on the Marine Water Quality VC will be characterized, and an assessment of their significance and likelihood and a prediction of confidence will be provided. The significance of residual effects will be determined as outlined in Section 3.4.

4.5.6 Cumulative Effects Assessment

Where a residual effect is identified, the Application will identify the existing and reasonably foreseeable projects and activities that may affect the marine water quality. The cumulative effects assessment will include the rationale used to identify these projects and descriptions of potential adverse effects on marine water quality that may overlap temporally or spatially with Project-related residual effects. The cumulative effects will be assessed based on the methods outlined in Section 3 of this document.

4.5.7 Conclusion

The Application will include a summary of the Marine Water Quality VC effects assessment, identified residual and cumulative effects, and their significance.

4.6 Surface Water Quality

4.6.1 Scoping and Rationale

Surface Water Quality is proposed as a VC to address potential changes to surface water quality as a result of the Project activities, as well as due to the proximity of the Project Site to the Shawatlan River Watershed. The Project Site covers five small watersheds, the majority of which drain west into Tuck Inlet. There are a number of small lakes, wetlands, and unnamed watercourses within the Project Site. The Shawatlan River Watershed includes Woodworth and Shawatlan Lakes, which are the water supply and backup water supply, respectively, for the City of Prince Rupert.

Potential effects on surface water quality during construction, operations, and decommissioning are associated with site preparation, site water management, and air emissions. No surface water or wastewater discharges from the facility operations into freshwater sources are expected.

The Application will include a description of legislation, guidelines, BMPs, and guidance documents that are relevant to the management of surface water quality. The Application will also describe how ATK, as obtained through agreed-upon methods from Aboriginal Groups, was used in the scoping and execution of the assessment.

The Application will describe any environmental effect defined in Section 5(1) or 5(2) of CEAA 2012 that is of relevance to the Surface Water Quality VC. If it is determined that the Project will not result in an environmental effect defined in Section 5(1) or 5(2) of CEAA 2012, a rationale to substantiate this conclusion will be provided in the Application.

4.6.2 Assessment Boundaries

4.6.2.1 *Spatial Boundaries*

The proposed LSA (Appendix A, Figure A-3) has been defined as the boundary of watersheds that intersect or interact with DL 444 (the Project Site),the Woodworth Lake Conservancy, and the City of Prince Rupert.

Acid Sensitivity Area (ASA): the area with water bodies located within the potential acidic deposition zone, and where the potential for cumulative effects with regard to acidification will be assessed. The ASA boundary aligns with the air quality LSA boundary, minus the shipping route, and the northern extent of the boundary includes Grassy Point.

Eutrophication Sensitive Area (ESA): the area with water bodies located in the potential nutrient nitrogen deposition area, and where the potential for cumulative effects with regard to eutrophication will be assessed. The ESA boundary aligns with the air quality LSA minus the shipping route, and boundary and the northern extent of the boundary includes Grassy Point.

The ASA/ESA areas include creeks and water bodies located within the potential aquatic acidification and eutrophication zone based on dispersion modelling of Project air emissions. The potential for cumulative effects with regard to aquatic acidification and eutrophication will be assessed within this area based on acidic and nutrient N deposition modelling to be conducted as part of the Air Quality VC. The RSA boundary aligns with the Air Quality LSA boundary with the exclusion of the shipping route.

4.6.2.2 *Temporal Boundaries*

The temporal boundaries for the assessment of effects on Surface Water Quality VC will include the construction, operations, and decommissioning phases of the Project.

4.6.2.3 *Administrative Boundaries*

The Application will describe the methods used in identifying administrative boundaries for the assessment of effects on the Surface Water Quality VC.

4.6.2.4 *Technical Boundaries*

The Application will describe the methods used in identifying technical boundaries for the assessment of effects on the Surface Water Quality VC.

4.6.3 Existing Conditions

The Application will describe the existing surface water quality conditions. Surface water samples will be collected that are representative of the spatial and temporal boundaries for surface water quality. Surface water flows are a key pathway for the transport of contaminants to terrestrial, freshwater, marine, and human environments. Surface water quality interacts with other VCs such as Ecological Health (Fish and Fish Habitat, Wildlife, and Vegetation) and Human Health (drinking water supplies).

The information sources and methods to be used to characterize the existing conditions within the study area include:

- Base mapping;
- Literature review and gap analysis; and
- Water quality monitoring.

Historical data available from government reports and databases, scientific research, regional monitoring programs, and previous EAs undertaken in the area will be reviewed to obtain relevant information. Specific sources of existing surface water quality information for the LSA and RSA will include:

- BC Water Resources Atlas;
- BC MOE Environmental Monitoring System;
- BC Water Licence Query (iMAP);
- BC MOE Water Information Data Management system;
- City of Prince Rupert *Drinking Water Report* (2013);
- Existing sampling study for nearby water source (*Parasite Sampling in Northwest Coastal Communities: Prince Rupert, Terrace and Kitimat, Skeena Region*; BC MOE 2005); and
- Relevant project related studies / sampling programs carried out for nearby projects.

Consultation with Aboriginal Groups and federal and provincial environmental agencies will also occur in an effort to source data not readily available.

4.6.4 Effects Assessment and Proposed Mitigation Measures

The Application will consider potential Project-related effects on the Surface Water Quality VC according to the methods outlined in Section 3 of this document.

The Application will describe the specific approach and methods used to determine the potential effects of the Project on surface water quality. Potential adverse effects may occur during the construction, operations, and decommissioning phases. The effects will be evaluated by considering the potential changes to surface water quality in accordance with established water quality standards and guidelines. As the Surface Water Quality VC acts as a pathway for potential effects on other VCs, the surface water quality effects will be considered for potential effects on other VCs (e.g., Freshwater Fish and Fish Habitat, Human and Ecological Health).

Water bodies in the ASA and ESA will be screened according to their physical characteristics and expected acid and nutrient N deposition loadings through a desktop assessment and through Aboriginal and stakeholder consultation. Selected water bodies will then be sampled for water chemistry parameters as part of the surface water quality field program.

Effects due to acidic and nutrient N deposition (i.e., eutrophication) will be assessed using a critical load approach. A critical load is the level of exposure below which significant adverse effects on sensitive environmental components are not likely to occur. For water bodies with potential loadings exceeding the critical load, changes to pH or trophic state will be assessed.

A summary of potential effects, indicators, and measurable parameters that will be considered through the assessment of the effects on surface water quality is provided in Table 22.

The mechanisms through which Project activities may result in the potential adverse effects and the resulting effects will be described further in the Application. Mitigation measures designed to address any identified potential effects will be proposed according to the methods outlined in Section 3 of this document. Technically and economically feasible measures to avoid, mitigate, or otherwise offset potential effects will be provided.

Table 22: Potential Effects and Proposed Indicators and Measurable Parameters for Surface Water Quality

Potential Project Effects	Indicators for Assessment of Project Effects	Measurable Parameters for Assessment of Project Effects
Construction: • Excavation, stockpiling, temporary resurfacing, and installation of culverts will alter site drainage characteristics local to the disturbance. Alteration of drainage patterns can lead to erosion and/or sedimentation of local water bodies. Operations: • Roads and Project Site facilities will increase the impervious area on the site. This has the potential to increase flow rates and thereby increase erosion potential (on land and in watercourses) affecting sediment yields and concentrations in receiving watercourses. • Water withdrawals for potable water and LNG facility process cooling have the potential to affect water chemistry. • The storage, transportation, and use of chemicals and fuels has the potential to affect water quality. The access road adjacent to the marine terminal facility will traverse a number of watercourses. Vehicle movements near watercourses create the potential for sediment runoff, which could affect water quality. • Air emissions associated with release of sulphur oxides (SO_x) and NO_x into the atmosphere could contribute to acidification or eutrophication of surrounding freshwater bodies. Decommissioning: • Potential effects at the decommissioning stage include temporary increases in land erosion and sediment input.	• Surface water quality chemistry. • Sensitivity to acidification and eutrophication.	• Water grab sampling (physical and chemical parameters, including acid neutralizing capacity and chlorophyll *a*). • Water quality monitoring. • Sediment sampling (physical parameters, nutrients, and carbon content).

4.6.5 Residual Effects and Their Significance

The residual effects of the Project on the Surface Water Quality VC will be characterized, and an assessment of their significance and likelihood, and a prediction of confidence will be provided. The significance of residual effects will be determined as outlined in Section 3.4.

4.6.6 Cumulative Effects Assessment

Where a residual effect is identified, the Application will describe the existing and reasonably foreseeable projects and activities that may affect surface water quality. The cumulative effects assessment will focus

on potential lake acidification and eutrophication within the ASA and ESA. The Air Quality VC effects assessment will include acidic and nutrient N deposition modelling results for various scenarios; one scenario includes air emissions from other existing and proposed sources within the Project Area. The cumulative effects assessment will also consider the result of the Prince Rupert Airshed Study conducted by the BC MOE. The cumulative effects assessment will include the rationale used to identify these projects and descriptions of potential adverse effects on surface water quality that may overlap temporally or spatially with Project-related residual effects. The cumulative effects will be assessed based on the methods outlined in Section 3 of this document.

4.6.7 Conclusion

The Application will include a summary of the Surface Water Quality VC effects assessment, identified residual and cumulative effects, and their significance.

4.7 Surface Water Quantity

4.7.1 Scoping and Rationale

Surface Water Quantity is proposed as a VC to assess potential changes to VCs such as Surface Water Quality and Freshwater Fish and Fish Habitat. The Project Site covers five small watersheds. Potential effects on surface water quantity during construction, operations, and decommissioning are associated with changes to drainage pathways and surface cover, water withdrawals for potable water, and LNG facility process cooling withdrawals, with potential effects on catchment runoff quantity. Surface water flows are a key pathway for the transport of contaminants to terrestrial, freshwater, marine, and human environments. The Application will include a description of BMPs and guidance documents that are relevant to the management of surface water quantity. The Application will also describe how ATK, as obtained through agreed-upon methods from Aboriginal Groups, was used in the scoping and execution of the assessment, and the efforts made to obtain ATK from Aboriginal Groups.

The Application will describe environmental effects defined in Section 5(1) or 5(2) of CEAA 2012 that are of relevance to the Surface Water Quantity VC. If it is determined that the Project will not result in an environmental effect defined in Section 5(1) or 5(2) of CEAA 2012, a rationale to substantiate this conclusion will be provided in the Application.

4.7.2 Assessment Boundaries

4.7.2.1 *Spatial Boundaries*

The proposed assessment areas for the Surface Water Quantity VC are equivalent to the proposed LSA defined for the Surface Water Quality VC (Section 4.6.2). As no Project-related effects on the Surface Water Quantity VC are expected beyond the LSA, an RSA has not been defined.

4.7.2.2 *Temporal Boundaries*

The temporal boundaries for the assessment of effects on Surface Water Quantity VC will include the construction, operations, and decommissioning phases of the Project.

4.7.2.3 *Administrative Boundaries*

The Application will describe the methods used in identifying administrative boundaries for the assessment of effects on the Surface Water Quantity VC.

4.7.2.4 *Technical Boundaries*

The Application will describe the methods used in identifying technical boundaries for the assessment of effects on the Surface Water Quantity VC.

4.7.3 Existing Conditions

The Application will describe the existing hydrologic conditions. Existing surface water levels will be measured, from which watershed surface water flows will be estimated to represent the spatial and temporal boundaries for Surface Water Quantity.

The information sources and methods to be used for characterizing the Project setting and existing conditions within the study area include:

- Base mapping;
- Literature review and gap analysis; and
- Hydrologic monitoring.

Historical data available from government reports and databases, scientific research, regional monitoring programs, and previous EAs undertaken in the Project Area will be reviewed to obtain relevant information. Specific sources of existing surface water quantity information for the LSA and RSA will include:

- BC Water Resources Atlas;
- Water Survey of Canada Hydrometric Monitoring Program;
- BC Streamflow Inventory; and
- Studies / monitoring programs carried out for nearby projects.

Consultation with Aboriginal Groups and federal and provincial agencies will also occur in an effort to source data not readily available.

4.7.4 Effects Assessment and Proposed Mitigation Measures

The Application will describe the specific approach and methods used to determine the potential effects of the Project on surface water quantity. Potential adverse effects may occur during the construction, operations, and decommissioning phases. The effects on Surface Water Quantity will be evaluated by considering the potential changes to annual and seasonal surface runoff quantity and storm hydrograph characteristics. A summary of the potential changes of the Project on surface water quantity and the parameters that will be used to quantify these changes are provided in Table 23. The assessment will identify potential linkages with other VCs (e.g., Freshwater Fish and Fish Habitat, Terrestrial Wildlife).

Table 23: Potential Effects and Proposed Indicators and Measurable Parameters for Surface Water Quantity

Potential Project Effects	Indicators for Assessment of Project Effects	Measurable Parameters for Assessment of Project Effects
Construction: • Excavation, stockpiling, temporary resurfacing, and installation	• Changes in flows based on changes	• Water level monitoring.

Potential Project Effects	Indicators for Assessment of Project Effects	Measurable Parameters for Assessment of Project Effects
of culverts will alter site drainage characteristics local to the disturbance; alteration of drainage patterns can lead to erosion and/or sedimentation of local water bodies. • Potential temporarily alteration of stream flows and freshwater habitat. • Freshwater withdrawals for potable water. Operations: • Roads and site facilities will increase the impervious area; this has the potential to increase flow rates and thereby increase erosion potential (on land and in watercourses) affecting sediment yields and concentrations in receiving watercourses. • Freshwater withdrawals for potable water and LNG facility process cooling. Decommissioning: • Potential effects at the decommissioning stage include temporary increases in land erosion and sediment input.	in runoff quantity and land cover and terrain features changes.	• Water flow measurements.

4.7.5 Conclusion

The Application will include a summary of the potential adverse effects of the Project to the Surface Water Quantity VC and confirm the VC assessments that are linked to the Surface Water Quantity VC (e.g., Surface Water Quality and Vegetation).

4.8 Marine Resources

4.8.1 Scoping and Rationale

Marine Resources is proposed as a VC to address potential changes to marine flora and fauna and their habitats as a result of Project activities. The Project Area supports marine species protected under the federal *Fisheries Act* (Government of Canada 1985a) (fish[1] belonging to a CRA fishery, or fish that support such a fishery) and species designated as protected under the *Species at Risk Act* (SARA) (Government of Canada 2002) or provincially under the BC Red or Blue List (BC MOE 2015b). A search of the SARA Registry and the BC Conservation Data Centre (BC CDC) Species and Ecosystems Explorer indicate 21 provincially and/or federally listed marine species are confirmed to or have the potential to occur in the Project Area (BC CDC 2015).

The intertidal and subtidal areas in Tuck Inlet may serve as productive foraging, nursery, and refuge habitat for marine fish belonging to a CRA fishery or supportive of a CRA fishery. A total of 26

[1] Fish, as defined by DFO under the federal *Fisheries Act* (Government of Canada 1985), includes fish, shellfish, crustaceans, marine mammals, and any other marine animals, or the eggs, sperm, spawn, larvae, spat, and juvenile stages of fish, shellfish, crustaceans, or other marine animals.

CRA-associated fish species were identified in the Project Area during existing conditions sampling, including but not limited to salmon, Pacific herring, capelin, eulachon, halibut, sole, and rockfish.

The *Marine Mammal Regulations* (Government of Canada 1993), pursuant to the *Fisheries Act* (Government of Canada 1985a, Section 7), prohibit the disturbance of marine mammals except when fishing for marine mammals under the authority of the Regulations. A total of 10 marine mammal species have the potential to occur in the Project Area, including 7 species designated as protected under SARA. The proposed shipping routes overlap with "Important Areas" for northern resident killer whales and North Pacific humpback whales, as well as "Potential Critical Habitats" for northern resident killer whales in Chatham Sound (PNCIMA 2011). Although not legally protected through SARA, Important Areas and Potential Critical Habitats are recognized by DFO as sensitive areas with potential for migratory movements, foraging or breeding activities, based on consultation with local experts and in consideration of recent literature (Clarke and Jamieson 2006) and marine spatial planning initiatives (PNCIMA 2011).

The selected Marine Resources VC subcomponents include resources of conservation concern; resources of socio-economic, ecological, or Aboriginal importance; and those likely to be affected by the Project. The Application will also describe how ATK, as obtained through agreed-upon methods from Aboriginal Groups, was used in the scoping and execution of the assessment, and the efforts made to obtain ATK from Aboriginal Groups.

The Application will describe any environmental effect defined in Section 5(1) or 5(2) of CEAA 2012 that is of relevance to the Marine Resources VC. If it is determined that the Project will not result in an environmental effect defined in Section 5(1) or 5(2) of CEAA 2012, a rationale to substantiate this conclusion will be provided in the Application.

4.8.2 Assessment Boundaries

4.8.2.1 *Spatial Boundaries*

The Marine Resources VC was divided into two study components: Marine Mammals and Marine Fish and Fish Habitat. Four spatial boundaries are proposed for the assessment of effects on Marine Resources in the Project Area: a Marine Mammal LSA and RSA and a Marine Fish and Fish Habitat LSA and RSA (Table 24). The LSAs will allow an assessment of Project effects at a local, operational scale. The RSAs provide a regional, ecologically relevant context for the distribution of VCs and the habitat they depend on.

Table 24: Description of Marine Resources and Marine Mammal Local and Regional Study Areas

Proposed Study Area	Description
Marine Resources – Marine Mammal LSA (Appendix A, Figure A-5)	The Marine Mammal LSA encompasses the area in which there is potential for direct measurable Project effects on marine mammals, including direct physical effects (i.e., injury or mortality) from vessel strikes and/or Project-generated underwater noise during construction, operations, and decommissioning. The LSA has been defined as an approximate 389 km^2 marine area, which includes a 5 km buffer around the proposed terminal footprint and a 2 km buffer on either side of the Project navigation route between Tuck Inlet and the Triple Island Pilotage Station.

Proposed Study Area	Description
Marine Resources – Marine Mammal RSA (Appendix A, Figure A-5)	The Marine Mammal RSA encompasses the area within which direct and indirect effects have the potential to occur and within which cumulative effects are assessed. This includes the area for which there is potential for marine mammal behavioural responses due to Project-generated underwater noise. The RSA has been defined as an approximate 1,979 km^2 marine area that encompasses Prince Rupert Harbour and Chatham Sound. In the proposed marine terminal area, the RSA extends north to the north end of Tuck Inlet, southeast in Fern Passage to Butze Rapids, and southwest along the proposed navigational route in Prince Rupert harbour (including the north and west sides of Kaien Island and the east side of Digby Island). Along the proposed Project navigational route in Chatham Sound, the RSA is bounded to the north by the south end of Dundas Island extending eastward to the northwest tip of the Tsimpsean Peninsula (encompassing Grassy Point), to the south by the north end of Stephens, Prescot and Porcher islands, and to the east by land and the mouth of the Skeena River. The western boundary of the RSA extends 2.5 km west of the Triple Island Pilotage Station.
Marine Resources – Marine Fish and Fish Habitat LSA (Appendix A, Figure A-6)	The Marine Fish and Fish Habitat LSA encompasses the area in which there is potential for direct measurable Project effects that may result in serious harm to fish that are part of or support CRA fisheries (i.e., death of fish and/or permanent alteration or removal of marine fish habitat). The LSA has been defined as an approximate 31 km^2 marine area, which includes a 1.5 km buffer around the proposed terminal footprint. The LSA boundary extends north to Osborne Cove and southwest along the proposed navigation route to the entrance of Prince Rupert Harbour (south end of Kaien and Digby islands).
Marine Resources – Marine Fish and Fish Habitat RSA (Appendix A, Figure A-6)	The Fish and Fish Habitat RSA encompasses the area within which direct and indirect effects have the potential to occur and within which cumulative effects are assessed. This includes the area for which there is potential for Project-induced changes in water quality. The RSA has been defined as an approximate 1,988 km^2 marine area that encompasses Prince Rupert Harbour and Chatham Sound. In the proposed terminal area, the RSA extends north to the north end of Tuck Inlet, southeast in Fern Passage to the bottom of Fern Passage, and southwest along the proposed navigational route in Prince Rupert harbour (including the north and west sides of Kaien Island and the east side of Digby Island). Along the proposed Project navigational route in Chatham Sound, the RSA is bounded to the north by the south end of Dundas Island extending eastward to the northwest tip of the Tsimpsean Peninsula (encompassing Grassy Point), to the south by the north end of Stephens, Prescot, and Porcher islands, and to the east by land and the mouth of the Skeena River. The western boundary of the RSA extends 2.5 km west of the Triple Island Pilotage Station.

4.8.2.2 *Temporal Boundaries*

The temporal boundaries for the assessment of effects on Marine Resources VC will include the construction, operations, and decommissioning phases of the Project.

4.8.2.3 *Administrative Boundaries*

The Application will describe the methods used in identifying administrative boundaries for the assessment of effects on the Marine Resources VC.

4.8.2.4 *Technical Boundaries*

The Application will describe the methods used in identifying technical boundaries for the assessment of effects on the Marine Resources VC.

4.8.3 Existing Conditions

This section of the Application will describe the existing conditions for marine resources and will provide the basis for assessing potential adverse effects associated with the Project.

Existing marine resource conditions will be derived from the following information sources as part of the initial background review and site-specific field studies:

- Desktop review of available scientific and other literature (i.e., published and unpublished literature), publicly available reports, and other relevant data sources;
- Relevant local community knowledge, including available ATK;
- Seasonal field surveys coinciding with key annual life cycle events for VC subcomponents; and
- Underwater noise modelling results of Project-generated noise sources.

The background review will summarize existing conditions and relevant marine resources data for the Project Area. Consultation with government agencies will be undertaken to discuss the Project and potential effects on marine resources. The primary agency with regulatory authority over marine resources in the Project Area is DFO.

Marine field investigations in the Project Area will focus on those subcomponents identified at the preliminary stage, which include CRA-associated species and their habitats, as well as provincially and federally designated species at-risk and sensitive ecosystems that support habitat elements for marine species at-risk. Surveys planned as part of the Marine Resources VC workplan are as follows:

- Intertidal biophysical surveys;
- Subtidal biophysical (remotely operated vehicle and towed video) surveys;
- Sediment sampling for benthic invertebrates (benthic infauna);
- Marine fish sampling including hydroacoustic surveys;
- Herring spawn dive surveys;
- Ling cod egg mass dive surveys;
- Plankton and chlorophyll sampling;
- Marine mammal surveys; and
- Underwater acoustic monitoring and noise modelling study.

The Application will include details regarding standards used, sampling and analytical methods, and relevant quality control measures.

4.8.4 Effects Assessment and Proposed Mitigation Measures

The Application will consider potential Project-related effects on the Marine Resources VC according to the methods outlined in Section 3 of this document.

A pathway analysis will be used to identify and assess the linkages between Project components or activities and potential effects on marine resources. The assessment endpoint for marine resources will be the maintenance of self-sustaining populations that maintain their ecological function at an ecologically relevant scale (e.g., the RSA).

A summary of potential Project effects, indicators, and measurable parameters for the assessment of effects on Marine Resource subcomponents is provided in Table 25. The mechanisms through which Project activities may result in potential effects on Marine Resource subcomponents will be described in the Application. Mitigation measures designed to address identified potential effects will be proposed according to the methods outlined in Section 3. The Application will identify environmental management strategies to first avoid and then mitigate potential effects of the Project on marine resources, including works, undertakings, or activities that are likely to result in adverse effects on to fish or fish habitat that are part of or support CRA fisheries. Technically and economically feasible measures to avoid, mitigate, or otherwise offset potential effects will be provided.

A conceptual fish habitat offset plan will be provided in the Application that describes measures to offset identified potential adverse effects on fish in accordance with fisheries protection provisions of the *Fisheries Act* (Government of Canada 1985a), the *Fisheries Protection Policy Statement* (DFO 2013b), and the *Fisheries Productivity Investment Policy: A Proponent's Guide to Offsetting* (DFO 2013a). If required, marine fish habitat offset requirements for residual adverse effects will be based on the guiding principles of DFO's *Fisheries Productivity Investment Policy: A Proponent's Guide to Offsetting* (DFO 2013a), as follows:

- Offsetting measures must support fisheries management objectives or local restoration priorities.
- Benefits from offsetting measures must balance project effects.
- Offsetting measures must provide additional benefits to the fishery.
- Offsetting measures must generate self-sustaining benefits over the long term.

Table 25: Potential Effects and Proposed Indicators and Measurable Parameters for Marine Resources

Subcomponents	Potential Project Effects	Indicators for Assessment of Project Effects	Measurable Parameters for Assessment of Project Effects
Marine Fish: • Chinook, Chum, Coho, Pink, and Sockeye salmon • Dolly Varden char • Steelhead trout • Coastal cutthroat trout • Rockfish • Ling cod • Capelin • Eulachon • Pacific Herring • Rock sole • Halibut • Surf smelt Marine Mammals: • Steller sea lion • Harbour seal • Harbour porpoise • Killer whale • Humpback whale	Construction: • Disturbance, alteration, or removal of marine habitat, as well as serious harm to CRA-associated fish and/or protected species (marine SAR), may occur directly as a result of installation of marine infrastructure and construction activities (e.g., dredging and seabed conditioning, blasting, construction vessel activities), or indirectly due to changes to marine water, surface water, and sediment quality (accidental spills and sediment disturbance from dredging, underwater blasting, and/or underwater grading, pile installation, and propeller wash), air quality and acoustic environment (construction and vessel noise) • Potential changes in behaviour due to changes to existing acoustic and ambient light environment	• Habitat quantity and quality • Abundance and distribution (presence/ absence) • Habitat utilization	• Underwater noise levels generated by Project activities relative to established disturbance and injury thresholds for marine mammals and fish. • Permanent alteration or removal of habitat in area (m^2). • Change in presence/ absence and relative abundance. • Change in relative habitat use.

Subcomponents	Potential Project Effects	Indicators for Assessment of Project Effects	Measurable Parameters for Assessment of Project Effects
• Grey whale Other Marine Species of Interest: • Dungeness crab • Pandalid shrimp • Scallop • Oyster • Northern abalone • Laver (*Porphyra*) • Hexactinellid (glass) sponges • Cockles, mussels, and clams (littleneck, manila, and butter clams) Sensitive Marine Habitat: • Eelgrass • Bull kelp and Giant kelp • Saltmarsh • Fish spawning grounds Marine Species at Risk (SAR): • Marine species in the Project Area that are listed federally under SARA or provincially on Blue or Red List	Operations: • Disturbance, alteration, or removal of marine habitat, as well as serious harm to CRA-associated fish and/or protected species, may occur directly as a result of operational activities (e.g., propeller wash), or indirectly due to changes to marine water, surface water, and sediment quality (seabed disturbance from propeller wash, accidental spills), acoustic environment (vessel noise),air quality or ambient light environment (infrastructure lighting) • Potential changes in behaviour due to changes to existing acoustic and ambient light environment • Potential entrainment and impingement of fish (should there be marine water intake) Decommissioning: • Disturbance, alteration, or removal of marine habitat, as well as serious harm to CRA-associated fish and/or protected species, may occur directly as a result of removal of marine infrastructure, or indirectly due to changes to marine water, surface water, and sediment quality (accidental spills and sediment disturbance from pile removal and propeller wash), air quality or acoustic and ambient light environment (construction and vessel noise) • Potential changes in behaviour due to changes to existing acoustic environment		

4.8.5 Residual Effects and Their Significance

The residual effects of the Project on the Marine Resources VC will be characterized, and an assessment of their significance and likelihood and a prediction of confidence will be provided. The significance of residual effects will be determined as outlined in Section 3.4.

4.8.6 Cumulative Effects Assessment

A cumulative effects assessment will be conducted for the Project in combination with other existing and reasonably foreseeable projects and activities in the Marine Fish and Fish Habitat and Marine Mammal RSAs. The cumulative effects assessment will describe the rationale used to identify these projects and descriptions of potential adverse effects on marine resources that may overlap temporally or spatially with Project-related residual effects. Anthropogenic disturbances, such as other terminal developments, in-water construction, and changes in shipping traffic, are primary components of a cumulative effects assessment for marine resources. The cumulative effects assessment will follow the methods outlined in Section 3.

4.8.7 Conclusion

The Application will include a summary of the Marine Resources VC effects assessment, identified residual and cumulative effects, and their significance.

4.9 Freshwater Fish and Fish Habitat

4.9.1 Scoping and Rationale

Freshwater Fish and Fish Habitat is proposed as a VC to address potential changes to freshwater fish and their habitat as a result of the Project activities as required by:

- Section 5 of CEAA 2012, which requires assessment of environmental effects on fish and fish habitat, as defined under the federal *Fisheries Act* (Government of Canada 1985a), and aquatic species, as defined in SARA (Government of Canada 2002)*;* and
- The BC Environmental Protection and Management Regulation and Water Regulation*,* which require the protection of water quality and habitat during works occurring in and about a stream.

Twenty-one watercourses are located within or adjacent to the Project Site, of which several provide suitable and accessible fish habitat, particularly for resident and anadromous salmonid species (e.g., Scissors Creek Watershed) and the larger lake-fed tributaries that discharge to Fern Passage or the Shawatlan River Watershed. Potential adverse effects from the development could therefore lead to:

- Changes to fish habitat (i.e., permanent alteration to or destruction of freshwater fish habitat including changes in habitat quality and quantity) and water quality;
- Risk of physical injury or mortality to fish; and
- Change in fish health.

An emphasis of the assessment will be on effects associated with the construction of the Project, which could potentially lead to serious harm to fish that have associated CRA importance (as defined by the federal *Fisheries Act* [Government of Canada 1985a]) as well as the freshwater species that support CRA species. These construction activities include those that are pertinent to the Project, such as introduction of barriers, modification of flows, permanent alteration or destruction of habitat, and deposition of deleterious substances.

The Freshwater Fish and Fish Habitat VC will consider potential effects on salmon during their freshwater life stages only. The marine life stage of salmon, as well as fish species that live entirely within the marine environment (such as Pacific herring [*Clupea pallasii*]) are discussed in Section 4.7 of this document.

The Application will also describe how ATK, as obtained through agreed-upon methods from Aboriginal Groups, was used in the scoping and execution of the assessment, and the efforts made to obtain ATK from Aboriginal Groups.

The Application will describe any environmental effect defined in Section 5(1) or 5(2) of CEAA 2012 that is of relevance to the Freshwater Fish and Fish Habitat VC. If it is determined that the Project will not result in an environmental effect defined in Section 5(1) or 5(2) of CEAA 2012, a rationale to substantiate this conclusion will be provided in the Application.

4.9.2 Assessment Boundaries

4.9.2.1 *Spatial Boundaries*

The proposed LSA (Appendix A, Figure A-7) covers all drainages that may be directly affected by aspects of the Project:

- Slopes of the LSA along the east shore of Prince Rupert Harbour;
- Scissors Creek draining into Osborn Cove; and
- Shawatlan Lake and north shore tributaries to the lake.

The proposed RSA is the same as the Air Quality RSA and extends approximately 65 km east–west and by 65 km north–south.

The RSA (Appendix A, Figure A-7) has been developed based on two main considerations:

- Cumulative interactions in the Prince Rupert Area; and
- Potential for Project emissions to air to result in changes in fish health due to acidification and eutrophication effects, directly addressed in Section 4.3 (Air Quality) and Section 4.6 (Surface Water Quality). The assessment of surface water quality can provide information on the potential for fishery-level effects in regional water bodies by considering the likelihood of a change in trophic status due to eutrophication, or a change in pH due to critical load exceedances of depositional sulphate and NO_x into regional aquatic ecosystems.

4.9.2.2 *Temporal Boundaries*

The temporal boundaries for the assessment of effects on the Freshwater Fish and Fish Habitat VC will include the construction, operations, and decommissioning phases of the Project.

4.9.2.3 *Administrative Boundaries*

The Application will describe the methods used in identifying administrative boundaries for the assessment of effects on the Freshwater Fish and Fish Habitat VC.

4.9.2.4 *Technical Boundaries*

The Application will describe the methods used in identifying technical boundaries for the assessment of effects on the Freshwater Fish and Fish Habitat VC.

4.9.3 Existing Conditions

This section of the Application will describe existing conditions for freshwater fish and fish habitat. Issues that have been identified through scoping and preliminary research will be documented to provide an overview of the data collection necessary to assess the interactions between the Project setting and the various Project components.

This section will provide detailed information on the Freshwater Fish and Fish Habitat VC and will include the following:

- A comprehensive literature review to compile and summarize existing background information on fish habitat, distribution, and abundance within the RSA and LSA. Sources of information will include but are not limited to government reports, relevant technical reports, ATK, and the following online databases: Fisheries Information Summary System, Habitat Wizard, Ecocat, DFO Salmon Escapement Data System.

- Summary of methods, and a reference to appended technical reports that provide details, including:
    - Description of sampling to evaluate and supplement existing fish distribution and abundance information – Fish sampling will be consistent with RISC standards (RISC 1997) and may consist of electrofishing, minnow trapping, and visual observation following accepted methods for streams and potentially using other methods as appropriate (traps, gill, and/or seine nets) for lake sampling; benthic invertebrate sampling will also be undertaken, in accordance with the Canadian Aquatic Biomonitoring Network (CABIN) standards (CABIN 2012, 2014) to provide an indication of productivity and food availability in freshwater habitats;
    - Summary tables illustrating timing and frequency of sampling and sampling results;
    - Fish distribution and relative abundance, including descriptions and types of obstructions to fish migration for resident and anadromous species that influence fish distribution within the LSA;
    - Description of habitat mapping – habitat characteristics will be documented in a manner consistent with RISC standards (RISC 2001), including stream channel and riparian area properties;
    - Maps showing freshwater fish habitats, features that influence fish distribution and use, sampling locations, and sampling results within the LSA; and
    - Consideration of surface water quality to characterize existing conditions; water quality data will be presented in Section 4.6 (Surface Water Quality) and cross-referenced in this section.

4.9.4 Effects Assessment and Proposed Mitigation Measures

The Application will consider potential Project-related effects on the Freshwater Fish and Fish Habitat VC according to the methods outlined in Section 3 of this document.

The Application will outline the specific approach and methods used to determine the Project effects on freshwater fish and fish habitat. The assessment endpoint for fish and fish habitats will be the presence of self-sustaining populations that maintain their ecological function at an ecologically relevant scale (i.e., the RSA). The indicators selected for the assessment are provided in Table 26, along with the potential effects the Project could have on freshwater fish and fish habitat and measurable parameters that will be considered throughout the assessment. Where applicable, the assessment of potential effects will provide cross-references to other VC interactions and pathways. More specifically, this section will integrate results of hydrological predictive modelling along with surface water quantity results (Section 4.6), and will describe mitigation and monitoring plans if there are notable uncertainties or risks associated with any predictions.

The mechanisms through which Project activities may result in potential adverse effects and the resulting effects will be described further in the Application. Mitigation measures designed to address identified potential effects will be proposed according to the methods outlined in Section 3 of this document.

The Application will identify mitigation measures and environmental management strategies to avoid or mitigate potential effects of the Project on freshwater fish and fish habitat, including works, undertakings, or activities that are likely to result in impacts to fish or fish habitat that are part of or support CRA

fisheries. Technically and economically feasible measures to avoid, mitigate, or otherwise offset potential effects will be provided.

A conceptual fish habitat offset plan will be provided in the Application, if required, that clearly describes measures to offset serious harm to fish in accordance with fisheries protection provisions of the *Fisheries Act* (Government of Canada 1985a), the *Fisheries Protection Policy Statement* (DFO 2013b), and the *Fisheries Productivity Investment Policy: A Proponent's Guide to Offsetting* (DFO 2013a). If required, freshwater fish habitat offset requirements for residual impacts will be based the guiding principles of DFO's *Fisheries Productivity Investment Policy: A Proponent's Guide to Offsetting* (DFO 2013a), as follows:

- Offsetting measures must support fisheries management objectives or local restoration priorities.
- Benefits from offsetting measures must balance project impacts.
- Offsetting measures must provide additional benefits to the fishery.
- Offsetting measures must generate self-sustaining benefits over the long term.

Table 26: Potential Effects and Proposed Indicators and Measurable Parameters for Freshwater Fish and Fish Habitat

Subcomponents	Potential Project Effects	Indicators for Assessment of Project Effects	Measurable Parameters for Assessment of Project Effects
Fish SAR: • Coastal cutthroat trout. Other Aquatic Species of Interest (Salmonid species): • Dolly Varden char. • Rainbow / Steelhead trout. • Chinook, Chum, Coho, Pink, and Sockeye salmon.	Construction: • Disturbance, alteration, or removal of instream fish habitat and supporting riparian habitat, as well as harm to fish, may occur during construction of Project facilities. Operations: • Site operations could result in sedimentation or release of dust, waste water, and other deleterious substances due to soil erosion, equipment malfunction, or spills, leading to effects on water quality, fish health, and fish habitat. Decommissioning: • Site decommissioning could result in disturbance, alteration, or removal of instream and riparian fish habitat, as well as sedimentation or release of dust, waste water, and other deleterious substances due to soil erosion, equipment malfunction, or spills. These could lead to effects on water quality, fish health, and fish habitat.	• Fish habitat (quality and quantity) of instream, and riparian habitat. • Fish distribution (presence/ absence). • Fish abundance.	• Area (m^2) and quality of instream and riparian habitat (Habitat Units). • Fish species presence/absence and relative abundance.

4.9.5 Residual Effects and Their Significance

The residual effects of the Project on the Freshwater Fish and Fish Habitat VC will be characterized, and an assessment of their significance and likelihood and a prediction of confidence will be provided. The significance of residual effects will be determined as outlined in Section 3.4.

4.9.6 Cumulative Effects Assessment

Where a residual effect is identified, the Application will identify the existing and reasonably foreseeable future projects and activities that may affect freshwater fish and fish habitat. The cumulative effects assessment will include the rationale used to identify these projects and descriptions of potential adverse effects on freshwater fish and fish habitat that may overlap temporally or spatially with Project-related residual effects. The cumulative effects will be assessed per the methods outlined in Section 3 of this document.

4.9.7 Conclusion

The Application will include a summary of the Freshwater Fish and Fish Habitat VC effects assessment, identified residual and cumulative effects, and their significance.

4.10 Vegetation

4.10.1 Scoping and Rationale

Vegetation is proposed as a VC to evaluate potential changes to vegetation resources due to Project activities. The Vegetation VC includes two species-based subcomponents and four ecosystem-based subcomponents (Table 27).

Species-based VC subcomponents have been selected based on their Aboriginal, regulatory, stakeholder, and conservation importance. The SARA and the associated bilateral *Canada-British Columbia Agreement on Species at Risk* (Government of Canada 2002, 2005) protect plant species in BC that are listed federally as Threatened or Endangered. Plant SAR are provincially tracked due to limited or unknown population distributions, and have been identified as a conservation priority. Other plant species of management concern, including species that have been used traditionally by Aboriginal Groups, are also of conservation interest. Populations of species-based VC subcomponents may be reduced through Project direct and indirect effects, such as vegetation clearing, alteration of abiotic conditions sustaining plant populations, or the introduction of invasive and noxious plant species.

Ecosystem-based VC subcomponents have been selected based on their Aboriginal, regulatory, stakeholder, and conservation importance. Rare and sensitive ecological communities are provincially tracked due to limited (or unknown) population distributions, and have been identified as a conservation priority. Wetlands, old growth forests, and riparian ecosystems are sensitive to disturbance, have developed over long time periods, and provide high value wildlife habitat. The spatial extent of these ecosystem-based VC subcomponents may be reduced through direct and indirect effects, including vegetation clearing, alteration of hydrological regimes, eutrophication, or habitat fragmentation.

The Application will describe how ATK, as obtained through agreed-upon methods from Aboriginal Groups, was used in the scoping and execution of the assessment, and efforts made to obtain ATK from Aboriginal Groups.

The Application will describe any environmental effect defined in Section 5(1) or 5(2) of CEAA 2012 that is of relevance to the Vegetation VC. If it is determined that the Project will not result in an environmental effect defined in Section 5(1) or 5(2) of CEAA 2012, a rationale to substantiate this conclusion will be provided in the Application.

4.10.2 Assessment Boundaries

4.10.2.1 *Spatial Boundaries*

The Vegetation and Wildlife VCs will use the same Terrestrial LSA and RSA due to their ecological interdependence.

The Vegetation and Wildlife (i.e., Terrestrial) LSA (Appendix A, Figure A-8) incorporates the terrestrial portion of the Project Site and a 500 m wide buffer of terrestrial areas. The LSA overlaps the Scissors Creek, Shawatlan River, and WORCWSD001172 watersheds. The Vegetation and Wildlife VCs will use the same Terrestrial LSA of 7 km^2. The Terrestrial LSA encompasses the area in which the majority of direct and indirect measurable Project effects on Vegetation and Wildlife are expected during construction, operations, and decommissioning.

The Vegetation and Wildlife (i.e., Terrestrial) RSA comprises 37 watersheds. The Terrestrial RSA (Appendix A, Figure A-8) is bounded by the WORCWSD000124 watershed to the north, by Work Channel and Lachmach River watershed to the east, by the Skeena River to the south, and by Chatham Sound to the west. The Vegetation and Wildlife VCs will use the same Terrestrial RSA of 913 km^2 due to their ecological interdependence. The Terrestrial RSA is large enough to assess direct and indirect Project-related effects, as well as cumulative effects on Vegetation and Wildlife VC subcomponents.

The Terrestrial RSA was selected to include:

- General environmental features present in the Terrestrial LSA to facilitate a comparison of habitat types;
- Topographical breaks and watersheds that provide natural landscape barriers; and
- The home range of the wildlife species with the largest home range at the Project Site (i.e., 220 km^2 or 22,000 ha for a coastal male grizzly bear [MacHutchon et al. 1993]), and therefore covers a scale appropriate for assessing the effects of the Project on wildlife.

4.10.2.2 *Temporal Boundaries*

The temporal boundaries for the assessment of effects on the Vegetation VC will include the construction, operations, and decommissioning phases of the Project.

4.10.2.3 *Administrative Boundaries*

The Application will describe the methods used in identifying administrative boundaries for the assessment of effects on the Vegetation VC.

4.10.2.4 *Technical Boundaries*

The Application will describe the methods used in identifying technical boundaries for the assessment of effects on the Vegetation VC.

4.10.3 Existing Conditions

This section of the Application will describe the existing conditions for Vegetation VC subcomponents. Existing conditions will be determined using a combination of desktop review of existing information, a field sampling program, and Terrestrial Ecosystem Mapping (TEM).

Information and data sources accessed during the desktop review will include:

- *BC Species and Ecosystems Explorer* database for provincially blue-listed and red-listed plant species and ecological communities (BC CDC 2015);
- *Species at Risk Public Registry* (Government of Canada 2015a) – for information on federally listed Schedule 1 species and associated location/range information;
- Committee on the Status of Endangered Wildlife in Canada (COSEWIC) – for plant species listed by COSEWIC that may not be on SARA Schedule 1;
- iMapBC (Government of BC 2015a) – for geographic locations of listed species occurrences (where "masked" locations are noted, the information will be requested from the BC MOE;
- E-flora BC, a web-based database and information centre for rare plant species (Klinkenberg 2015);
- Digital information from DataBC (Government of BC 2015b) – (e.g., Biogeoclimatic Ecosystem Classification boundaries, Wildlife Habitat Areas, Old Growth Management Areas, Special Resource Management Zones, parks, and protected areas boundaries);
- *Vegetation Resources Inventory* data from the British Columbia Ministry of Forests. Lands and Natural Resource Operations (BC FLNRO 2015), with updates on recent cut blocks;
- Previous TEM, Predictive Ecosystem Mapping (PEM), or Sensitive Ecosystem Mapping near the Project Area; and
- Previous rare plant surveys and traditional use plant studies in the area.

The TEM will be completed in accordance with RISC (1998) at a scale of 1:5,000 for the terrestrial LSA. Ecosystems will be described following Banner et al. (1993), and wetland ecosystems will be described following the *Canadian Wetland Classification System* (NWWG 1997) and MacKenzie and Moran (2004). An amalgamation of TEM and small-scale PEM available from the BC MOE PEM warehouse will be used to map ecosystems for the terrestrial RSA.

A field sampling program will be undertaken to characterize existing conditions for terrestrial vegetation in the LSA. The ATK related to vegetation resources in the Project Area, as obtained through consultation with Aboriginal Groups, will also be considered. The field program will be implemented within the LSA during spring and summer. Specifically, field sampling will be carried out to:

- Ground-truth preliminary TEM and meet RISC (1998) polygon visitation standards through the establishment of full ecosystem plots, ground inspections, and visual checks in a variety of ecosystems;
- Delineate and classify wetland ecosystems in accordance with the National Wetlands Working Group (NWWG) (1997) and MacKenzie and Moran (2004);

- Search for listed plant species and listed ecological communities;
- Search for traditional use plant species;
- Search for noxious weeds and invasive plant species; and
- Collect stand age and coarse woody debris data to help characterize wildlife habitat.

4.10.4 Effects Assessment and Proposed Mitigation Measures

The Application will consider potential Project-related effects on Vegetation VC subcomponents according to the methods outlined in Section 3. Potential effects of the Project on the Vegetation VC will largely arise from direct removal of vegetation species and communities during site preparation for Project construction. A pathway analysis will be used to identify and assess the linkages between Project components or activities and potential residual effects on vegetation. After the potential linkages are identified, environmental design features and mitigations that might eliminate, reduce, or offset effects of the Project on vegetation will be identified and discussed.

The assessment endpoint for vegetation will be the presence of self-sustaining plant populations and communities that maintain their ecological function at an ecologically relevant scale. Effects to the Vegetation VC subcomponents will be quantified and assessed at the LSA scale to inform the effects assessment. The distribution of Vegetation subcomponents within the assessment areas will be used as an indicator to identify whether self-sustaining populations and communities of Vegetation subcomponents are present.

Project effects on the Vegetation VC subcomponents will be predicted by overlaying data describing the distribution of Vegetation VC subcomponents with the Project Site in a GIS environment. A summary of potential effects, indicators, and measurable parameters that will be considered through the assessment of the effects on vegetation is provided in Table 27.

The mechanisms through which Project activities may result in potential effects and the resulting effects will be described further in the Application. Mitigation measures designed to address identified potential effects will be proposed according to the methods outlined in Section 3 of this document. Technically and economically feasible measures to avoid, mitigate, or otherwise offset potential effects will be provided.

Table 27: Potential Effects and Proposed Indicators and Measurable Parameters for Vegetation

Subcomponents	Potential Project Effects	Indicators for Assessment of Project Effects	Measurable Parameters for Assessment of Project Effects

Species-based subcomponents:
• Plant SAR
• Other plant species of management concern.
  o Traditional use plant species, including the current use of plants for traditional purposes.
  o Invasive plant species.
	Construction:
	• Site preparation will begin with clearing and grubbing vegetation across the Project Site, and other areas where vegetation clearing is required for ancillary facilities (e.g., firebreaks and perimeter fence access).
		• Plant SAR distribution.
		• Traditional use plant distribution.
		• Invasive plant distribution.
			• Number of known locations of species-based subcomponents affected by footprint.

Subcomponents	Potential Project Effects	Indicators for Assessment of Project Effects	Measurable Parameters for Assessment of Project Effects
Ecosystem-based subcomponents: • Rare and sensitive ecological communities. • Wetlands (including saltmarsh if applicable). • Old growth forests. • Riparian ecosystems.	Operations: • Vegetation resources may be affected by reduced air and water quality during operations. • Change in vegetation health, vigour, or species composition resulting from soil acidification, vegetation eutrophication, or fumigation from air emissions. Decommissioning: • Project facilities will be removed and if required the site will be revegetated, per the BC OGC requirements.	• Rare and sensitive ecological community distribution. • Wetland distribution. • Old growth forest distribution. • Riparian ecosystem distribution.	• Area (ha) of ecosystem-based subcomponents affected by Project Site • Area (ha) of vegetation communities where: o Critical loads for acidic nitrogen and sulphur deposition are predicted to be exceeded o Critical loads for nutrient nitrogen deposition are predicted to be exceeded o Critical levels for sulphur dioxide or nitrogen dioxide are predicted to be exceeded • Surface water flow and site drainage alterations • Changes in floristic community structure and composition

4.10.5 Residual Effects and Their Significance

The residual effects of the Project on the Vegetation VC will be characterized, and an assessment of their significance and likelihood and a prediction of confidence will be provided. The significance of residual effects will be determined as outlined in Section 3.4.

4.10.6 Cumulative Effects Assessment

A cumulative effects assessment will be conducted for the Project in combination with other existing and reasonably foreseeable projects and activities in the RSA. The cumulative effects assessment will describe the rationale used to identify these projects and descriptions of potential adverse effects on vegetation that may overlap temporally or spatially with Project-related residual effects. Anthropogenic disturbances, such as increasing industrial development or changes in timber harvest pressure, are primary components of a cumulative effects assessment for vegetation. The cumulative effects assessment will follow the methods outlined in Section 3.

4.10.7 Conclusion

The Application will include a summary of the Vegetation VC effects assessment, identified residual and cumulative effects, and their significance.

4.11 Wildlife

4.11.1 Scoping and Rationale

Wildlife is proposed as a VC to address any potential changes to wildlife and wildlife habitat as a result of Project activities. The SARA and the associated bilateral *Canada-British Columbia Agreement on Species at Risk* (Government of Canada 2002, 2005), the *Migratory Birds Convention Act* (Government of Canada 1994), and the BC *Wildlife Act* (Government of BC 1996a) provide protection to wildlife and certain types of wildlife habitat in the Project Area. The Wildlife VC includes both terrestrial wildlife species and marine birds.

Federally and provincially listed wildlife species occur within the Project Area. A search of the *BC Species and Ecosystems Explorer* indicates 22 provincially and/or federally designated wildlife SAR are confirmed and/or have the potential to occur in the Project Area (BC CDC 2014). A species presence search found 143 species of migratory birds known to occur within the Project Area (BC Breeding Bird Atlas 2014). The selection of Wildlife VC subcomponents considered federal and provincial conservation status, Identified Wildlife species, species groups (i.e., amphibian, avian, and mammalian), species range, and habitat use within the Project Area. There are four Wildlife subcomponents: wildlife SAR, migratory birds, marine birds, and other species of interest. The Wildlife VC subcomponents are of conservation concern, of socio-economic or Aboriginal traditional importance, and are representative of wildlife potentially affected by the Project.

Environment Canada has expressed interest in the rationale for substituting little brown myotis (*Myotis lucifugus*) and peregrine falcon *paelei* subspecies (*Falco peregrinus paelei*) with other wildlife subcomponent species (Huxter 2015, pers. comm.). Little brown myotis are common in a wide range of forest types and are most abundant in older forest stands, where cavities of large-diameter trees are used for roost and maternity sites (COSEWIC 2013a). Little brown myotis forage over water and in forest gaps (COSEWIC 2013a). Little brown myotis was not selected as a Wildlife subcomponent focal species because several other focal species share similar habitat associations and similar sensitivities to the potential effects of the Project. For example, western screech-owl is also associated with lower elevation forests near water (COSEWIC 2002) and marbled murrelet, northern goshawk, and olive-sided flycatcher are associated with mature to old growth forest (Altman and Sallabanks 2012; COSEWIC 2013b; EC 2014). Myotis populations may be limited by the availability of hibernacula, but the terrestrial LSA is not expected to facilitate hibernation of little brown myotis. Sea level caves and mines are considered too warm for hibernation (Burles 2015, pers. comm.).

Three subspecies of peregrine falcon occur in BC but only the *paelei* subspecies has potential to occur in the terrestrial LSA year round (Davidson et al. 2014, White et al. 2002). Peregrine falcons traditionally nest on cliff ledges 50 to 200 m in height (White et al. 2002). The *paelei* subspecies is also known to nest on small cliffs under Sitka spruce roots, in abandoned bald eagle nests or in tree cavities (Government of Canada 2015b). Peregrine falcons breed only in habitats with access to sufficient food supplies (COSEWIC 2007; White et al. 2002). Along the Pacific coast, 78% of peregrine falcon diet is composed of alcids such as auklets and murrelets, and procellariids such as storm-petrels and shearwaters (White et al. 2002). The *pealei* subspecies usually nests near seabird colonies (COSEWIC 2007). Therefore, Cassin's auklet habitat is considered a suitable substitution for peregrine falcon *paelei* habitat and was chosen as a representative Wildlife subcomponent focal species.

The Project has the potential to cause direct and indirect effects on wildlife and wildlife habitat. Changes to the acoustic environment, ambient light, marine navigation, surface water quality and quantity, air quality, vegetation clearing, and the presence of traffic, blasting, flaring, and infrastructure may affect the distribution, use, and persistence of wildlife species in the Project Area. The assessment of wildlife will consider Project-related effects on wildlife habitat quality and quantity, wildlife mortality, and wildlife movement.

The Application will also describe how ATK, as obtained through agreed-upon methods from Aboriginal Groups, was used in the scoping and execution of the assessment, and the efforts made to obtain ATK from Aboriginal Groups.

The Application will describe any environmental effect defined in Section 5(1) or 5(2) of CEAA 2012 that is of relevance to the Wildlife VC. If it is determined that the Project will not result in an environmental effect defined in Section 5(1) or 5(2) of CEAA 2012, a rationale to substantiate this conclusion will be provided in the Application.

4.11.2 Assessment Boundaries

4.11.2.1 *Spatial Boundaries*

Four spatial boundaries are proposed for the assessment of effects on wildlife: a proposed Terrestrial LSA and RSA and a proposed Marine Bird LSA and RSA (Table 28). The LSAs will allow an assessment of Project effects at a local, operational scale. The RSAs provide a regional, ecologically relevant context for the distribution of VCs and the habitat they depend on.

Table 28: Description of Proposed Terrestrial and Marine Bird Local and Regional Study Areas

Study Area	Description
Proposed Terrestrial LSA (Appendix A, Figure A-8)	The Vegetation and Wildlife (i.e., Terrestrial) LSA incorporates the terrestrial portion of the Project Site and a 500 m wide buffer of terrestrial areas. The LSA overlaps the Scissors Creek, Shawatlan River, and WORCWSD001172 watersheds. The Vegetation and Wildlife VCs will use the same Terrestrial LSA of 7 km^2. The Terrestrial LSA encompasses the area in which the majority of direct and indirect measurable Project effects on Vegetation and Wildlife are expected during construction, operations, and decommissioning.
Proposed Terrestrial RSA (Appendix A, Figure A-8)	The Vegetation and Wildlife (i.e., Terrestrial) RSA comprises 37 watersheds. The Terrestrial RSA is bounded by the WORCWSD000124 watershed to the north, by Work Channel and Lachmach River watershed to the east, by the Skeena River to the south, and by Chatham Sound to the west. The Vegetation and Wildlife VCs will use the same Terrestrial RSA of 913 km^2 due to their ecological interdependence. The Terrestrial RSA is large enough to assess direct and indirect Project-related effects, as well as cumulative effects on Vegetation and Wildlife VC subcomponents. The Terrestrial RSA was selected to include: • General environmental features present in the Terrestrial LSA to facilitate a comparison of habitat types; • Topographical breaks and watersheds that provide natural landscape barriers; and • The home range of the wildlife species with the largest home range at the Project Site (i.e., 220 km^2 or 22,000 ha for a coastal male grizzly bear [MacHutchon et al. 1993]), and therefore covers a scale appropriate for assessing the effects of the Project on wildlife.
Proposed Marine Bird LSA (Appendix A, Figure A-9)	The Marine Bird LSA incorporates the northern and southern shipping route options in Chatham Sound and a 2 km wide buffer of marine areas. The approximately 414 km^2 Marine Bird LSA encompasses the area in which the majority of direct and indirect Project-related effects on marine birds are expected during construction, operations, and decommissioning.

Study Area	Description
Proposed Marine Bird RSA (Appendix A, Figure A-9)	The Marine Bird RSA incorporates the northern and southern shipping route options in Chatham Sound. In the proposed terminal area, the RSA extends north to the north end of Tuck Inlet and southeast through Fern Passage to Port Edward. Along the proposed Project navigational route in Chatham Sound, the RSA is bounded to the north by the south end of Dundas Island extending eastward to the northwest tip of the Tsimpsean Peninsula (encompassing Grassy Point), to the south by the north end of Stephens, Prescot, and Porcher islands, and to the east by land and the mouth of the Skeena River. The western boundary of the Marine Bird RSA extends 2.5 km west of the Triple Island Pilotage Station. The Marine Bird RSA encompasses approximately 2,055 km^2 and is large enough to assess direct and indirect Project-related effects, as well as cumulative effects.

4.11.2.2 *Temporal Boundaries*

The temporal boundaries for the assessment of effects on the Wildlife VC will include the construction, operations, and decommissioning phases of the Project.

4.11.2.3 *Administrative Boundaries*

The Application will describe the methods used in identifying administrative boundaries for the assessment of effects on the Wildlife VC.

4.11.2.4 *Technical Boundaries*

The Application will describe the methods used in identifying technical boundaries for the assessment of effects on the Wildlife VC.

4.11.3 Existing Conditions

The Application will describe the existing conditions for terrestrial wildlife and marine birds and provide the basis for assessing likely effects associated with the Project.

Existing wildlife conditions will be derived from the following information sources as part of the initial review:

- Government of BC iMapBC web-based mapping service for spatial wildlife data, including Ungulate Winter Ranges, Wildlife Habitat Areas, Special Resource Management Zones, parks, and protected areas (Government of BC 2015);
- *BC Species and Ecosystems Explorer and Internet Mapping Service* to develop a list of species at risk that are expected to occur in the Project Area based on known distribution and habitat needs and wildlife occurrence records (BC CDC 2015);
- *Species at Risk Public Registry* for information and designations of wildlife SAR (Government of Canada 2015a);
- Information from the *North Coast Land and Resource Management Plan: Final Recommendations*, including mapping and available databases (BC Ministry of Sustainable Resource Management 2005);
- Information from the Royal BC Museum publications and natural history collections;
- Relevant peer-reviewed scientific papers, other literature and general journal articles of relevance;
- Existing wildlife data and reports in the area from other organizations or companies;

- Wildlife habitat suitability mapping in the area, if available;
- Government agency biologists with local and/or regional expertise; and
- The ATK, as obtained through agreed-upon methods from Aboriginal Groups, relating to culturally important species in the Project Area.

The background review will summarize existing conditions and relevant wildlife data for the Project Area. Emphasis will be on the need and type of additional wildlife data collection necessary to meet the requirements of an EA under the BC EAA and CEAA 2012.

Consultation with government agencies will be undertaken to discuss the Project and potential effects on wildlife. The primary agencies with regulatory authority over wildlife resources in the Project Area are the Canadian Wildlife Service of EC and the BC FLNRO.

The wildlife field program will focus on Wildlife VC subcomponents identified at this preliminary stage. The existing wildlife and wildlife habitat conditions will be surveyed in the LSA.

Surveys planned as part of the wildlife workplan are as follows:

- Marine bird surveys (Marine Bird LSA and Marine Bird RSA);
- Low Level Aerial Survey of marbled murrelet critical nesting habitat (Terrestrial LSA);
- Western screech-owl surveys (Terrestrial LSA);
- Upland breeding bird surveys (Terrestrial LSA);
- Raptor and heron stick nest surveys (Terrestrial LSA);
- Amphibian surveys (Terrestrial LSA);
- Upland wildlife habitat surveys (Terrestrial LSA);
- Northern goshawk breeding surveys (Terrestrial LSA); and
- Bat surveys (Terrestrial LSA); and
- Coastal tailed frog surveys (Terrestrial LSA).

4.11.4 Effects Assessment and Proposed Mitigation Measures

The Application will consider potential Project-related effects on the Wildlife VC according to the methods outlined in Section 3. The assessment endpoint for terrestrial wildlife and marine birds will be the presence of self-sustaining populations that maintain their ecological function at an ecologically relevant scale (i.e., the RSA). Self-sustaining populations that maintain their ecological function at ecologically relevant scale are an appropriate assessment endpoint for all wildlife and marine bird focal species. In general, a significant effect will be defined for each focal species as a residual effect that is predicted to exceed the resilience and adaptability limits of the population and results in a population that is not self-sustaining or maintaining its ecological function under existing conditions. In the case of most species that are not self-sustaining based on existing conditions data, an adverse effect will be considered to be significant if it contributes to the factors that are limiting the population. Indicators used to identify whether self-sustaining populations of Wildlife subcomponents are or will be present in each assessment case will include:

- Habitat suitability and quantity;
- Mortality; and
- Movement.

Habitat suitability modelling will be used to determine the suitability and quantity of available habitat for most of the selected subcomponents. These models combine habitat data, known wildlife habitat selection patterns, and habitat requirements through available literature and expert knowledge to produce scientifically defensible estimates of habitat suitability. Habitat modelling will use the class rating scheme described in the *British Columbia Wildlife Habitat Rating Standards* (RISC 1999). Wildlife habitat suitability models are planned for sitka black-tailed deer, western toad, olive-sided flycatcher, and northern goshawk. Wildlife subcomponent species models will measure the predicted change in habitat suitability and quantity due to the Project. Marbled murrelet critical nesting habitat identified by EC (2014) will be ground-truthed and refined to delineate suitable terrestrial habitat for marbled murrelet in the effects assessment. Habitat suitability mapping quantifies and displays the distribution of habitat quality across a landscape, which aids in the evaluation of land management decisions.

A summary of potential Project effects, indicators, and measurable parameters for the assessment of effects on Wildlife subcomponents is provided in Table 29. Measurable parameters for assessment of Project effects are area and suitability of wildlife habitat, sources of mortality and intensity of effect, and barriers to wildlife movement. Quantitative and qualitative approaches will be used to assess Project effects. Changes in wildlife habitat suitability and quantity will be estimated by overlaying habitat suitability maps in a GIS within the Project Site. Changes in wildlife mortality and movement will be estimated qualitatively using professional judgment based on expert knowledge and literature regarding the effects of development and existing population conditions. Estimated changes in wildlife mortality and movement will be specific to the planned construction and operations activities of the Project, relative to the risks of mortality and barriers to wildlife movement present under existing conditions.

The mechanisms through which Project activities may result in potential effects on wildlife subcomponents will be described in the Application. Mitigation measures designed to address identified potential effects will be proposed according to the methods outlined in Section 3. Technically and economically feasible measures to avoid, mitigate, or otherwise offset potential effects will be provided.

Table 29: Potential Effects and Proposed Indicators and Measurable Parameters for Wildlife

Wildlife Subcomponents	Potential Project Effects	Indicators for Assessment of Project Effects	Measurable Parameters for Assessment of Project Effects
Wildlife SAR • Coastal tailed frog • Western toad • Western screech owl (*kennicottii* subspecies) • Northern goshawk (*laingi* subspecies) • Grizzly bear Migratory Birds • Olive sided flycatcher • Great blue heron (*fannini* subspecies) Marine Birds • Marbled murrelet • Pelagic cormorant (*pelagicus* subspecies) • Cassin's auklet Other species of interest • Sitka black tailed deer	Construction • Traffic, noise, blasting, light, surface water quality and quantity, and air quality changes due to construction activities may affect wildlife subcomponents. Shipment of construction materials and personnel may alter marine bird breeding, foraging, and/or behaviour. Changes to available habitat, movement patterns, and wildlife mortality may occur during vegetation clearing and site construction. Operations • Traffic, noise, light, flaring and floodlit structure, surface water quality and quantity, and air quality changes due to operational activities may affect wildlife subcomponents. Shipment of LNG and other Project-related shipping may alter marine bird breeding, foraging, and/or behaviour. Changes to available habitat, movement patterns, and wildlife mortality may occur during site operations. Decommissioning • Traffic, noise, and light due to decommissioning activities may affect Wildlife subcomponents. Changes to available habitat, movement patterns, and wildlife mortality may occur during site decommissioning.	• Wildlife habitat quality (suitability) and quantity • Wildlife mortality • Wildlife movement	• Area (ha) and quality (suitability) of wildlife habitat • Sources of mortality and intensity of effect (qualitative) • Barriers to wildlife movement (qualitative)

4.11.5 Residual Effects and Their Significance

The residual effects of the Project on each focal species of the Wildlife VC will be characterized, and an assessment of their significance and likelihood will be provided with a prediction of confidence. The significance of residual effects will be determined as outlined in Section 3.4.

4.11.6 Cumulative Effects Assessment

A cumulative effects assessment will be conducted for the Project in combination with other existing and reasonably foreseeable projects and activities in the RSA. The cumulative effects assessment will

describe the rationale used to identify these projects and descriptions of potential adverse effects on wildlife that may overlap temporally or spatially with Project-related residual effects. Anthropogenic disturbances, such as increasing industrial development or changes in timber harvest pressure, are primary components of a cumulative effects assessment for wildlife. The cumulative effects assessment will follow the methods outlined in Section 3.

4.11.7 Conclusion

The Application will include a summary of the Wildlife VC effects assessment, identified residual and cumulative effects, and their significance.

4.12 Summary of Assessment of Potential Environmental Effects

The Application will provide the summary table of potential effects, mitigation measures and the significance of the Project-related residual effects (Table 30).

Table 30: Summary of Assessment of Potential Environmental Effects

Valued Component	Project Phase	Potential Effects	Key Mitigation Measures	Significance Analysis of Residual Effects

5 ASSESSMENT OF POTENTIAL ECONOMIC EFFECTS

5.1 Economic Background

The Application will provide a general description of the existing economic environment of the area in which the Project will be located. More details will be provided in the existing conditions section for the VC.

5.2 Economy / Economic Conditions

5.2.1 Scoping and Rationale

Economy / Economic Conditions is proposed as a VC to assess potential effects of the Project on economy and economic conditions. The Project will generate direct, indirect, and induced economic effects on gross domestic product (GDP), labour income, and employment during its construction, operations, and decommissioning phases. Challenges associated with recruitment of workers and procurement of goods and services may occur during the construction, operations, and decommissioning phases, and may require recruitment and procurement from outside the study area including BC, other parts of Canada, or internationally. Competition for labour and contractors within the defined study area may increase labour costs and the costs of goods and services, affect income disparity, and cause boom-bust economic cycles.

The Application will describe any environmental effect defined in Section 5(1) or 5(2) of CEAA 2012 that is of relevance to the Economy / Economic Conditions VC. If it is determined that the Project will not result in an environmental effect defined in Section 5(1) or 5(2) of CEAA 2012, a rationale to substantiate this conclusion will be provided in the Application. The Application will describe the efforts made, and the results of those efforts, to collect information about the Economy / Economic Conditions VC indicators and about particular potential economic effects on Aboriginal peoples resulting from a Project-related environmental effect.

Municipal, provincial, and federal governments and affected public have an interest in economic effects of major projects.

5.2.2 Assessment Boundaries

5.2.2.1 *Spatial Boundaries*

The proposed LSA (Appendix A, Figure A-10) comprises an area within which all (or most) potential Project effects are expected to occur. It encompasses the zone of influence of the Project, including areas that may be affected by the Project socio-economic effects, such as employment, and use of services and infrastructure. The boundary of the LSA reflects the statistical reporting units used by Statistics Canada and the Government of BC. The LSA includes the following:

- City of Prince Rupert;
- District of Port Edward;
- Lax Kw'alaams Band community;
- Metlakatla First Nation community;

- Gitxaala Nation community (Lach Klan);
- Kitselas First Nation community;
- Kitsumkalum Indian Band community;
- City of Terrace; and
- Skeena-Queen Charlotte Regional District Electoral Area (RDEA) A.

The proposed RSA (Appendix A, Figure A-10) is used to provide additional sources for workers, goods, and services; it is often used as the spatial boundary for the assessment of potential cumulative effects. The RSA boundary is consistent with the administrative boundaries of the Skeena-Queen Charlotte Regional District excluding Haida Gwaii, but including the City of Terrace and the adjacent Kitsumkalum Indian Band and Kitselas First Nation communities.

5.2.2.2 *Temporal Boundaries*

The temporal boundaries for the assessment of effects on the Economy / Economic Conditions VC will include the construction, operations, and decommissioning phases of the Project.

5.2.2.3 *Administrative Boundaries*

Administrative boundaries refer to the limitations imposed on an EA by political, economic, or social constraints. These may include existing datasets that are collected on the basis of regional or provincial boundaries that may not be the same as the spatial boundaries of the selected VCs, and which may therefore constrain the assessment of potential effects in some way.

In this assessment, social and economic data will be compiled based on Statistics Canada or BC Stats boundaries, such as Census subdivisions, Local Health Areas, and School Districts. These areas may not always align with the defined LSA and RSA and may constrain the assessment.

5.2.2.4 *Technical Boundaries*

Technical boundaries refer to the constraints imposed on an EA by limitations in the ability to predict the effects of a project.

In this assessment, the use of an input/output model to calculate the economic effects of the Project may impose some technical limitations on the analysis. These limitations will be clearly identified and discussed in the Application.

If and where technical boundaries have constrained the identification and/or assessment of potential economic effects of the Project, the nature of the technical boundaries and their effect on the assessment will be documented.

5.2.3 Existing Conditions

For the Economy / Economic Conditions VC, the existing conditions within the LSA and the RSA will be described in sufficient detail to enable potential Project-VC interactions to be identified, understood, and assessed.

The description of existing economic conditions will include current status, natural, and/or human-caused trends that may alter the socio-economic setting irrespective of the changes that may be caused by the Project or other projects and activities in the LSA and RSA. These trends and conditions may include population fluctuations, industrial activity, changes in income and earnings and labour force indicators.

The description of existing economic conditions will also explain whether and how other existing projects and activities in the LSA and RSA have affected or are affecting the VC. The description will include a summary of the regulatory or government context for the management of the Economy / Economic Conditions VC.

The development of the existing conditions description will require the collection of primary and secondary data and information. Primary data and information will be collected through interviews with key informants in the LSA and RSA. Key informants include representatives of local government, local business organizations, relevant industry organizations, and post-secondary training institutions. In addition, community-specific socio-economic existing conditions data will be collected from the City of Prince Rupert and other stakeholders, as well as Aboriginal Groups at the discretion of each Aboriginal Group.

Secondary data sources include, but may not be limited to:

- Review of existing, available databases from Statistics Canada and BC Stats, including BC Stats Socio-economic profiles and BC Stats Surveys;
- Review of existing literature, including labour market surveys, industry association publications, and post-secondary training institution reports on industry demands for training;
- Review of previous socio-economic assessments for similar projects and for other types of projects in the same region;
- The available results of previous socio-economic monitoring programs, if any; and
- LSA and RSA community websites and publications available through those websites.

5.2.4 Effects Assessment and Proposed Mitigation Measures

This section of the Application will describe how the Economy / Economic Conditions VC and its subcomponents will be potentially affected by the Project. The effects assessment will identify and evaluate potential adverse effects on Economy / Economic Conditions VC and its subcomponents during the construction, operations, and decommissioning phases. Potential effects that will be assessed include the following:

- Project's demand for short-term labour, goods, and services during the construction phase;
- Project's demand for long-term labour, goods, and services during the operations phase; and
- Project's demand for short-term workers and services during decommissioning.

While the above potential economic effects are all beneficial, other potential adverse economic effects associated with Project's demands for labour, goods, and services include:

- Labour shortages could lead to competition among other developers and industries in the area and increase wage rate.
- Direct and indirect Project-related population changes could place additional demands on local infrastructure and services, including housing. These additional demands could lead to increases in local costs or shortage in service provision and reduce access by residents (see Infrastructure and Community VC).
- Competition for labour, demand for housing, and the demand for goods and services could cause inflationary pressures in the study area.

- The availability of additional disposable income could create effects on individual, family, and community wellbeing if rational spending decisions are not made (see Community Health and Wellbeing VC).

A summary of potential effects, indicators, and measurable parameters that will be considered through the assessment of the effects on the Economy / Economic Conditions VC is provided in Table 31.

Table 31: Potential Effects and Proposed Indicators and Measurable Parameters for Economy / Economic Conditions

Subcomponents	Potential Project Effects	Indicators for Assessment of Project Effects	Measurable Parameters for Assessment of Project Effects
Project expenditures and provincial GDP	Construction: • Through the Project demand for labour, goods, and services during construction, positive economic effects will be experienced by local workers and businesses. Governments will experience income through increased taxes. Some inflationary pressures may be experienced locally. Demand for labour could encourage influx of new residents. Operations: • The Project will create long-term demand for local operating staff, providing an employment opportunity for local residents or encouraging people to migrate to the area for employment. Positive economic effects will be experienced through the increased employment and the associated demand for local goods and services. Governments will have increased tax revenues. Decommissioning: • Closure and decommissioning of the Project will create short-term employment but will reduce the local Project-related employment, demand for local goods and services, and government tax revenues.	• Distribution of Project expenditures • Provincial economy	• Project procurement of goods and services • Provincial GDP
Government revenues		• Government taxes and revenues	• Project-related government revenues and taxes
Project employment and income		• Project employment • Project-related employment income	• Employment, unemployment and participation rates • Labour force by occupation and industry • Project-related income
Population		• Local and regional population	• Population change

The resulting effects will be described further in the Application. Mitigation measures designed to address identified potential effects will be proposed according to the methods outlined in Section 3 of this document. The assessment will describe the recruitment and procurement plans expected to be needed for the Project, including hiring, training, and purchasing of goods and services. Standard mitigation, BMPs, socio-economic management plans, and other general practices proposed to be implemented by the Proponent will also be described.

5.2.5 Residual Effects and Their Significance

The residual effects of the Project on the Economy / Economic Conditions VC will be characterized, and an assessment of their significance and likelihood and a prediction of confidence will be provided. The significance of residual effects will be determined as outlined in Section 3.4.

5.2.6 Cumulative Effects

Where appropriate, a cumulative effects assessment will be conducted for the Project in combination with other existing and reasonably foreseeable projects and activities in the RSA. The cumulative effects assessment will describe the rationale used to identify these projects and descriptions of potential adverse effects on Economy / Economic Conditions VC that may overlap temporally or spatially with Project-related residual effects. The cumulative effects assessment will follow the methods outlined in Section 3.

5.2.7 Conclusions

The Application will include a summary of the Economy / Economic Conditions VC assessment, identified residual and cumulative effects, and their significance.

5.3 Summary of Assessment of Potential Economic Effects

The Application will provide the summary table of potential effects, mitigation measures, and the significance of the Project-related residual effects (per Table 30).

6 ASSESSMENT OF POTENTIAL SOCIAL EFFECTS

6.1 Social Background

The Application will provide a general description of the existing social environment of the area in which the Project will be located. More details will be provided in the existing conditions section for each VC.

6.2 Community Health and Wellbeing

6.2.1 Scoping and Rationale

Community Health and Wellbeing is proposed as a VC to assess potential effects of the Project. The Project will potentially provide direct and indirect employment opportunities for residents of the study areas and may result in some new workers moving into the region. The potential change in regional demographics and new Project-related income may affect the social determinants of health in the communities, increase inequities, alter other socio-economic and health factors, and place pressure on the health care system, all of which may affect the health and wellbeing of individuals, families, and communities.

The Application will describe any environmental effect defined in Section 5(1) or 5(2) of CEAA 2012 that is of relevance to the Community Health and Wellbeing VC. If it is determined that the Project will not result in an environmental effect defined in Section 5(1) or 5(2) of CEAA 2012, a rationale to substantiate this conclusion will be provided in the Application. The Application will describe the efforts made, and the results of those efforts, to collect information about the Community Health and Wellbeing VC indicators and about particular potential social effects on Aboriginal peoples resulting from a Project-related environmental effect.

The BC EAO requires a discussion of the social effects of the Project for the determination of effect significance. Municipal, provincial, and federal governments and affected public have an interest in social effects of major projects, including effects on community health and wellbeing.

6.2.2 Assessment Boundaries

6.2.2.1 *Spatial Boundaries*

The proposed LSA (Appendix A, Figure A-10) comprises an area within which all (or most) potential Project effects are expected to occur. It encompasses the zone of influence of the Project, including areas that may be affected by the Project's socio-economic effects, such as employment, demography, housing, and community services. The Project Site is located in the municipality of the City of Prince Rupert within the Skeena-Queen Charlotte Regional District.

The proposed LSA includes the following:

- City of Prince Rupert;
- District of Port Edward;
- Lax Kw'alaams Band community;
- Metlakatla First Nation community;

- Gitxaala Nation community (Lach Klan);
- Kitselas First Nation community;
- Kitsumkalum Indian Band community;
- City of Terrace; and
- Skeena-Queen Charlotte Regional District Electoral Area (RDEA) A.

The proposed RSA (Appendix A, Figure A-10) is used to provide additional sources for workers, goods, and services; it is often used as the spatial boundary for the assessment of potential cumulative effects. The RSA boundary is consistent with the administrative boundaries of the Skeena-Queen Charlotte Regional District, excluding Haida Gwaii, but including the City of Terrace and the adjacent Kitsumkalum Indian Band and Kitselas First Nation communities. Temporal Boundaries

The temporal boundaries for the assessment of effects on the Community Health and Wellbeing VC will include the construction, operations, and decommissioning phases of the Project.

6.2.2.2 *Administrative Boundaries*

The LSA communities are in the Northeast Health Services Delivery Area and Prince Rupert Local Health Area of the Northern Health Authority; there are no inconsistencies between the dataset available at the level of the Health Authority and the defined spatial boundaries; therefore, there are no administrative boundaries for this VC.

6.2.2.3 *Technical Boundaries*

In this assessment, technical boundaries could relate to available statistics, such as BC Stats wellbeing rankings.

6.2.3 Existing Conditions

This section of the Application will describe the existing conditions of the Community Health and Wellbeing VC, including the four subcomponents: social determinants of health, health conditions, health and social infrastructure and services, and wellbeing. The Application will include the rationale and a description of the methods used for existing conditions characterization. The Application will include a summary of the regulatory, government, and Aboriginal context for the management of the VC, references to any technical reports related to the VC, and a summary of expected VC interactions with Project components or activities.

The existing Community Health and Wellbeing conditions and trends will be described. The existing conditions will provide a benchmark against which to measure and assess changes to the Community Health and Wellbeing VC as a result of the Project. Primary data and information will be collected through interviews with key informants in the LSA and RSA. Key informants include representatives of local government, health institutions, women's and homeless shelters, Royal Canadian Mounted Police, and social services providers, and will be from both Aboriginal and non-Aboriginal communities. In addition, community-specific socio-economic existing conditions data will be collected from the City of Prince Rupert and other stakeholders, as well as Aboriginal Groups at the discretion of each Aboriginal Group.

Secondary data sources will include the following:

- Review of existing, available databases from Statistics Canada and BC Stats including BC Stats socio-economic profiles and BC Stats Surveys, particularly economic hardship data, crime rates, and children and youth at risk data;
- Review of previous socio-economic assessments for similar projects and for other types of projects in the same region;
- The available results of previous socio-economic monitoring programs, if any;
- LSA and RSA community websites and publications available through those websites; and
- BC Health publications.

6.2.4 Effects Assessment and Proposed Mitigation Measures

This section of the Application will describe how the Community Health and Wellbeing VC and its subcomponents will be potentially affected by the Project. Potential Project effects will be assessed at the community and administrative district level subject to constraints imposed by statistical reporting areas, confidentiality, and privacy concerns.

The Project will generate additional direct and indirect employment, through construction and operations recruitment and procurement opportunities, and will potentially increase labour income. Decisions made on how to spend the disposable income may have effects on Community Health and Wellbeing. In-migration of temporary and/or permanent populations may lead to additional demands on services and public concerns, and finally the Project may affect country foods[2] availability and quality.

Project-related effects will be considered in relation to community health and wellbeing issues and potential change in demand for health and social services (e.g., counselling, social services, women's and homeless shelters), along with the associated availability and cost of these services and amenities.

A summary of the potential effects, indicators, and measurable parameters that will be considered through the assessment of the effects on Community Health and Wellbeing VC is provided in Table 32.

[2] The definition of country foods includes those foods trapped, fished, hunted, harvested, or grown for subsistence or medicinal purposes, or obtained from recreational activities such as sport fishing and/or game hunting (Health Canada 2010e).

Table 32: Potential Effects and Proposed Indicators and Measurable Parameters for Community Health and Wellbeing

Subcomponent	Potential Project Effects	Indicators for Assessment of Project Effects	Measurable Parameters for Assessment of Project Effects
Social determinants of health	• Project may directly and indirectly affect community health and wellbeing. • Potential for in-migration of temporary and/or permanent populations leading to increased demand for services and/or public concerns. • Project may affect country foods availability and quality. • Project will create additional disposable income, which may adversely or beneficially affect family and community health and wellbeing depending on how it is spent/used.	• Social determinants of health	• Demographically related determinants: population, labour force, income, education, health status. • Behaviour determinants: substance abuse (alcohol and drug), gambling, spousal abuse, family breakdown, crime rates community cohesion, and lifestyle. • Diet and nutrition: country foods.
Health conditions		• Health conditions status	• Physical health: infectious and common diseases, accidents, and injuries (i.e., Potential Years of Life Lost). • Mental health: depression, anxiety, and suicide.
Health and social infrastructure and services		• Health and social infrastructure and services capacity and availability	• Hospitals, health centres, and social services centres: availability (of services and staff), capacity, utilization, and ratios (doctor/patients).
Wellbeing		• Wellbeing status	• Economic hardship. • Children and youth at risk. • Crime rates.

The resulting effects will be described further in the Application. Mitigation measures designed to address identified potential effects will be proposed according to the methods outlined in Section 3 of this document. The assessment will describe the Project's effects on community health and wellbeing, including aspects such as use of country food, social conditions, and access to social and health services. The discussion will consider relevant construction and operations procedures, practices, and plans that could potentially affect or provide mitigations for Community Health and Wellbeing VC. Standard mitigation, BMPs, socio-economic management plans, and other general practices assumed or proposed to be implemented by the Project will also be described.

6.2.5 Residual Effects and Their Significance

The residual effects of the Project on the Community Health and Wellbeing VC will be characterized, and an assessment of their significance and likelihood and a prediction of confidence will be provided. The significance of residual effects will be determined as outlined in Section 3.4.

6.2.6 Cumulative Effects

A cumulative effects assessment will be conducted for the Project in combination with other existing and reasonably foreseeable projects and activities in the RSA. The cumulative effects assessment will describe the rationale used to identify these projects and descriptions of potential adverse effects on Community Health and Wellbeing VC that may overlap temporally or spatially with Project-related residual effects. The cumulative effects assessment will follow the methods outlined in Section 3.

6.2.7 Conclusions

The Application will include a summary of the Community Health and Wellbeing VC assessment, identified residual and cumulative effects, and their significance.

6.3 Infrastructure and Services

6.3.1 Scoping and Rationale

Infrastructure and Services is proposed as a VC to assess the potential effects of the Project. Project activities and workforce may create additional pressure on infrastructure and services that may or may not be within their designed capacity. The additional demand and/or pressure created by the Project on infrastructure and services may affect the availability, accessibility, and the affordability of these services (e.g., housing). The potential effects on health and social services and infrastructure are assessed under the Community Health and Wellbeing VC.

The Application will describe any environmental effect defined in Section 5(1) or 5(2) of CEAA 2012 that is of relevance to the Infrastructure and Services VC. If it is determined that the Project will not result in an environmental effect defined in Section 5(1) or 5(2) of CEAA 2012, a rationale to substantiate this conclusion will be provided in the Application. The Application will describe the efforts made, and the results of those efforts, to collect information about the Infrastructure and Services VC indicators and about particular potential social effects on Aboriginal peoples resulting from a Project-related environmental effect.

Municipal, provincial, and federal governments and affected public have an interest in social effects of major projects including effects on infrastructure and services.

6.3.2 Assessment Boundaries

6.3.2.1 *Spatial Boundaries*

The proposed LSA (Appendix A, Figure A-10) comprises an area within which potential project effects are expected to occur. It encompasses the zone of influence of the Project, including areas that may be affected by the Project socio-economic effects, such as employment, demography, housing, and community services. The Project Site is located in the municipality of the City of Prince Rupert, within the Skeena-Queen Charlotte Regional District.

The proposed LSA includes the following:

- City of Prince Rupert;
- District of Port Edward;
- Lax Kw'alaams Band community;
- Metlakatla First Nation community;
- Gitxaala Nation community (Lach Klan);
- Kitselas First Nation community;
- Kitsumkalum Indian Band community;
- City of Terrace; and
- Skeena-Queen Charlotte Regional District Electoral Area (RDEA) A.

The proposed RSA (Appendix A, Figure A-10) provides a spatial representation of the potential additional sources for workers, goods, and services; it is often used as the spatial boundary for the assessment of potential cumulative effects. The RSA boundary is consistent with the administrative boundaries of the Skeena-Queen Charlotte Regional District, excluding Haida Gwaii, but including the City of Terrace and the adjacent Kitsumkalum Indian Band and Kitselas First Nation communities. Temporal Boundaries

The temporal boundaries for the assessment of effects on the Infrastructure and Services VC will include the construction, operations, and decommissioning phases of the Project.

6.3.2.2 *Administrative Boundaries*

Administrative boundaries refer to the limitations imposed on an EA by political, economic, or social constraints. These may include existing datasets that are collected on the basis of regional or provincial boundaries and may not be the same as the spatial boundaries of the selected VCs, and which may therefore constrain the assessment of potential effects in some way.

In this assessment, although the RSA boundary is consistent with the administrative boundaries of the Skeena-Queen Charlotte Regional District, Terrace Airport and the City of Terrace are included to consider potential adverse effects on regional transportation and housing.

6.3.2.3 *Technical Boundaries*

Technical boundaries refer to the constraints imposed on an EA by limitations in the ability to predict the effects of a project. No technical boundaries were identified for the Infrastructure and Services VC.

6.3.3 Existing Conditions

This section of the Application will describe the existing conditions of the Infrastructure and Services VC, including the six subcomponents: education services, housing, municipal services, protective services and public safety, recreation services, and transportation (marine, air, rail, and road corridors). The Application will include the rationale and a description of the methods used for existing conditions characterization. The Application will include a summary of the regulatory, government, and Aboriginal context for the management of the VC, references to any technical reports related to the VC, and a summary of expected VC interactions with Project components or activities.

The existing infrastructure and community service conditions and trends will be described. The existing conditions will provide a benchmark against which to measure and assess potential changes to the Infrastructure and Services VC as a result of the Project. Primary data and information will be collected through interviews with key informants in the LSA and RSA. Key informants include representatives of local government, real estate agents, health institutions, recreation institutions, protective services institutions, and schools and post-secondary training institutions, and will be from both Aboriginal and non-Aboriginal communities. In addition, community-specific socio-economic existing conditions data will be collected from the City of Prince Rupert and other stakeholders, as well as Aboriginal Groups at the discretion of each Aboriginal Group.

Secondary data sources will include the following:

- Review of existing, available databases from Statistics Canada and BC Stats, including BC Stats Socio-economic profiles and BC Stats Surveys;
- Review existing literature, including labour market surveys, industry association publications, and post-secondary training institution reports on industry demands for training;

- Review of previous socio-economic assessments for similar projects and for other types of projects in the same region;
- The available results of previous socio-economic monitoring programs, if any;
- LSA and RSA community websites and publications available through those websites;
- Multiple listing service (MLS) listings; and
- BC Health publications.

6.3.4 Effects Assessment and Proposed Mitigation Measures

This section of the Application will describe how the Infrastructure and Services VC and its subcomponents may be affected by the Project. The effects assessment will identify and evaluate potential adverse effects on Infrastructure and Services VC and its subcomponents during the construction, operations, and decommissioning phases. Potential Project effects will be assessed at the community and administrative district level subject to constraints imposed by statistical reporting areas, confidentiality, and privacy concerns.

Project-related effects will be considered in relation to socio-community issues, potential change in demand for services (e.g., education, protective/emergency services) and physical infrastructure (e.g., housing and temporary accommodation, utilities, and roads), along with the associated availability and cost of these services and amenities. Demand may originate from Project requirements (e.g., for on-site emergency and waste services), or from Project workforce requirements and associated in-migration for employment opportunities. The demand for services will be informed by an assessment of the Project's potential effects on population. The assessment of the potential effects of the Project on the Infrastructure and Services subcomponents will take into account the service areas of local and regional service providers.

The section will discuss the Project’s potential effects on community services, housing, education, communications, and recreation services, as well as the Project’s potential pressure on infrastructure (i.e., roads and transportation networks).

The Project’s demand for infrastructure and services will be compared to the design capacity and current utilization rates of those services. The effects assessment will consider expansion plans.

A summary of the potential effects, indicators, and measurable parameters that will be considered through the assessment of the effects on Infrastructure and Services VC is provided in Table 33.

Table 33: Potential Effects and Proposed Indicators and Measurable Parameters for Infrastructure and Services

Subcomponent	Potential Project Effects	Indicators for Assessment of Project Effects	Measurable Parameters for Assessment of Project Effects
Education services	Construction and operations: • Population and traffic increase associated with construction and operations demand for workers and services could create additional demand on local and regional infrastructure and services and may create pressure on those services that exceeds the design capacity and/or, reduce accessibility Decommissioning: • Decommissioning of the Project may create short-term increases in demands on infrastructure and services; however, Project closure will reduce demands through reduced activity, employment, and potentially population on infrastructure and services	• Education services availability, capacity, and utilization	• Education attainment • Schools availability, capacity/ utilization ratios (teacher–student) and expansion plans • College and university: availability, capacity/utilization, ratios, and expansion plans • Trades and technical skills training availability, capacity, utilization
Housing		• Housing availability, conditions, costs	• Housing costs • Occupancy/vacancy rates • MLS listings and average sale prices • Accommodation rental prices • Dwelling type, condition, age • Availability of appropriately zoned land for housing development
Municipal services		• Municipal services availability, conditions	• Availability/utilization, capacity and expansion plans of the following municipal services: potable water, waste management, water and wastewater treatment
Protective services and public safety		• Protective services and public safety availability, capacity, and accessibility	• Availability/utilization and capacity and expansion plans for the following protective services: policing, fire and emergency services • Crime statistics
Recreation services		• Recreation services availability, capacity	• Recreation centres: availability, capacity, utilization, and expansion plans
Transportation (Marine, air, rail, and road corridors)		• Transportation: (marine, air, rail, and road corridors) availability and conditions	• Infrastructure services in the study area • Daily traffic volume: marine, ferries, road, rail, and air (vehicles/day) • Conditions and capacity of local and regional transportation infrastructure and service • Motor vehicle accident data

The resulting effects will be described further in the Application. Mitigation measures designed to address identified potential effects will be proposed according to the methods outlined in Section 3 of this document. The assessment will describe the Project's demands for infrastructure and community services and will assess the additional pressure on those services created by both the Project's activities and the arrival of workers. The discussion will include relevant construction and operations procedures, practices and plans. Standard mitigation, BMPs, socio-economic management plans, on-site emergency response capability, and other general practices proposed to be implemented by the Project will also be described.

6.3.5 Residual Effects and Their Significance

The residual effects of the Project on the Infrastructure and Services VC will be characterized, and an assessment of their significance and likelihood and a prediction of confidence will be provided. The significance of residual effects will be determined as outlined in Section 3.4.

6.3.6 Cumulative Effects

A cumulative effects assessment will be conducted for the Project in combination with other existing and reasonably foreseeable projects and activities in the RSA. The cumulative effects assessment will describe the rationale used to identify these projects and descriptions of potential adverse effects on Infrastructure and Services VC that may overlap temporally or spatially with Project-related residual effects. The cumulative effects assessment will follow the methods outlined in Section 3.

6.3.7 Conclusions

The Application will include a summary of the Infrastructure and Services VC assessment, identified residual and cumulative effects, and their significance.

6.4 Land and Resource Use

6.4.1 Scoping and Rationale

Land and Resource Use is proposed as a VC for assessment because of potential Project effects on existing and future land and resource use, in addition to satisfying BC EAO and CEAA regulatory requirements. The Project has the potential to affect land and resource uses as a result of:

- The Project footprint and activities displacing and disrupting existing land and resource uses and access to existing land and resources; and
- Effects from other Project activities (e.g., noise and dust disturbances that could disrupt and disturb various land and resource uses).

The Application will include a description of legislation, guidelines, BMPs, and guidance documents that are relevant to the management of the Land and Resource Use VC.

The Application will describe any environmental effect defined in Section 5(1) or 5(2) of CEAA 2012 that is of relevance to the Land and Resource VC. If it is determined that the Project will not result in an environmental effect defined in Section 5(1) or 5(2) of CEAA 2012, a rationale to substantiate this conclusion will be provided in the Application.

For clarity, Current Use of Lands and Resources for Traditional Purposes will be assessed as a separate VC (Section 6.7).

6.4.2 Assessment Boundaries

6.4.2.1 *Spatial Boundaries*

The proposed LSA (Appendix A, Figure A-11) is composed of a 5 km zone of terrestrial areas measured from the centre of the Project Area. The non-terrestrial areas, i.e., marine coastal waters, will be part of the Marine Use and Transportation VC study area (Section 6.5). The LSA will also include a 2 km corridor centred on Highway 16 from Prince Rupert to Terrace.

The proposed RSA (Appendix A, Figure A-11) includes the terrestrial areas within a 10 km zone from the centre of the Project Area and includes the 2 km corridor centred on Highway 16 from Prince Rupert to Terrace.

6.4.2.2 *Temporal Boundaries*

The temporal boundaries for the assessment of effects on the Land and Resource Use VC will include the construction, operations, and decommissioning phases of the Project.

6.4.2.2.1 Administrative Boundaries

The Application will describe the methods used in identifying administrative boundaries for the assessment of effects on the Land and Resource Use VC.

6.4.2.2.2 Technical Boundaries

The Application will describe the methods used in identifying technical boundaries for the assessment of effects on the Land and Resource Use VC.

6.4.3 Existing Conditions

This section of the Application will describe the existing conditions of the Land and Resource Use VC, including for each of the subcomponents and will include the rationale and a description of the methods used for existing conditions characterization. Data collected will include both primary and secondary data that describe the existing conditions. The results of the data collection and analysis will form the basis against which to measure and assess potential Project-related changes to the VC. The Application will include a summary of the regulatory or government context for the management of the VC, references to any technical reports related to the VC, and a summary of expected VC interactions with Project components or activities.

Primary data/information collected will include a series of focused interviews with key regulatory personnel, guide-outfitters, trappers, recreational user groups, and forestry, energy, and mineral tenure holders to determine areas of particular interest, levels of use, and months of peak activity.

Secondary data sources will include (but not limited to), the following:

- Provincial, regional, and local government land use designations and land use plans;
- Applicable Aboriginal Group land and marine use plans, policies, and agreements, where provided to the Proponent or otherwise available publicly;
- Trapping and guide-outfitting statistics from the BC FLNRO;
- Wildlife harvesting regulations;
- Commercial tenures (i.e., trapping, guide-outfitting, and forestry) and potential access routes from DataBC;

- Parks and protected areas from the BC Data Warehouse;
- Park attendance statistics from Parks BC;
- Recreational hunting and fishing statistics from the BC FLNRO and DFO;
- Terrestrial and marine harvesting regulations;
- Non-commercial recreational tenures and potential access roads from the BC Data Warehouse;
- Recreational information from DataBC Marine Conservation Analysis (e.g., routes, anchorages, boat launches); and
- Community and user group websites.

6.4.4 Effects Assessment and Proposed Mitigation Measures

The Application will address potential Project interactions with the Land and Resource Use VC and its various subcomponents. The Application will describe the specific approach and methods used to determine potential Project-related effects on land and resource use, including criteria for characterizing potential Project-related effects. Interactions with a potential to result in effects, will be carried forward in this analysis.

The Land and Resource Use assessment will identify, evaluate, and summarize potential Project-related adverse effects from the Project's construction, operations, and decommissioning phases for each subcomponent. A summary of the potential effects, indicators, and measurable parameters that will be considered through the assessment of effects on Land and Resource Use VC is provided in Table 34.

Table 34: Potential Effects and Proposed Indicators and Measurable Parameters for Land and Resource Use

Subcomponent	Potential Project Effects	Indicators for Assessment of Project Effects	Measurable Parameters for Assessment of Project Effects
Land use management planning	Construction and operations • The Project footprint, land and marine transportation activities, increased population. Decommissioning • Reduced Project footprint, transportation activities, and, potentially, population.	• Application of provincial and local government land use designations and existing/relevant land use plans, strategies and policies.	• Ability to achieve land use plan objectives identified in existing/relevant land use plans, strategies, and policies.
Communities and private lands		• Availability of private land use parcels and communities. • Private land uses, locations within study area.	• Change in land use ownership and ability to use private lands and pursue related activities.
Crown land tenures (e.g., forestry and timber, energy and minerals)		• Crown land tenures locations and related activities, management units, harvest, future plans, access.	• Change in ability to pursue Crown tenure-related activities.
Parks and protected areas		• Availability of and access to parks and protected area locations and activities.	• Change in ability to pursue activities within park and protected areas. • Change in values associated with sites.
Guide outfitting (hunting and fishing) and trapping		• Availability of outdoor activity locations, relevant stakeholders, and intensity of use (e.g., trappers, guide-outfitters, management units, harvesting locations/areas, access seasons/timing).	• Change in ability to carry out consumptive recreational activities. • Change in fur species and access.
Recreational hunting and fishing		• Availability of recreational hunting and fishing locations, activities, access; recreation features and amenities.	• Change in ability to carry out consumptive recreational activities.

Subcomponent	Potential Project Effects	Indicators for Assessment of Project Effects	Measurable Parameters for Assessment of Project Effects
Other recreational activities		• Availability of other recreation activities, locations and access: Recreation features and amenities	• Change in ability to carry out non-consumptive recreational activities
Linear infrastructure and access		• Locations, activities, extent and kinds of linear infrastructure • Access to linear infrastructure	• Change in linear infrastructure, access and related activities

The resulting effects will be described further in the Application. Mitigation measures designed to address identified potential effects will be proposed according to the methods outlined in Section 3 of this document. The Project will consider industry BMP relevant to the mitigation of a particular effect and/or on stakeholders, based on input from appropriate and relevant association, agency, or expert opinion and review of similar projects, where applicable.

6.4.5 Residual Effects and Their Significance

The residual effects of the Project on the Land and Resource Use VC will be characterized, and an assessment of their significance and likelihood and a prediction of confidence will be provided. The significance of residual effects will be determined as outlined in Section 3.4.

6.4.6 Cumulative Effects

A cumulative effects assessment will be conducted for the Project in combination with other existing and reasonably foreseeable projects and activities in the RSA. The cumulative effects assessment will describe the rationale used to identify these projects and descriptions of potential adverse effects on Land and Resource Use VC that may overlap temporally or spatially with Project-related residual effects. The cumulative effects assessment will follow the methods outlined in Section 3.

6.4.7 Conclusions

The Application will include a summary of the Land and Resource Use VC assessment, identified residual and cumulative effects, and their significance.

6.5 Marine Use and Transportation

6.5.1 Scoping and Rationale

Marine Use and Transportation is proposed as a VC because there is the potential for interactions between Project-related marine traffic and related activities to existing fisheries, recreational and tourism-related activities, marine infrastructure, commercial and business operations, and ferry and marine shipping traffic in the Project Area.

LNG carriers from the Project will transit in accordance with the *Canada Shipping Act* (Government of 2001b) and regulations established by Transport Canada and the PRPA. The right of any floating vessel being able to navigate for the purpose of transportation, recreation, or commerce is protected under the *Navigation Protection Act* (Government of Canada 1985b). Increases in marine traffic from the Project could affect various marine users near the Project footprint and along Project shipping routes. The Marine Use and Transportation VC assessment will be supported by the assessment for Land and Resource Use VC where there are overlaps.

The Application will describe any environmental effect defined in Section 5(1) or 5(2) of CEAA 2012 that is of relevance to the Marine Use and Transportation VC. If it is determined that the Project will not result in an environmental effect defined in Section 5(1) or 5(2) of CEAA 2012, a rationale to substantiate this conclusion will be provided in the Application.

For clarity, Current Use of Lands and Resources for Traditional Purposes will be assessed as a separate VC (Section 6.7).

6.5.2 Assessment Boundaries

6.5.2.1 *Spatial Boundaries*

The proposed LSA and RSA (Appendix A, Figure A-12) for the Marine Use and Transportation VC were selected based on expected direct and indirect effects on marine users and marine transportation as a result of LNG shipping activities between Triple Island Pilotage Station and Tuck Inlet.

The LSA for the Marine Use and Transportation VC includes the marine and coastal areas associated with and adjacent to the Project Site, including Tuck Inlet, the entire PRPA boundary east to Smith Island and west including marine waters of Chatham Sound to the northern shore of Porcher Island to Stephens Island, and a 5 km buffer along both sides of the proposed marine shipping route. The LSA has been expanded to 10 km west of Triple Island to account for the area where the exchange of marine pilots may occur.

The RSA is the same as marine mammal RSA. The RSA has been defined as an approximate 1,979 km^2 marine area that encompasses Prince Rupert Harbour and Chatham Sound. The RSA has been expanded to 10 km west of Triple Island to account for the area where the exchange of marine pilots may occur.

6.5.2.2 *Temporal Boundaries*

The temporal boundaries for the assessment of effects on the Marine Use and Transportation VC will include the construction, operations, and decommissioning phases of the Project.

6.5.2.2.1 Administrative Boundaries

The Application will describe the methods used in identifying administrative boundaries for the assessment of effects on the Marine Use and Transportation VC.

6.5.2.2.2 Technical Boundaries

The Application will describe the methods used in identifying technical boundaries for the assessment of effects on the Marine Use and Transportation VC.

6.5.3 Existing Conditions

This section of the Application will describe the existing conditions of the Marine Use and Transportation VC. The Application will include the rationale and a description of the methods used for existing conditions characterization.

Primary data collection will consist of a series of focused interviews with key regulatory personnel and representatives from commercial fisheries, aquaculture businesses, coastal logging businesses, guide/tour operators, the PRPA, marina operators, float plane operators, and ferry service providers to determine issues and areas of particular interest, levels of use, and months of peak activity.

Existing conditions in the LSA and RSA will be collected through a review of available information pertaining to marine-related commercial businesses, recreation and tourism, parks and protected areas, marine infrastructure and marine transportation. Coastal management plans, including those of study area Aboriginal Groups, will be considered. This information will be collected from secondary data sources, including existing databases, literature, and other EA reports, and supplemented with primary data.

6.5.4 Effects Assessment and Proposed Mitigation Measures

Project-related marine traffic may affect identified marine uses and users in the LSA. Potential adverse effects may occur during the construction, operations, and decommissioning phases. The Application will describe the specific approach and methods used to determine direct and indirect Project-related effects on various marine uses and users and transportation, including criteria for characterizing potential Project-related effects. Interactions with a potential to result in effects will be carried forward in this analysis.

The Application will identify, evaluate, and summarize potential Project-related adverse effects from the Project's construction, operations, and decommissioning phases for each subcomponent. A summary of the potential effects, indicators, and measurable parameters that will be considered through the assessment of the effects on Marine Use and Transportation VC is provided in Table 35.

Table 35: Potential Effects and Proposed Indicators and Measurable Parameters for Marine Use and Transportation

Subcomponent	Potential Project Effects	Indicators for Assessment of Project Effects	Measurable Parameters for Assessment of Project Effects
Coastal management planning	Construction and operations: • The Project footprint, marine transportation activities, increased population Decommissioning: • Reduced Project footprint, transportation activities, and, potentially, population	• Application of national, provincial and local coastal management and coastal use plans, strategies, and policies.	• Ability to achieve coastal planning objectives identified in plans, strategies and policies, by the Project
Marine parks, protected areas and recreational Areas		• Availability of and access to parks, protected areas, and recreational site locations and activities	• Change in ability to carry out recreational activities • Change in access to parks, protected and recreational sites • Change in values associated with sites, due to Project activities
Marine commercial businesses		• Availability of commercial fishing, aquaculture, and coastal log boom locations, infrastructure, and related access; fish and aquaculture harvesting statistics	• Change to commercial fishing, aquaculture and log boom sites, access, and harvesting, due to Project activities and related vessel movement • Fish and aquaculture harvesting statistics
Marine recreation and tourism		• Availability of and access to tourism and recreation activities, locations, amenities, and capacity	• Change in ability to access and conduct commercial and personal recreational and tourism related pursuits at current location(s): o Change to recreational experience (due to changes in noise, air quality and visual resources) due to Project activities o Visitor utilization

Subcomponent	Potential Project Effects	Indicators for Assessment of Project Effects	Measurable Parameters for Assessment of Project Effects
Marine infrastructure		• Locations, activities, extent, and types of marine infrastructure; access to marine infrastructure	• Change in marine infrastructure and related activities and demand, due to Project activities
Marine transportation and access		• Availability of marine transportation, access, routes and schedules	• Change to current marine access and transportation routes and schedules, due to Project activities

The resulting effects will be described further in the Application. Mitigation measures designed to address identified potential effects will be proposed according to the methods outlined in Section 3 of this document. The Project will consider industry BMPs relevant to the mitigation of a particular effect and/or on stakeholders, based on input from appropriate and relevant association, agency, or expert opinion and review of similar projects, where applicable.

6.5.5 Residual Effects and Their Significance

The residual effects of the Project on the Marine Use and Transportation VC will be characterized, and an assessment of their significance and likelihood and a prediction of confidence will be provided. The significance of residual effects will be determined as outlined in Section 3.4.

6.5.6 Cumulative Effects

A cumulative effects assessment will be conducted for the Project in combination with other existing and reasonably foreseeable projects and activities in the RSA. The cumulative effects assessment will describe the rationale used to identify these projects and descriptions of potential adverse effects on Marine Use and Transportation VC that may overlap temporally or spatially with Project-related residual effects. The cumulative effects assessment will follow the methods outlined in Section 3.

6.5.7 Conclusions

The Application will include a summary of the Marine Use and Transportation VC assessment, identified residual and cumulative effects, and their likely significance.

6.6 Visual Quality

6.6.1 Scoping and Rationale

Visual Quality is proposed as a VC to assess the potential effects on visual quality in the Project Area and surrounding landscape related to the construction, operations, and decommissioning phases of the Project and related shipping activity. Project components will introduce additional anthropogenic structures to the environment, and alter existing viewscapes from receptor sites in and around the City of Prince Rupert, local Aboriginal communities, and recreational, tourism, and culturally important locations. The Application will include a description of regulatory and policy guidelines, characterization of viewing conditions and the established visual resources inventory, and an assessment of the potential visual impact of the Project to understand the effects on the Visual Quality VC.

The Application will describe any environmental effect defined in Section 5(1) or 5(2) of CEAA 2012 that is of relevance to the Visual Quality VC. If it is determined that the Project will not result in an environmental effect defined in Section 5(1) or 5(2) of CEAA 2012, a rationale to substantiate this conclusion will be provided in the Application.

For clarity, potential effects on Aboriginal cultural landscapes, and cultural attributes tied to those landscapes, will be assessed as part of the Current Use of Lands and Resources for Traditional Purposes VC (Section 6.7).

6.6.2 Assessment Boundaries

6.6.2.1 *Spatial Boundaries*

The proposed LSA (Appendix A, Figure A-13) boundary includes the area within an 8 km viewing distance of the Project Area. This area will be established to assess the potential effects of the Project from foreground and middle-ground viewing distances where visual details are most easily discernible (BC MOF 1997, 2001).

The proposed RSA (Appendix A, Figure A-13) boundary includes the area beyond a minimum viewing distance of 8 km and a maximum viewing extent of 15 km from the Project Area and potential shipping routes. This area will be established to assess the potential effects of the Project from background viewing distances and provide a regional landscape context.

6.6.2.2 *Temporal Boundaries*

The temporal boundaries for the assessment of effects on Visual Quality VC will include the construction, operations, and decommissioning phases of the Project.

6.6.2.3 *Administrative Boundaries*

Administrative boundaries for the assessment will include the use of landscape units defined by Visual Sensitivity Units or Visually Sensitive Areas identified in the British Columbia Visual Landscape Inventory (BC MOF 1997).

6.6.2.4 *Technical Boundaries*

Technical boundaries for the assessment will include the use of established viewing condition and viewer rating parameters and Visual Quality Objectives identified in the British Columbia Visual Landscape Inventory (BC MOF 1997).

6.6.3 Existing Conditions

This section of the Application will describe the existing conditions of the Visual Quality VC. The Application will provide an overview of background information, environmental setting and landscape characteristics, the identification and rationale for selected key viewpoints, and a summary of desktop and field studies related to the Visual Quality VC. An inventory of viewing condition and viewer rating parameters for affected Visual Sensitivity Units will be provided to summarize the condition of visual resources and sensitivities to visual disturbance. This section will include a summary of standards used, analytical methods, and relevant quality control measures.

The existing conditions studies to be conducted will include:

- Desktop review of existing information including available local, regional, provincial, and federal plans and policy documents related to the management of scenic landscape, as well as inventory mapping and geographic surveys related to visual resources;
- The selection of key viewpoints and analysis of visible area of the landscape and potentially visible Project features; and
- Field visit(s) and photographic survey(s) undertaken from key viewpoints to verify estimates of visibility and establish photos of the existing conditions. The timing of the photographic studies will represent the season of highest potential use and/or sensitivity.

The existing conditions studies and assessment will be used to determine the impact of potential Project-related visual effects in comparison to the existing visual conditions.

6.6.4 Effects Assessment and Proposed Mitigation Measures

This section of the Application will identify and evaluate potential effects of all phases of the Project on the Visual Quality VC. The Application will provide an overview of landscape modelling and assessment approaches as well as indicators used to describe changes in the character and quality of visual resources. Project components and activities will be identified that are expected to interact with visual resources and to be carried forward for analysis. A summary of the potential effects of the Project on the Visual Quality VC will be provided and include:

- Visibility assessment of the Project from selected viewpoints to determine the visual prominence of Project components and activities; and
- Assessment of the visual contrast created by the Project from key viewpoints to determine the level of visual change to visual quality.

The visual impact of Project effects will be assessed. A summary of the potential effects of the Project on the Visual Quality VC, and subcomponents, indicators, and measurable parameters that will be used to quantify these effects is provided in Table 36.

Table 36: Potential Effects and Proposed Indicators and Measurable Parameters for Visual Quality

Potential Project Effects	Indicators for Assessment of Project Effects	Measurable Parameters for Assessment of Project Effects
Construction/Operations/Decommissioning: • There is the potential for interaction with visual resources through construction and operation of the Project land-based and marine infrastructure and shipping vessel activity. Construction: • Short-term visibility of temporary infrastructure and construction activities. Operations: • Project effects include increased visibility of industrial features and activity and changes to the quality of the existing visual resources. Decommissioning: • The potential exists for visible disturbance to remain after decommissioning.	• Level of change in visual quality.	• Visibility of Project components from selected receptor sites. • Predicted visual character based on scale and contrast of Project components from selected receptor sites.

6.6.5 Residual Effects and Their Significance

The residual effects of the Project on the Visual Quality VC will be characterized, and an assessment of their significance and likelihood and a prediction of confidence will be provided. The significance of residual effects will be determined as outlined in Section 3 of the AIR.

6.6.6 Cumulative Effects

Where a residual effect is identified, this section of the Application will identify the existing and reasonably foreseeable future projects and activities that may affect visual quality in the region. A cumulative effects assessment will include the identification and rationale used for including other developments and qualitative descriptions of potential effects on the Visual Quality VC that may overlap temporally and spatially with Project-related residual effects. The significance of potential cumulative effects and the Project's contribution to cumulative effects will be assessed using the methods outlined in Section 3 of the AIR.

6.6.7 Conclusions

This section of the Application will include a summary of the Visual Quality VC effects assessment, identified residual and cumulative effects, and their significance.

6.7 Current Use of Lands and Resources for Traditional Purposes

6.7.1 Scoping and Rationale

The current use of lands and resources for traditional purposes is a factor identified under Section 5(1)(c) of CEAA 2012. Project components and activities have the potential to adversely affect the current use of locations and resources that support traditional diets, economies, social and spiritual life, governance, and cultural transmission (e.g., transfer of traditional language, laws, stories, and beliefs associated with places and sites on the landscape, harvesting of resources, and formation and maintenance of cultural identity). Potential Project-related effects on the current use of lands and resources for traditional purposes may also extend to the exercise of Aboriginal Interests that may be associated with that use. The assessment of effects in Part B on VCs that are linked to the exercise of Aboriginal Interests will be carried forward and assessed in Part C of the Application in relation to information such as traditional use studies TUS obtained through agreed-upon methods from Aboriginal Groups through consultation throughout the EA.

In addition to assessing potential Project-related effects on the current use of lands and resources for traditional purposes, this section of the Application will also include the assessment of other factors identified under Section 5(1)(c) of CEAA 2012 that are closely related to the current use of lands and resources for traditional purposes. For clarity, this assessment will include potential Project-related effects on intangible cultural heritage of Aboriginal peoples, including Aboriginal cultural landscapes and cultural attributes (e.g., language, stories, beliefs) tied to those landscapes, where information to support this assessment is available (see Section 6.6 of the AIR for the scope of the Visual Quality VC assessment and Section 7 for the Archaeology and Heritage Resources VC assessment).

If it is determined that the Project will not result in an environmental effect that causes a change to the current use of lands and resources or closely related Section 5(1)(c) factors, a rationale to substantiate this conclusion will be provided in the Application.

6.7.2 Assessment Boundaries

6.7.2.1 *Spatial Boundaries*

The proposed LSA corresponds to each Aboriginal Group's asserted traditional territory or otherwise defined area of use. Where the use of lands and resources for traditional purposes is linked to or interrelated with another VC, the LSA for that VC will serve as a spatial reference point in the assessment of potential Project effects, but will not serve to limit the assessment of use that may be related to that VC.

Establishing an LSA that corresponds to each Aboriginal Group's asserted traditional territory or otherwise defined area of use is designed to facilitate an understanding of potential Project-related changes to the current use of locations and resources for traditional purposes in the context of current use activity throughout each asserted traditional territory or otherwise defined area of use. This context is important for characterizing residual Project-related effects and significance.

The relative contribution of Project-related residual effects on cumulative effects on current use that may arise in combination with other projects and activities that have been or will be carried out will also be considered in relation to each Aboriginal Group's asserted traditional territory or otherwise defined area of use. For these reasons, the RSA is the same as the LSA.

The basis for the definition of spatial boundaries (as described above) will be reviewed through consultation with Aboriginal Groups, and the Application will include the rationale for any changes made to these spatial boundaries. Maps of traditional territory (or consultative area) boundaries for Aboriginal Groups identified in the Section 11 Order will be presented in the Application.

6.7.2.2 *Temporal Boundaries*

The temporal boundaries for the assessment of potential Project-related effects on the Current Use of Lands and Resources for Traditional Purposes VC will include the construction, operations, and decommissioning phases of the Project. Temporal characteristics that are specific to the VC and of relevance to the assessment will be identified and described in the Application.

6.7.2.3 *Administrative Boundaries*

The current use of lands and resources for traditional purposes by Aboriginal Groups is constrained by federal and provincial laws, regulations, policies, and procedures, as well as by agreements between government and specific Aboriginal Groups, including, for example, land use planning and co-management agreements and Comprehensive Fisheries Agreements. These laws, regulations, policies, procedures, and agreements may define areas of current use that do not necessarily reflect the full spatial extent of areas that Aboriginal Groups have previously used or wish to use for traditional purposes, and may therefore function as administrative boundaries on the assessment. These boundaries will be described in the Application, where applicable.

6.7.2.4 *Technical Boundaries*

Technical boundaries for the assessment of the Current Use of Lands and Resources for Traditional Purposes VC will include the technical limitations identified for the VC assessments that inform the assessment of the current use of lands and resources for traditional purposes (e.g., the biophysical assessments). The relative availability of information regarding the current use of lands and resources for traditional purposes, and methods associated with the collection and reporting of that information (e.g., for the purposes of Project-specific studies), may also function as technical limitations on the assessment of the VC. These boundaries will be described in the Application, where applicable.

6.7.3 Existing Conditions

The Application will describe non-confidential information regarding the existing conditions of use of lands and resources for traditional purposes by Aboriginal Groups identified in the Section 11 Order. The description of existing conditions will focus on consumptive and non-consumptive use of locations and resources in relation to which potential adverse effects of the Project may occur, including how these locations and resources are accessed and experienced.

The description of existing conditions for each Aboriginal Group's use of lands and resources will include but may not be limited to the following information, as provided to the Proponent or otherwise available through publicly available sources:

- Frequency and timing of current use activities (e.g., use of harvesting areas, transportation corridors, special use sites, sacred places);
- Historical factors or trends that have influenced existing conditions of use, including information that helps to provide an indicative understanding of how current use differs from past use;
- Reasonably foreseeable use, particularly where desired use levels exceed current use levels; and
- ATK that supports and informs current use of lands and resources for traditional purposes.

These descriptions of existing conditions include terrestrial land and resource uses, marine use and transportation, and the visual quality or importance of specific sites or areas.

Information to support the characterization of existing conditions for each Aboriginal Group will be identified through the following methods:

- Review of existing information on current use of lands and resources for traditional purposes (e.g., from public sources, including regulatory submissions for other projects in the area);
- Review of Project-specific studies by Aboriginal Groups, as provided to the Proponent, relating to their current use of lands and resources for traditional purposes; and
- Consultation with Aboriginal Groups regarding their current use of lands and resources for traditional purposes, including their review of any summaries of this use prior to submission of the Application.

The specific methods used to acquire information to support the description of existing conditions of use for each Aboriginal Group, and information sources relied upon for each Aboriginal Group, will be documented in the Application.

6.7.4 Effects Assessment and Proposed Mitigation Measures

Project components and activities may adversely affect the current use of lands and resources for traditional purposes by Aboriginal Groups. These effects may be direct or indirect, and may be experienced during Project construction, operations, and decommissioning phases.

The Application will summarize the approach used to identify and assess the potential effects of the Project on the Current Use of Lands and Resources for Traditional Purposes VC. The approach will include but will not be limited to a review of the assessments of other VCs to which some current use activities are directly linked (e.g., Marine Resources, Freshwater Fish and Fish Habitat, Vegetation, Wildlife, Visual Quality, Archaeology and Heritage Resources).

A preliminary list of potential Project-related interactions with the Current Use of Lands and Resources for Traditional Purposes VC, and the proposed indicators and measurable parameters for the assessment of those potential interactions, is presented in Table 37.

Table 37: Potential Effects and Proposed Indicators and Measurable Parameters for the Current Use of Lands and Resources for Traditional Purposes

Potential Project Effects	Indicators for Assessment of Project Effects	Measurable Parameters for Assessment of Project Effects
Construction/Operations/Decommissioning: • Project component (placement and design) effects on current use locations and resources • Project activity effects on current use locations and resources (e.g., land and marine transportation, geology and terrain) • Indirect Project component and activity effects on traditional diets, economies, social and spiritual life, governance, and cultural transmission (e.g., transfer of traditional language, laws, stories, and beliefs associated with places and sites on the landscape, harvesting of resources, and formation and maintenance of cultural identity).	• Access to current use locations	• Changes in access and patterns of travel between current use locations, including physical or perceived barriers on the land or in marine environments
	• Availability of current use resources	• Changes in distribution or movement, relative abundance, or habitat area or composition of current use resources (as informed by other VC assessments linked to those resources) in traditional use areas (as informed by data provided by Aboriginal Groups specific to this VC)
	• Quality of current use resources	• Changes in the real or perceived quality of current use resources (as informed by other VC assessments linked to those resources) in traditional use areas (as informed by data provided by Aboriginal Groups specific to this VC)
	• Quality of current use experience	• Changes in the experience of current use (e.g., due to sensory disturbance), including associated changes to traditional use patterns or amount of time spent on the land or water
	• Quality of other cultural practices	• Changes to other cultural practices tied to current use locations and resources, including intangible heritage resources (e.g., gathering places) and the expression of cultural values or ways of knowing (e.g., ATK, language, laws, stories, spiritual beliefs)
	• Rates of current use activity	• Change in willingness to participate in current use activity (e.g., harvesting) or in harvesting rates

The Application will provide further details on the nature and extent of identified adverse effects on the current use of lands and resources for traditional purposes that may result from the Project, and will provide clear justification for excluding any interactions from further assessment.

Mitigation measures designed to address potential adverse effects on the current use of lands and resources for traditional purposes will be developed and evaluated according to the methods outlined in Section 3 of the AIR.

The Application will demonstrate how feedback from Aboriginal Groups, where expressed during consultation, was incorporated into the assessment of potential Project-related effects and the development and evaluation of proposed mitigation measures.

6.7.5 Residual Effects and Their Significance

Measurable or detectable residual adverse effects of the Project on the current use of lands and resources will be characterized, and an assessment of likelihood, significance, and level of confidence associated with each residual effect prediction will be provided, following the methods outlined in Section 3.

The views of Aboriginal Groups regarding potential residual effects and their significance for the current use of lands and resources for traditional purposes, where expressed during consultation, will be provided in the Application.

6.7.6 Cumulative Effects

Where a measurable or detectable Project-related residual effect is identified, the Application will identify other existing and reasonably foreseeable projects and activities that may also affect the current use of lands and resources for traditional purposes. The cumulative effects assessment will include the rationale used to identify these projects and activities, as well as a description of their potential residual adverse effects on the current use of lands and resources for traditional purposes that may overlap temporally or spatially with potential Project-related residual effects. Potential cumulative effects that are identified will be assessed using the methods outlined in Section 3. For clarity, both quantitative and qualitative changes that may potentially result in a residual effect will be carried forward into the cumulative effects assessment, where the change is likely to result in an effect that cannot be reduced to a negligible rating following the application of mitigation.

The views of Aboriginal Groups regarding potential cumulative effects on the current use of lands and resources for traditional purposes, where expressed during consultation, will be provided in the Application.

6.7.7 Conclusions

The Application will include a summary of the Current Use of Lands and Resources for Traditional Purposes VC effects assessment, identified residual and cumulative effects, and their significance.

6.8 Summary of Assessment of Potential Social Effects

The Application will provide the summary table of potential effects, mitigation measures, and the significance of the Project-related residual effects (per Table 30).

7 ASSESSMENT OF POTENTIAL HERITAGE EFFECTS

7.1 Heritage Background

The Application will provide a general description of the heritage resources in the vicinity of the Project to provide a general understanding of heritage resources and the legislation protecting heritage resources. It will include a high-level summary of the archaeology and history of the area, as well as a discussion of archaeological site potential.

7.2 Archaeology and Heritage Resources

7.2.1 Scoping and Rationale

Archaeological and Heritage Resources is proposed as a VC to assess potential Project effects on archaeology and heritage resources. For the purposes of the assessment, archaeological and heritage resources include structures, sites, or things that have archaeological or historical importance. Specifically, archaeological resources are structures, sites, or things that are eligible for protection under Section 13 of the BC *Heritage Conservation Act* (HCA; Government of BC 1996b), while heritage resources are structures, sites, or things that have historical importance, but are not protected under the HCA (generally post-1846 AD sites). Culturally modified trees may fall under either category, depending on their age. Archaeological and heritage resources may occur on land or under water. A Heritage Inspection Permit was issued by the Archaeology Branch under Section 14 of the HCA. Alteration permits under Section 12 of the HCA will be issued by the BC OGC.

For clarity with respect to CEAA 2012 Section 5(1) and 5(2), the Archaeological and Heritage Resources VC considers physical heritage, including any structure, site, or thing that is of archaeological or historical significance, but excludes non-physical (intangible) Aboriginal cultural heritage, which will be assessed as part of the Current Use of Lands and Resources for Traditional Purposes VC (Section 6.7). Based on a review of bedrock geology mapping, it is unlikely that fossil-bearing deposits will exist in the Project Area. Similarly, no structures are known or likely to exist within the Project Area. Consequently, structures, sites, or things of paleontological or architectural significance are not included in the assessment.

If it is determined that the Project will not result in an environmental effect defined in Section 5(1) or 5(2) of CEAA 2012, a rationale to substantiate this conclusion will be provided in the Application.

The rationale for including the Archaeological and Heritage Resources VC in the assessment is as follows (see also Table 10 in Section 3):

- Archaeological sites are protected under the provincial HCA (Government of BC 1996b) and BC EAA (2002a, Chapter 43) and CEAA 2012 require consideration of potential heritage effects.
- Many archaeological and heritage resources are of Aboriginal origin, and they may hold cultural, scientific, and historical value for Aboriginal peoples.
- Archaeological and heritage resources may also have value for researchers and the public.
- Archaeological sites are known to exist in the Project Area, and additional, currently unrecorded, sites may exist. The Project has the potential to affect archaeological and heritage resources through disturbance to archaeological or heritage objects or sites, or through indirect effects related to Project development.

Legislation, guidelines, BMPs, and guidance documents that are relevant to the management of the Archaeological and Heritage Resources VC will be described, including the provincial HCA and applicable sections of CEAA 2012. The Application will describe efforts made to obtain ATK and how the Archaeological and Heritage Resources assessment incorporates ATK information, if provided by Aboriginal Groups. The Application will include a summary of the regulatory or government context for the management of the VC, references to any technical reports related to the VC and a summary of expected VC interactions with Project components or activities.

Consistent with freedom of information and protection of privacy legislation, detailed archaeological and heritage site locations will not be presented in the Application. This information will be provided to the BC Archaeology Branch through Archaeological Site Inventory Forms and associated spatial data, and in a separate archaeological assessment report, which will be submitted to the Archaeology Branch and potentially affected Aboriginal Groups as a condition of the Heritage Inspection Permit that has been obtained for the Project.

7.2.2 Assessment Boundaries

7.2.2.1 *Spatial Boundaries*

The proposed LSA (Appendix A, Figure A-14) spatial boundaries for the Archaeological and Heritage Resources VC corresponds to the Project Site, as well as immediately adjacent marine areas in Tuck Inlet and Fern Passage. The proposed RSA for the Archaeological and Heritage Resources VC will be the same as the LSA.

7.2.2.2 *Temporal Boundaries*

The temporal boundaries for the assessment of effects on Archaeology and Heritage Resources VC will include the construction, operations, and decommissioning phases of the Project, with a focus on the construction phase during which potential effects on archaeological and heritage resources are most likely to occur.

7.2.2.3 *Administrative Boundaries*

The Application will describe the methods used in identifying administrative boundaries for the assessment of effects on the Archaeology and Heritage Resources VC.

7.2.2.4 *Technical Boundaries*

The Application will describe the methods used in identifying technical boundaries for the assessment of effects on the Archaeology and Heritage Resources VC.

7.2.3 Existing Conditions

This section of the Application will describe the existing conditions of the Archaeological and Heritage Resources VC. The Application will include the rationale and a description of the methods used for characterizing the existing conditions. The Application will present the following information to characterize the existing conditions for the assessment:

- A description of known archaeological and historical sites in the LSA/RSA based on a desktop review of the Provincial Heritage Register, archaeological reports and articles

available from published sources or the provincial Archaeology Report Library, shipwreck records, and other published or unpublished sources;

- Results of an Archaeological Impact Assessment that will be conducted for the Project, in accordance with the *British Columbia Archaeological Impact Assessment Guidelines*, and under a Heritage Inspection Permit, issued under Section 14 of the HCA*;*
- A review of current data on post-glacial sea level curves;
- A review of local histories, archival information, and studies that document historical use of the Project Area;
- A review of known past developments in the LSA/RSA, such as logging; and
- Heritage information that may be provided by Aboriginal Groups during consultation for the Project.

7.2.4 Effects Assessment and Proposed Mitigation Measures

The Application will assess Project effects on the Archaeological and Heritage Resources VC, as described in Section 3. The Application will describe the specific approach and methods used to predict and assess the Project's potential effects on archaeological and heritage resources, and will present a summary of potential adverse effects of the Project on the VC. A summary of potential effects, indicators, and measurable parameters that will be considered through the assessment of the effects on Archaeological and Heritage Resources VC is provided in Table 38.

Mitigation measures designed to address potential measurable effects will be proposed, as outlined in Section 3. Where appropriate, site-specific mitigation measures will be developed in consultation with the Archaeology Branch or Heritage Branch, and informed by discussions with potentially affected Aboriginal Groups.

Table 38: Potential Effects and Proposed Indicators and Measurable Parameters for Archaeological and Heritage Resources

Potential Project Effects	Indicators for Assessment of Project Effects	Measurable Parameters for Assessment of Project Effects
Construction/Operations/ Decommissioning: • The Project has the potential to interact with archaeological and historical sites, particularly through ground disturbance and tree removal during site preparation and construction. The potential exists for disturbance to historical and archaeological sites during all Project phases.	• Changes to archaeological sites (locations or objects that are protected under the HCA) • Changes to historical sites (locations or objects with heritage value that are not automatically protected under the HCA. Generally post-1846 sites) (culturally modified trees may fall into either category)	• Number of archaeological and historical heritage sites affected • Area covered by affected archaeological and historical heritage sites

7.2.5 Residual Effects and Their Significance

The residual effects of the Project on the Archaeological and Heritage Resources VC will be characterized, and an assessment of their significance and likelihood and a prediction of confidence will be provided. The significance of residual effects will be determined as outlined in Section 3.4.

7.2.6 Cumulative Effects

Where a measurable residual effect is identified in the archaeological and heritage resources assessment, the Application will assess cumulative affects according to the methods outlined in Section 3.5.

7.2.7 Conclusions

This section of the Application will include a summary of the Archaeological and Heritage Resources VC effects assessment, identified residual and cumulative effects, and their significance.

7.3 Summary of Assessment of Potential Heritage Effects

The Application will provide a summary table of potential effects, mitigation measures, and the significance of the Project-related residual and cumulative effects (per Table 30).

8 ASSESSMENT OF POTENTIAL HEALTH EFFECTS

8.1 Health Background

The Application will provide a general description of the existing health environment of the area in which the Project will be located. More details will be provided in the existing conditions section for the VC.

8.2 Human and Ecological Health

8.2.1 Scoping and Rationale

Human and Ecological Health (aquatic organisms and terrestrial wildlife) is proposed as a VC to address potential changes to air, water, soil, and food quality as a result of the Project activities. The objective of the human and ecological health risk assessment is to evaluate the potential Human Health and Ecological risks that could result from the Project. The assessment will consider the effect of potential emissions from routine activities on the receiving environment (e.g., soil, food, water and air) and how these emissions may affect human and ecological health. A sediment characterization study, including sediment and contaminant transport modelling, will be included as part of the Application Sediment samples will be analyzed for dioxins and furans.

The Application will describe any environmental effect defined in Section 5(1) or 5(2) of CEAA 2012 that is of relevance to the Human and Ecological Health VC. If it is determined that the Project will not result in an environmental effect defined in Section 5(1) or 5(2) of CEAA 2012, a rationale to substantiate this conclusion will be provided in the Application.

The human health assessment will focus on the people most likely to be exposed to Project and cumulative effects. Human receptors include members of Aboriginal Groups and other local residents who regularly engage in harvesting activities or consume harvested resources potentially impacted by the Project or cumulatively. Human receptors will be identified through consideration of populations with the greatest potential to be affected by Project emissions and cumulatively, by potential effects on other VCs (e.g., Air Quality, Land and Resource Use, Marine Use and Transportation), and through consultation with Aboriginal Groups and key stakeholders.

Selection of ecological (aquatic and terrestrial wildlife) receptors will consider those with the greatest potential to be affected by Project emissions and cumulatively.

8.2.2 Assessment Boundaries

8.2.2.1 *Spatial Boundaries*

The proposed LSA (Appendix A, Figure A-15) corresponds to the Air Quality LSA. The Air Quality LSA includes the area in which potential Project-related air quality effects can be measured and predicted, and includes the worker camp (Section 4.3.2.1).

The proposed RSA (Appendix A, Figure A-15) corresponds to the Air Quality RSA (Section 4.3.2.1).

Information to support the assessment of effects on human health will also be derived from the study areas for Land and Resource Use and Marine Use and Transportation VCs, as well as from available information on Aboriginal traditional use. Specific community locations will be selected within the study area for analysis. Recreational cabin locations, other recreational land use areas, and preferred Aboriginal traditional use locations that may fall within the LSA or RSA will also be considered.

8.2.2.2 *Temporal Boundaries*

The temporal boundaries for the assessment of effects on the Human and Ecological Health VC will include the construction, operations, and decommissioning phases of the Project.

8.2.2.2.1 Administrative Boundaries

The Application will describe the methods used in identifying administrative boundaries for the assessment of effects on the Human and Ecological Health VC.

8.2.2.2.2 Technical Boundaries

The Application will describe the methods used in identifying technical boundaries for the assessment of effects on the Human and Ecological Health VC.

8.2.3 Existing Conditions

Data and information from other PCs and VCs (e.g., Air Quality, Water Quality) will be used as inputs to the Human and Ecological Health assessment.

Additional chemistry data will be collected to characterize the range of existing environmental contaminant levels present within soil, sediment, and foods that are consumed by people or wildlife in the study area (e.g., soil, vegetation, fish, drinking water data for human health). For the sediment characterization of existing conditions for the Human and Ecological Health VCs, soil, vegetation, and berry samples will be collected as part of the existing conditions program for the Human and Ecological Health component. Samples will be analyzed for metals and PAHs. Marine fish and shellfish samples will be also collected and analyzed for metals, PAHs, and dioxins and furans. Existing conditions sampling conducted for other components will also be used as inputs in the human and ecological health assessment to characterize the existing and predicted future conditions (e.g., water quality, air quality, sediment quality).

The Application will include a summary of the regulatory or government context for the management of the VC, references to any technical reports related to the VC, and a summary of expected VC interactions with Project components or activities.

8.2.4 Effects Assessment and Proposed Mitigation Measures

Problem formulation is the first step of a risk assessment. The scope of the health risk assessment is determined based on the results of the problem formulation.

The problem formulation will address both human and ecological receptors, and will include the following major elements:

- **Identification of constituents of potential concern (COPCs)** – The Human and Ecological Health assessment will include comparison of predicted constituent concentrations in air, water, sediment, fish tissue, and country food quality measures to the applicable environmental quality guidelines or standards, and to base case concentrations, to identify contaminants of potential concern.
- **Identification of receptors of concern** – Human and ecological receptors (for both aquatic health and terrestrial wildlife health) will be identified, and consideration will be given to sensitive receptors.

- **Identification of operable pathways** – The possible exposure pathways will be reviewed to provide a sound technical basis for the subsequent scope of risk assessment activities, as well as to document rationale used to exclude specific exposure pathways from further consideration.
- **Conceptual exposure models** – Human and ecological conceptual exposure models will be prepared, incorporating sources, pathways, and receptors.

If the problem formulation identifies a link between receptors, COPCs, and operable exposure pathways, a quantitative human and ecological health risk assessment will be conducted, which includes the following components:

- **Exposure assessment** – This step involves estimating the amount of a constituent that people, aquatic organisms, or terrestrial wildlife may be exposed to through applicable exposure pathways, including bioaccumulation of constituents in tissues or traditional foods and prey, where relevant. It can be expressed as an external concentration (e.g., water-column exposure to fish), as an internal body burden (e.g., accumulation of a substance in fish tissue), or as a daily dose (e.g., intake via multimedia exposure). Exposure will be assessed using a combination of measured and predicted environmental data. Exposure will be characterized for the base case, Project-alone case, application case, and cumulative case to evaluate the Project-related contributions to cumulative effects.
- **Toxicity assessment** – The purpose of the toxicity assessment is to determine the acceptable dose, external concentration, or internal concentration that people, aquatic organisms or terrestrial wildlife can be exposed to without risk of adverse health effects over a given period of exposure. The proposed toxicity values and limits will be reviewed and the most applicable acceptable doses (e.g., toxicity reference values [TRVs]) and concentrations (e.g., science-based environmental benchmarks [SBEBs]) will be selected for the assessment. Justification will be provided for the selection of these values.
- **Risk characterization** – In the risk characterization, the results of the exposure assessment are compared with the findings of the toxicity assessment to determine whether there is potential for constituents from the site to pose potential adverse health effects on people or wildlife. The predicted exposures are compared to TRVs, SBEBs, exposure limits, or concentration limits to determine potential risks and context is provided so that regulators, communities, and other interested parties can better understand the results. Potential sources of uncertainty and conservative assumptions used in the assessment will be described.

Further description for the quantitative risk assessment for each subcomponent is provided below.

8.2.4.1 *Terrestrial Wildlife Health*

The terrestrial wildlife health risk assessment will be composed of the following subcomponent with the specific scope determined as an outcome of the problem formulation:

1) A **multimedia assessment** to evaluate chronic risks to terrestrial wildlife associated with exposure to COPCs that might be present in soil, sediment, water, and the food chain (vegetation and prey).

   The multimedia assessment estimates the dose of a constituent to a particular species and compares it to a TRV representing an acceptable level of exposure. The dose of a constituent depends on the concentration in various media (e.g., air, water, soil, and food), the amount of time that wildlife might be in contact with these media, and the physiological characteristics of the wildlife

(e.g., ingestion rates, inhalation rates, body weights, and dietary preferences). Toxicity reference values are determined considering relevant guidance from EC and the United States Environmental Protection Agency (US EPA), as well as studies published in the literature.

Acute effects resulting from multimedia exposure will not be assessed directly because of the nature of exposure to Project emissions is over the long term as a result of ongoing constituent deposition. Thus, where long-term deposition does not result in chronic risks to wildlife via multimedia exposure, then it can be also concluded that acute risks from multimedia exposure would also be unlikely.

Acute and chronic effects from air inhalation exposure are not typically assessed in terrestrial wildlife health assessments. It is common practice in terrestrial wildlife risk assessments to assume that exposure via the respiratory tract (inhalation exposure) is negligible. In most situations, the dust inhalation pathway is considered negligible relative to the oral ingestion pathway, and the amount of exposure excluded by not including inhalation would be small (Sample et al. 1997; BC MOELP 2000). Long-term influence of dust generation is expected to be captured in the predictions of soil and vegetation quality used in the exposure model for the food chain pathway. The air inhalation assessment for human health provides a surrogate assessment for terrestrial wildlife (i.e., any mitigation for human health would also mitigate effects on wildlife health), since the toxicity reference values for humans are typically based on animal studies.

The terrestrial wildlife risk assessment will be conducted considering the standard provincial and federal framework for risk assessment listed below:

- Federal Contaminated Sites Action Plan *Ecological Risk Assessment Guidance* (FCSAP 2012);
- Canadian Council of Ministers of the Environment *A Framework for Ecological Risk Assessment* (CCME 1996/1997); and
- Science Advisory Board for Contaminated Sites in British Columbia *Detailed Ecological Risk Assessment (DERA) in British Columbia – Technical Guidance* (SABCS-BC 2008).
- Golder. 2010. *Identification and Evaluation of Protocols for the Derivation of Human Health Sediment Quality Guidelines.* Prepared for Health Canada. March 2010.

8.2.4.2 *Aquatic Health*

The potential effects of acidification and eutrophication will be acknowledged in the human health risk assessment, based on the results of the surface water quality assessment. If there is a potential for constituent changes to surface water quality and/or sediment quality resulting in the identification of COPCs, the potential for effects on aquatic receptors will be assessed based on water and sediment quality predictions. Constituents of potential concern will be determined by comparison to SBEBs developed for the Project (for water quality) and to provincial sediment quality guidelines. The SBEBs will be derived to represent benchmark concentrations below which detrimental effects on aquatic health are considered unlikely, in consideration of site-specific conditions. If COPCs are identified, the aquatic health risk assessment will be composed of the following components with the specific scope determined as an outcome of the problem formulation:

1) A **water-column-based assessment** to evaluate chronic risks to aquatic health associated with exposure to COPCs in water;
2) A **sediment-quality-based assessment** to evaluate chronic risks to aquatic health associated with exposure to COPCs in sediment; and
3) A **tissue-based assessment** to evaluate chronic risks to fish associated with accumulation of COPCs in tissues.

Each component estimates the exposure of aquatic organisms to COPCs and compares the exposure concentrations to SBEBs or other benchmarks representing an acceptable level of exposure. Exposure is represented by water column or sediment concentrations of COPCs (as determined by the effects assessment for the Surface Water Quality VC) or via prediction of tissue concentration by combining water column concentrations with site-specific or literature bioaccumulation factors. Science-based environmental benchmarks are determined considering relevant guidance from the Canadian Council of Ministers of the Environment (CCME), as well as studies published in the literature.

The focus of the assessment will be on chronic effects on aquatic health. Acute effects resulting from aquatic exposure will not be assessed directly because of the nature of exposure to Project emissions is over the long term as a result of ongoing emissions. Thus, where long-term exposure does not result in chronic risks aquatic health, then it can be also concluded that acute risks from aquatic exposure would also be unlikely.

The aquatic health risk assessment will be conducted considering the following guidance:

- *Detailed Ecological Risk Assessment (DERA) in British Columbia – Technical Guidance* (SABCS-BC 2008); and
- *A Protocol for the Derivation of Water Quality Guidelines for the Protection of Aquatic Life 2007* (CCME 2007).

8.2.4.3 *Human Health*

The human health risk assessment will be composed of three components with the specific scope of each component determined as an outcome of the problem formulation. The three components are as follows:

1) An **air quality risk assessment**, which evaluates the acute (short-term) and chronic (long-term) effects associated with certain airborne or gaseous substances that are only present in air. The air quality assessment identifies COPCs through a screening approach, which consists of comparison of predicted Application case ground level air quality concentrations to air thresholds protective of human health, and comparison to existing condition concentrations. The thresholds used in the screening process are selected as the lowest health-based thresholds available from several Canadian and international regulatory agencies (e.g., BC MOE, Agency for Toxic Substances and Disease Registry, CCME, Ontario Ministry of the Environment, World Health Organization, Texas Commission on Environmental Quality, and the US EPA), with consideration given to relevant test species (i.e., human data versus animal data), study endpoint, quality, and date of the study. Exposure periods are typically 1 hour, 24 hours, and annual, but some of the shorter exposure durations vary slightly by constituent, so they will be matched by the appropriate air quality standard (e.g., 10 minutes, eight hours). For substances identified as COPCs (other than particulate matter), the air quality assessment consists of calculation of risk estimates (hazard quotient for non-carcinogens or incremental lifetime cancer risk for carcinogens) and an evaluation of magnitude of risk for those COPCs with risk estimates exceeding acceptable risk levels. Cumulative effects of substances acting on the same toxicological endpoints will also be included based on the results of the problem formulation.
2) A **particulate matter assessment**, if particulate matter is identified as a COPC based on the results of the problem formulation. The particulate matter assessment is a qualitative assessment of the potential health effects from increased particulate matter concentrations as a result of the Project. The qualitative assessment consists of a literature review of key epidemiological studies focused on human health effects associated with particulate matter associated with Project-related sources.

3) A **multimedia assessment** to evaluate chronic risks associated with exposure to substances that might be present in air, soil, water, and country foods. The assessment provides an evaluation of health risks as a result of potential constituent changes in multiple media (air, soil, water, country foods) if COPCs are identified based on the problem formulation. The multimedia risk assessment considers both non-carcinogenic and carcinogenic COPCs.

The dose of each COPC is estimated and compared to a TRV representing an acceptable level of exposure. The dose depends on the concentration in various media (e.g., air, water, soil, and food), the amount of time that people might be in contact with these media and the physiological characteristics of the person (e.g., ingestion rates, inhalation rates, body weights, and dietary preferences).

The human health risk assessment will be conducted using the provincial and federal frameworks for risk assessment listed below:

- *Protocol 13 for Contaminated Sites, Screening Level Risk Assessment* (BC MOE 2008b); *Technical Guidance on Contaminated Sites 7, Supplemental Guidance for Risk Assessments* (BC MOE 2012);
- *British Columbia Ambient Air Quality Objectives* (BC MOE 2014a);
- *British Columbia Approved Water Quality Guidelines*. Water Protection and Sustainability Branch. (BC MOE. 2015c).
- *Useful Information for Environmental Assessments* (Health Canada 2010a);
- *Federal Contaminated Site Risk Assessment in Canada, Part I: Guidance on Human Health Preliminary Quantitative Risk Assessment (PQRA) Version 2.0* (Health Canada 2010b);
- *Federal Contaminated Site Risk Assessment in Canada, Part II: Health Canada Toxicological Reference Values (TRVs) and Chemical-Specific Factors, Version 2.0* (Health Canada 2010c); and
- *Federal Contaminated Site Risk Assessment in Canada. Part V. Guidance on Human Health Detailed Quantitative Risk Assessment for Chemicals* (Health Canada 2010d).

8.2.5 Residual Effects and Their Significance

The effects analysis methods for the Human and Ecological Health assessment are different in some notable ways from those used for other components. Specifically, the assessment of potential effects on Human and Ecological Health results in the generation of risk factors that inherently consider the geographic extent, duration, frequency, and other characteristics of the predicted changes to the environment that may result from Project activities. Therefore, the likelihood of significant adverse effects for Human and Ecological Health will be evaluated based on the following:

- The potential magnitude of the risk; and
- The degree of conservatism and uncertainty in the analysis.

The risk estimates by themselves do not fully reflect the potential for harm because the magnitude of any risk estimate calculation is a function of the exposure and effects assessments, each of which depends on the realism or conservatism applied during the modelling procedure. Together, potential magnitude and conservatism are used to determine overall risk, which in turn is used to evaluate environmental

significance. The magnitude of risk and conservatism associated with the risk estimates are assessed on a chemical-specific basis.

The residual effects of the Project on human and ecological health will be characterized and a summary of the residual effects, as well as an assessment of their significance will be provided. The significance of residual effects will be determined per the methods outlined in Section 3 of this document.

8.2.6 Cumulative Effects

Where a residual adverse effect is identified, the Application will identify the existing and reasonably foreseeable future projects and activities that may also affect human and ecological health in conjunction with the Project. The cumulative effects assessment will include the rationale used to identify these projects and activities, and descriptions of potential adverse effects on human and ecological health that overlap temporally and spatially with Project-related residual effects. The cumulative effects will be assessed per the methods outlined in Section 3 of this document.

8.2.7 Conclusions

The Application will include a summary of the Human and Ecological Health VC effects assessment, identified residual effects, and their significance.

8.3 Summary of Assessment of Potential Health Effects

The Application will provide the summary table of potential effects, mitigation measures, and the significance of the Project-related residual effects (per Table 30).

9 ACCIDENTS AND MALFUNCTIONS

This section of the Application will assess the effects of potential accidents or malfunctions related to all phases of the Project, as required in Section 19 (1)(a) and (b) of CEAA 2012. The section of the Application will include an explanation of how those events were identified and an assessment of potential environmental, social, economic, heritage, or human health effects as a result of these events. The consideration of potential accidents and malfunctions will also include specific reference to environmental effects as they are identified in Section 5 of CEAA 2012. For this assessment, an "accident" is defined as an unexpected occurrence or unintended action that can result in an adverse environmental, social, economic, heritage, or human health effect, and a "malfunction" is defined as the failure of a piece of equipment, a device, or a system to function normally that can result in an adverse environmental or human health effect. The Application will take into account how local conditions and natural hazards could adversely affect the Project and how this in turn could result in effects on a specific VC.

The Application will assess the effects of potential accidents or malfunctions on all the VCs considered for inclusion in the Application as listed in Table 10 of the AIR.

The specific accidents or malfunctions to be considered in the Application include:

- Spills of hazardous materials (not including LNG);
- Loss of containment of LNG in the plant process area or storage tanks;
- Emergency LNG facility shut-down (includes emergency flaring and venting);
- Explosion and/or fire;
- Failure of a water management process or structure;
- Machinery or equipment disturbance to sensitive area;
- Marine vessel grounding;
- Non-routine flaring activities, including a description of the different flaring events and their wildlife risk levels, timing, duration, volume, and level of control of the different possible flaring events, and;
- Marine vessel collisions (i.e., with the jetty and non-tug-assisted vessel or a marine mammal); this will include a loss of cargo and ship inventories (e.g., fuel) where applicable.

For each event, the Application will include:

- A description of the potential event;
- The method for assessing the potential risk;
- Definitions of each category of likelihood;
- Definitions of each category of consequence;
- The assessment of the probability (likelihood) of the event occurring based on, for example, historical trends and predictive models;
- The identification of proposed mitigation measures to reduce the likelihood of the event;

- The assessment of potential effects (consequences) that may result from such events;
- The identification of emergency response measures to mitigate the effects;
- The conclusions on the potential risk of the accident or malfunction, including determination of significance as required in Section 19 (1)(a) and (b) of CEAA 2012; and
- A cumulative effects assessment as required in Section 19 (1)(a) of CEAA 2012 and consistent with CEA Agency's Operational Policy Statement titled *Assessing Cumulative Environmental Effects under the Canadian Environmental Assessment Act, 2012* (December 2014; CEA Agency 2015b), including specific reference to environmental effects as identified in Section 5 of CEAA 2012.

10 EFFECTS OF THE ENVIRONMENT ON THE PROJECT

This section of the Application will identify the environmental factors deemed to have consequences on the Project, as required in Section 19(h) of CEAA 2012, including but not necessarily limited to consideration of natural hazards such as the following:

- Extreme weather and weather-related events (e.g., lightning, heavy precipitation, extreme temperatures, drought, wind);
- Flood risk;
- Natural seismic events, such as earthquakes, and associated effects, such as seiches, liquefaction, subsidence, and tsunamis;
- Volcanic events;
- Wildfires, with an assessment of natural fuel types;
- Slope stability and mass wasting events (e.g., debris flows, debris torrents, rock fall, snow avalanche) including the marine environment, where appropriate; and
- Predicted climate change effects during the Project lifecycle on sea level, precipitation, and temperature. Where applicable and possible, the implications of climate-induced changes to the extreme weather events listed above will also be assessed.

Characterization of the existing conditions for climate will include an analysis of the current climate conditions using available long-term meteorological observations near the Project Area. The assessment of potential changes to climate will identify which aspects of the Project infrastructure may be vulnerable to climate change.

To understand how the climate has been changing, and may change in the future, the assessment will document both the current climate and the future climate for the region containing the Project. The current climate will be analyzed using the norms and trends for the current normal period recognized by EC (30-year average period from 1981 through 2010). The future climate will be analyzed using model projections and trends, representing mid-century and end of century time periods. These data will be used to document Project climate-infrastructure interactions in a climate risk matrix, including how climate change vulnerabilities have been addressed in Project design or the development of an adaptive management plan.

For each of the above natural events, the Application will identify the following:

- The method for identifying and assessing the potential risk of a natural hazard;
- Description of the natural hazard or a cross reference to a description in the Application;
- Description of the consequences and likelihood of the natural hazard occurring;
- Assessment of the effects that may result from such an event, including with regard to the environmental effects as identified in Section 5 of CEAA 2012;
- Descriptions of the measures, including planning, design and construction strategies, to avoid or minimise the potential effects of the hazard; and
- Conclusions on the potential risk of the natural hazards to the Project.

Where applicable, the likelihood of the occurrence of the effects of natural events will be identified based on provincial or national codes and standards.

11 SUMMARY OF STATUTORY REQUIREMENTS UNDER THE *CANADIAN ENVIRONMENTAL ASSESSMENT ACT, 2012*

This section of the Application will summarize how Section 5(1) and 5(2) CEAA 2012 requirements were met by the analyses and assessment of Environmental, Economic, Social, Heritage, and Health VCs in previous sections. This summary will draw a clear line of sight from the VC Selection Document, the AIR, and the analyses and assessment (e.g., determination of residual effects, cumulative effects, mitigation measures, and significance), including the specific effect on Aboriginal peoples as described in Section 5(1)(c). The analyses and assessment of Section 5(1)(c) components will be conducted for each Aboriginal Group named in Schedule B and C of the Section 11 Order, in accordance with the methods outlined in Section 3 Environmental Assessment Methods of the AIR. If it is determined that the Project is not likely to result in an environmental effect as defined in Section 5 of CEAA 2012, a rationale to substantiate this conclusion will be provided in the Application. Appendix B includes a summary table describing how all requirements under CEAA 2012 have been met.

To meet the above objectives, this section of the Application will summarize or make cross-reference to, as appropriate:

- The specific VCs and key indicators that were assessed for each of the Section 5(1) and 5(2) factors;
- The applicable spatial, temporal, administrative, and technical study area boundaries for the VC;
- The approach to collecting existing conditions information, including field programs, desktop studies or modelling and reference to any applicable standards or methods for existing conditions information collection;
- The regulatory or government context for the management of the VC, including information related to federal lands potentially affected by the Project and/or SARA species, federal authorizations, and associated CEAA 5(1)(c) requirements;
- Any technical reports related to the VC that will be provided with the Application;
- Expected VC interactions with Project components or activities;
- The assessment of Section 5(1)(c) VCs identified in the AIR;
- A description of the linkages of the Section 5(1)(c) VCs with other VCs, including cumulative effects;
- A description or summary of any mitigation measures designed to avoid, mitigate, or otherwise manage potential effects on Section 5(1)(c) factors;
- A statement articulating the Proponent's determination of the significance of the effects of the environmental change on all Section 5(1)(c) factors; and
- A report on the views of Aboriginal Groups with respect to Section 5(1)(c) effects as provided to the Proponent.

PART C – ABORIGINAL CONSULTATION

12 ABORIGINAL CONSULTATION

12.1 Aboriginal Interests

The Aboriginal Groups discussed in this section will be those with whom the BC EAO has directed the Proponent, through the issuance of the Section 11 Order, to undertake procedural aspects of consultation. These groups have been identified in Schedule B of the Section 11 Order, as follows:

- Lax Kw'alaams Band;
- Metlakatla First Nation;
- Gitxaala Nation;
- Kitselas First Nation; and
- Kitsumkalum Indian Band.

12.1.1 Background Information

For each Aboriginal Group identified in Section 12.1, the Application will:

- Describe or summarize (where provided elsewhere in the Application) relevant and available profile information relating to, for example, the Aboriginal Group's language, land use setting and planning, governance, economy, and reserves; and
- Provide a map that identifies the location of the Aboriginal Group's communities, reserves, and traditional territory or otherwise defined area of use.

12.1.2 Consultation Activities

This section of the Application will cross-reference to Section 2 (Environmental Assessment Process), and will provide:

- An overview of the approved Aboriginal Consultation Plan, prepared pursuant to Part G of the Section 11 Order;
- A summary of the proposed changes to the Aboriginal Consultation Plan as a result of feedback received from Aboriginal Groups or as a result of experience from consultation to date;
- A summary of the Proponent's consultation to date with Aboriginal Groups, including:
    - Relevant consultation activities completed prior to entering the EA process;
    - Consultation activities conducted in accordance with the Section 11 Order and Aboriginal Consultation Plan; and
    - Reference to appendices containing pre-Application Aboriginal Consultation Reports, including the first report submitted with the final draft AIR and the second report submitted with the Application.

- A summary of key issues raised by Aboriginal Groups during the VC selection and the preparation of the AIR and Application, a discussion of how these issues were addressed, and the degree to which the Proponent considers them to be addressed; and
- A summary of the proposed approach for consulting with Schedule B Aboriginal Groups during the review of the Application and for resolving any outstanding issues.

12.1.3 Aboriginal Interests Assessment

For Aboriginal Groups identified in Section 12.1, this section of the Application will present the assessment of potential adverse Project effects on the exercise of their Aboriginal Interests. Spatial, temporal, and other relevant assessment boundaries for the assessment of Aboriginal Interests will be based on the boundaries used for the Current Use of Lands and Resources for Traditional Purposes VC (Section 6.7), subject to consultation with Aboriginal Groups. The Application will include the rationale for any changes made to these boundaries.

For each Aboriginal Group, this section of the Application will:

- Describe (or summarize if described elsewhere in the Application) relevant and non-confidential ATK and traditional use information, as provided to the Proponent or otherwise publicly available, including a description of how ATK and traditional use information was gathered and incorporated into the assessment of potential Project-related effects on the exercise of Aboriginal Interests;
- Identify Aboriginal Interests that are or have been exercised in relation to locations or resources that may be adversely affected by the Project;
- Describe how the exercise of Aboriginal Interests may be adversely affected by the Project through consideration of:
    - The existing conditions of Part B VCs associated with the exercise of Aboriginal Interests, including how the existing conditions of those VCs have been affected by other projects and activities that have been carried out;
    - The potential residual Project and future cumulative effects on Part B VCs associated with the exercise of Aboriginal Interests;
    - The extent to which the Project could affect each Aboriginal Group's access to and use of locations and resources for the exercise of Aboriginal Interests in or near the Project Area;
    - The relative importance of the 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 Group, where the meaningful exercise of Aboriginal Interests could reasonably occur.
- Describe (or summarize if described elsewhere in the Application) proposed mitigation measures to avoid, reduce, or other otherwise address potential adverse Project-related effects on the exercise of Aboriginal Interests, and specifically by considering:

  - Proposed mitigation measures identified for Part B VCs associated with the exercise of Aboriginal Interests;
  - Additional measures that may be necessary to address potential effects on the exercise of Aboriginal Interests linked to Part B VCs; and
  - Specific measures that may be necessary to address Aboriginal Interests where there is no effect pathway through a Part B VC.

- Provide a conclusion from the perspective of the Proponent on the effectiveness of proposed measures to address potential adverse effects on the exercise of Aboriginal Interests;
- Describe, where expressed during the consultation process, the views of Aboriginal Groups regarding measures to avoid, reduce, or otherwise address potential adverse effects on the exercise of Aboriginal Interests;
- Characterize potential residual effects on the exercise of Aboriginal Interests, including the likelihood of such effects occurring and the level of confidence in the prediction; and
- Describe, where expressed during the consultation process, the views of Aboriginal Groups regarding potential residual Project-related effects on the exercise of Aboriginal Interests.

The Application will also provide a summary of any outstanding issues identified by Aboriginal Groups related to Aboriginal Interests, and will identify, where applicable and appropriate, arrangements or agreements reached between the Proponent and Aboriginal Groups.

12.2 Other Matters of Concern

To the extent possible, other matters of concern raised by Aboriginal Groups with respect to potential environmental, economic, social, heritage, and health effects of the Project will be assessed in Part B or in Part C (Section 12), as applicable.

For other matters of concern that have not already been considered in the discussion about Aboriginal Interests (Section 12.1) or in the Part B assessments that address statutory requirements under CEAA 2012, as summarized in Section 11 of the Application will:

- Provide a list of these other matters of concern raised during the consultation process by Aboriginal Groups;
- Describe (or summarize if described elsewhere in the Application) proposed mitigation measures to avoid, reduce, or other otherwise address potential Project-related effects on these other matters of concern;
- Provide a conclusion from the perspective of the Proponent on the effectiveness of the proposed measures to address potential Project-related effects on other matters of concern to Aboriginal Groups;
- Describe, where expressed during the consultation process, the views of Aboriginal Groups regarding measures to avoid, reduce, or otherwise address potential adverse effects related to those other matters of concern; and
- Characterize residual effects related to those other matters of concern, in a manner consistent with the methods outlined in Section 3.

12.3 Summary Table of the Part C Assessment, Including Linkages with the Part B Assessment

This section of the Application will provide:

- A table in the format shown in Table 39 that summarizes the linkages between potential effects of the Project on Aboriginal Components (i.e., Aboriginal Interests or other matters of concern) assessed in Part C and the results of the Part B assessment where applicable, including proposed mitigation measures to avoid, reduce, or otherwise address these potential Project-related effects for each Aboriginal Group; and
- Reference to an appendix containing the Aboriginal Consultation Report, which will include comments received from Aboriginal Groups identified in Section 12.1 regarding this section of the Application, as well as the Proponent's responses to those comments.

Table 39: Summary Table of the Part C Assessment

Aboriginal Component	Part B Assessment Summary					Part C Assessment Summary					
Aboriginal Interest or Other Matter of Concern	**Linked VC**	**VC Indicators**	**Potential Project Effects on VC**	**Proposed Mitigation Measures for VC**	**Residual Project / Cumulative Effects on VC and Significance**	**Adverse Effect (including Cumulative Effect) on Aboriginal Component for each Aboriginal Group**	**Proposed Additional or Specific Mitigation**	**Proponent's Characterization of Residual Effect on Aboriginal Component**	**Cumulative Effect on Aboriginal Component (if applicable per CEAA 2012)**	**Aboriginal Group Views on Proposed Mitigation**	**Status (e.g., resolved, ongoing)**
[Aboriginal Group]											

PART D – PUBLIC CONSULTATION

13 PUBLIC CONSULTATION

The Application will include a report on the results of implementation of the approved Public Consultation Plan including:

13.1 Background Information

- Identification of local governments, residents, property owners, and other rights holders that are potentially affected by the Project;
- Maps of local government boundaries, private land, tenures/authorizations, or residents with respect to the Project; and
- Background information about each potentially affected municipality and/or stakeholder group.

13.2 Public Consultation

- A summary of the past and planned consultation activities;
- A summary of any proposed changes to the approved Public Consultation Plan as a result of feedback from local governments, stakeholders or individuals, or experience from consultation to date; and
- A description of key issues raised by the public that are relevant to the EA, the responses to those issues, and the status of resolution.

13.3 Summary Table

- The summary table will identify concerns raised by the public and the measures to avoid, reduce, or mitigate those effects.

PART E – SUMMARY OF PROPOSED CONSTRUCTION AND OPERATIONAL ENVIRONMENTAL AND SOCIAL IMPACT MANAGEMENT PLANS

14 ENVIRONMENTAL MANAGEMENT PLANS

The Application will include a description of the EMPs and SIMPs for the three phases of the Project (construction, operations, and decommissioning). The EMPs and SIMPs will include the identified mitigation measures described in each of the VC sections of the Application.

The management and monitoring plans expected to be listed in the overarching EMPs include, but are not limited to:

- Acid rock drainage;
- Air emissions;
- Ecology;
- Erosion and sediment control;
- Noise;
- Spill prevention;
- Terrestrial;
- Waste; and
- Water.

The social and economic management and monitoring plans expected to be listed in the overarching SIMPs include, but are not limited to:

- Health care services;
- Worker accommodation;
- Employment and procurement;
- Labour and training;
- Work camp management;
- Transportation; and
- Aboriginal and public consultation.

15 FOLLOW-UP PROGRAMS AND COMPLIANCE REPORTING

The Application will provide a reporting structure as identified within the EMPs, monitoring plans, and commitments. The reporting structure will include the type and frequency of reports to be submitted to the BC EAO and other regulatory agencies having jurisdiction over the Project.

PART F – CONCLUSIONS

16 CONCLUSIONS

The Application will include:

- A summary of the Proponent's understanding of the BC EA process in promoting sustainable development while minimizing effects on environmental, economic, social, heritage, and health values;
- A description of how the Project aligns with the goal of the BC EA process; and
- A statement of request for an EAC for the Project and the need to successfully complete a federal EA and subsequent permitting/authorization processes prior to proceeding with Project construction, operations, and decommissioning.

16.1 Summary of Residual Effects

The Application will include summary information for each environmental, economic, social, heritage, or health effect that cannot be completely avoided or mitigated through the redesign or relocation of the Project or through Proponent commitments in the manner set out in Table 40.

Table 40: Summary of Residual Effects

Valued Component	Project Phase	Potential Effect	Proposed Mitigation	Significance

16.2 Summary of Proposed Mitigation Measures

The Application will include a summary of proposed mitigation measures to prevent or reduce adverse environmental, economic, social, heritage or health effects, and identification, as per Table 41, of the specific mitigation measures.

Table 41: Summary of Proposed Mitigation Measures

Number	VC and Effect	Proposed Mitigation Measure	Timing	Legal Requirement?	Responsible Agency
Environment					
1.1					
Economic					
2.1					
Social					
3.1					
Heritage					
4.1					
Health					
5.1					

17 REFERENCE MATERIALS

Reference material used in developing the AIR includes:

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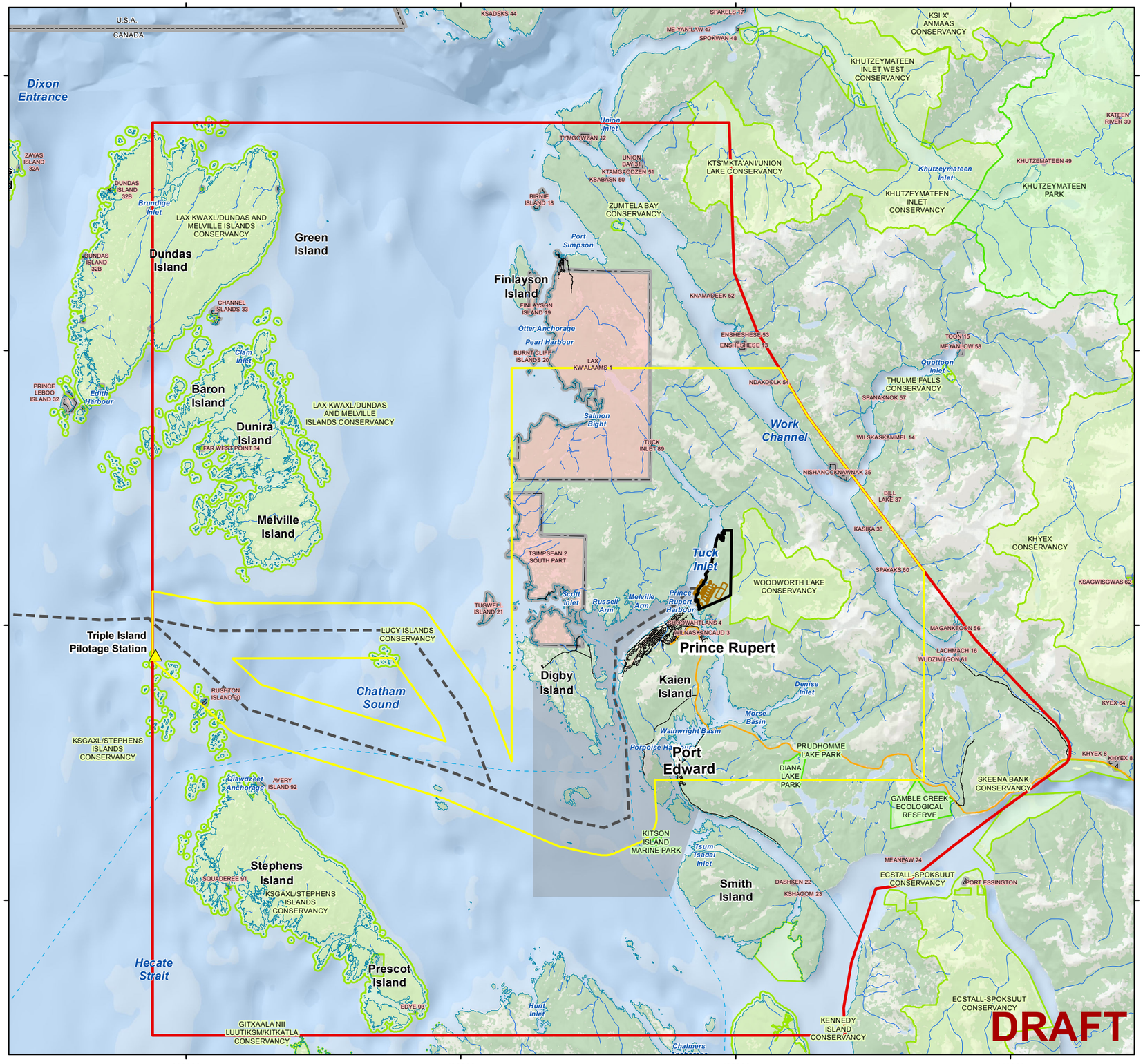
The Proponent will provide a list of reference material used in developing the Application.

18 APPENDICES

The Application will include applicable appendices to support the information provided within the Application. Where information is prepared by professionals and provided under their professional seal, this information will be identified in the Application and sealed studies will be provided as an appendix.

Appendix A:
Study Area Figures



LEGEND

- PROJECT AREA
- LOCAL STUDY AREA (LSA)
- REGIONAL STUDY AREA (RSA)
- PRINCE RUPERT PORT AUTHORITY BOUNDARY
- PILOTAGE STATION
- CONCEPTUAL FACILITY ARRANGEMENT
- PROPOSED NAVIGATION ROUTE
- CANADIAN AND UNITED STATES BORDER
- HIGHWAY
- ROAD
- FERRY ROUTE
- COASTLINE
- WATERCOURSE
- INDIAN RESERVE
- CONSERVANCY AREA
- PARK OR PROTECTED AREA
- VEGETATION

NOTES:
LOCATIONS OF PROPOSED NAVIGATION ROUTES ARE APPROXIMATE.

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DRAFT APPLICATION INFORMATION REQUIREMENTS

AIR QUALITY
REGIONAL AND LOCAL STUDY AREAS

REV	DESCRIPTION	DATE	INITIALS
1	DRAFT 2	15-11-10	R.H.
0	INITIAL DRAFT	15-04-28	J.W.

N

0 2,500 5,000 10,000
METRES
1:300,000
UTM NAD83 ZONE 9

PROJECT 1314220010

FIGURE A-1

REV. 1

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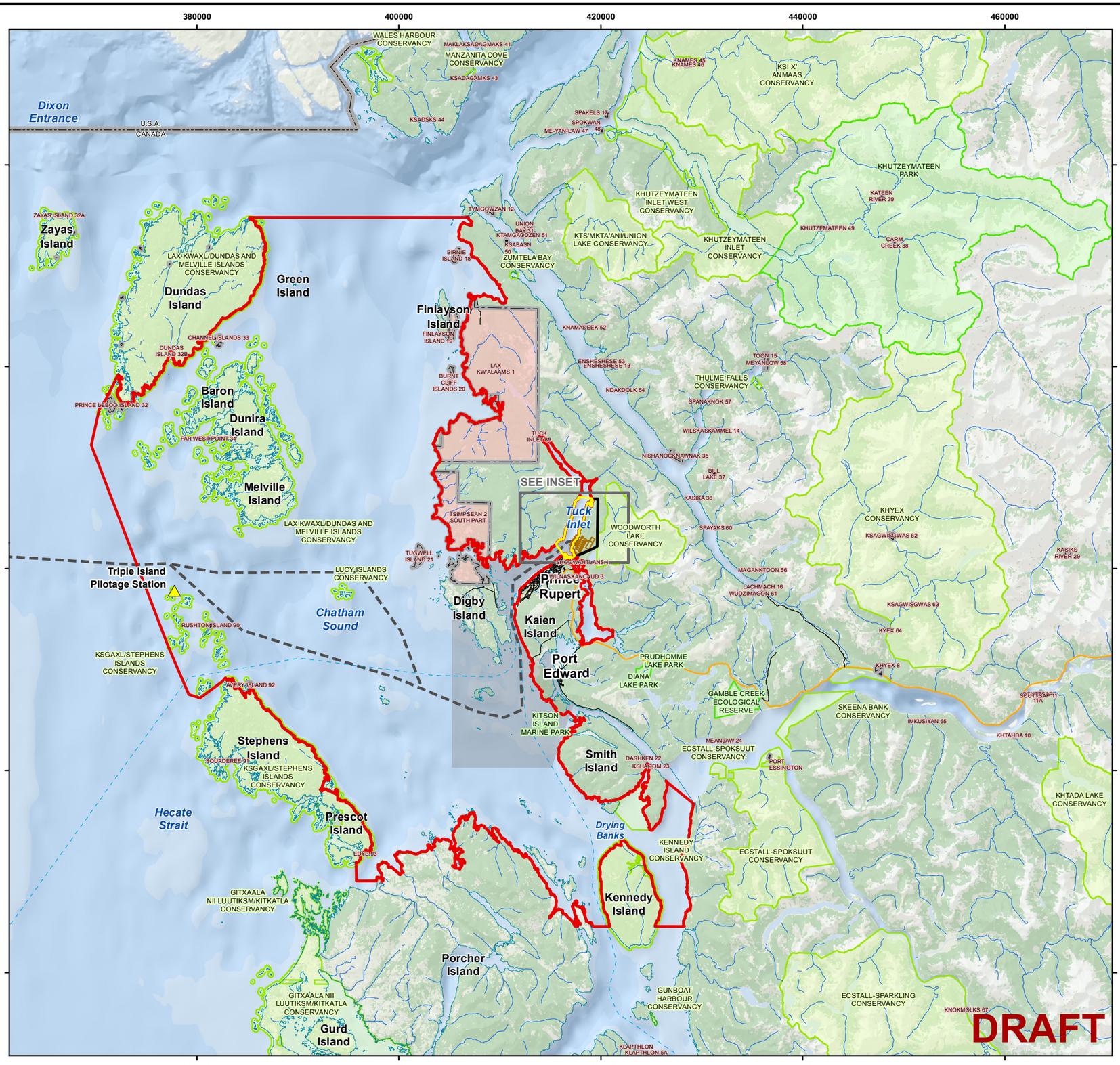
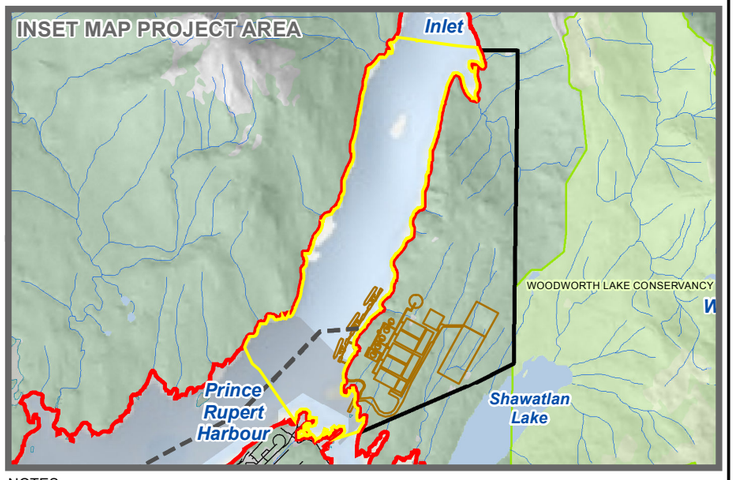


LEGEND

- PROJECT AREA
- LOCAL STUDY AREA (LSA)
- REGIONAL STUDY AREA (RSA)
- PRINCE RUPERT PORT AUTHORITY BOUNDARY
- PILOTAGE STATION
- CONCEPTUAL FACILITY ARRANGEMENT
- PROPOSED NAVIGATION ROUTE
- CANADIAN AND UNITED STATES BORDER
- HIGHWAY
- ROAD
- FERRY ROUTE
- COASTLINE
- WATERCOURSE
- INDIAN RESERVE
- CONSERVANCY AREA
- PARK OR PROTECTED AREA
- VEGETATION



NOTES:
LOCATIONS OF PROPOSED NAVIGATION ROUTES ARE APPROXIMATE.

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DRAFT APPLICATION INFORMATION REQUIREMENTS

MARINE WATER QUALITY
REGIONAL AND LOCAL STUDY AREAS

REV	DESCRIPTION	DATE	INITIALS
1	DRAFT 2	15-11-10	R.H.
0	INITIAL DRAFT	15-04-28	J.W.

N
0 2,500 5,000 10,000
METRES
1:400,000
UTM NAD83 ZONE 9

PROJECT 1314220010
FIGURE A-2

REV. 1

SERVICE LAYER CREDITS:

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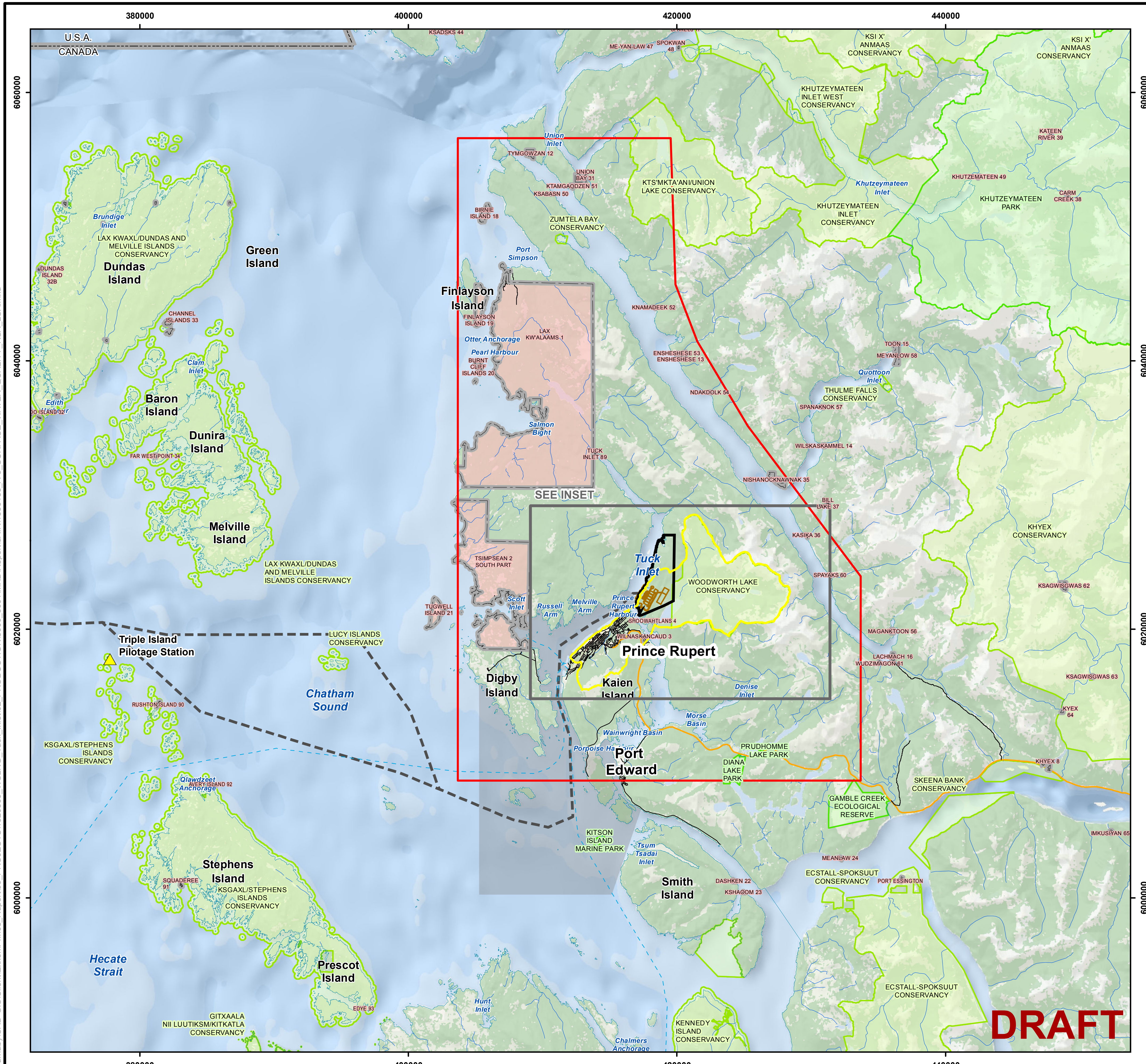
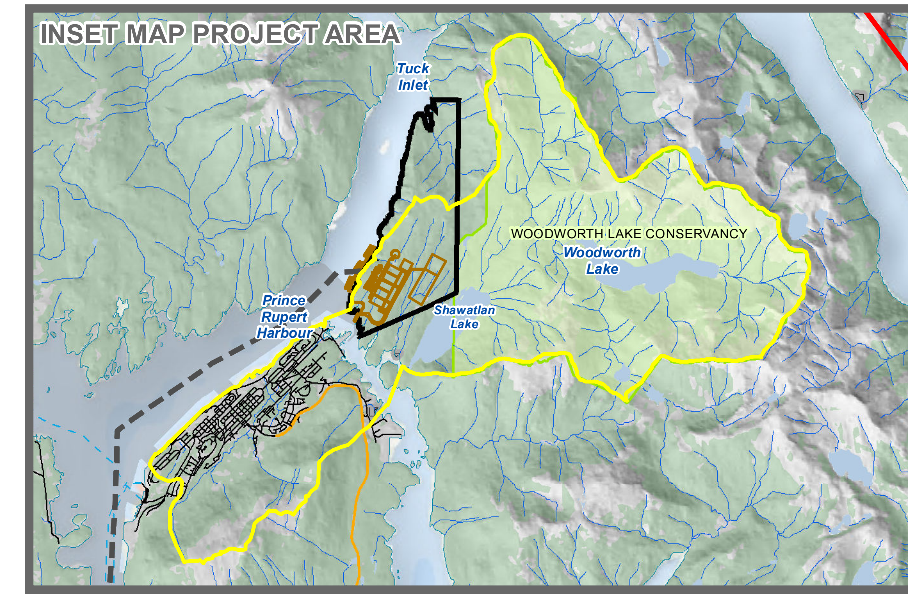


LEGEND

- PROJECT AREA
- LOCAL STUDY AREA (LSA)
- REGIONAL STUDY AREA (RSA) INCLUDES ASA/ESA
- PRINCE RUPERT PORT AUTHORITY BOUNDARY
- PILOTAGE STATION
- CONCEPTUAL FACILITY ARRANGEMENT
- PROPOSED NAVIGATION ROUTE
- CANADIAN AND UNITED STATES BORDER
- HIGHWAY
- ROAD
- FERRY ROUTE
- COASTLINE
- WATERCOURSE
- INDIAN RESERVE
- CONSERVANCY AREA
- PARK OR PROTECTED AREA
- VEGETATION



NOTES:
LOCATIONS OF PROPOSED NAVIGATION ROUTES ARE APPROXIMATE.

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DRAFT APPLICATION INFORMATION REQUIREMENTS

SURFACE WATER QUALITY
REGIONAL AND LOCAL STUDY AREA

REV	DESCRIPTION	DATE	INITIALS
1	DRAFT 2	15-11-10	J.W.
0	INITIAL DRAFT	15-04-28	J.W.

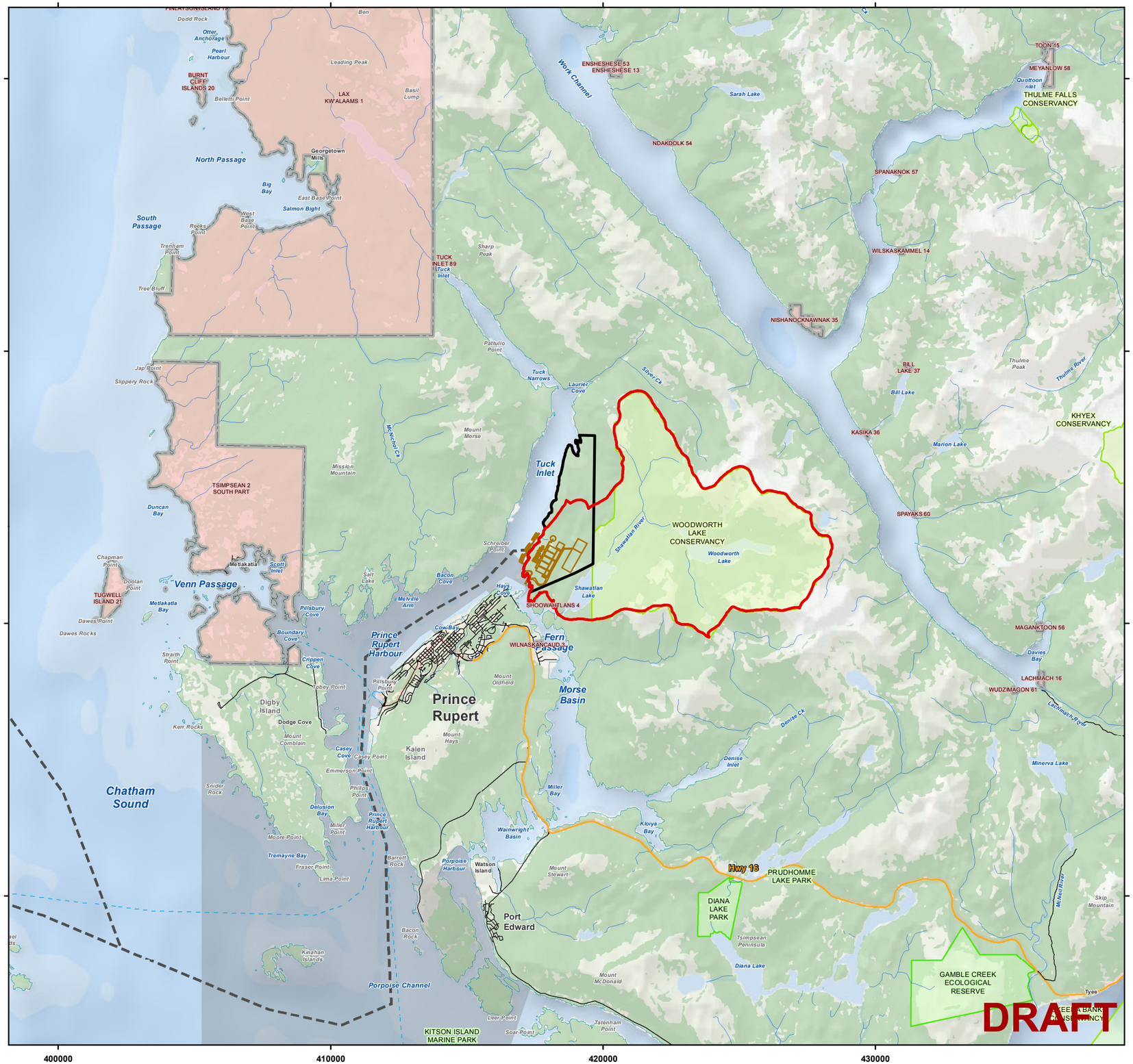
N

0 2,500 5,000 10,000
METRES
1:300,000
UTM NAD83 ZONE 9

PROJECT 1314220010 REV. 1

FIGURE A-3

SERVICE LAYER CREDITS:



LEGEND

- PROJECT AREA
- REGIONAL AND LOCAL STUDY AREA (RSA + LSA)
- PRINCE RUPERT PORT AUTHORITY BOUNDARY
- CONCEPTUAL FACILITY ARRANGEMENT
- PROPOSED NAVIGATION ROUTE
- HIGHWAY
- ROAD
- FERRY ROUTE
- COASTLINE
- WATERCOURSE
- INDIAN RESERVE
- CONSERVANCY AREA
- PARK OR PROTECTED AREA
- VEGETATION

NOTES:
LOCATIONS OF PROPOSED NAVIGATION ROUTES ARE APPROXIMATE.

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DRAFT APPLICATION INFORMATION REQUIREMENTS

SURFACE WATER QUANTITY REGIONAL AND LOCAL STUDY AREA

REV	DESCRIPTION	DATE	INITIALS
1	DRAFT 2	15-11-10	R.H.
0	INITIAL DRAFT	15-10-20	J.W.

N

0 1,000 2,000 4,000
METRES
1:150,000
UTM NAD83 ZONE 9

PROJECT 1314220010

FIGURE A-4

REV. 1

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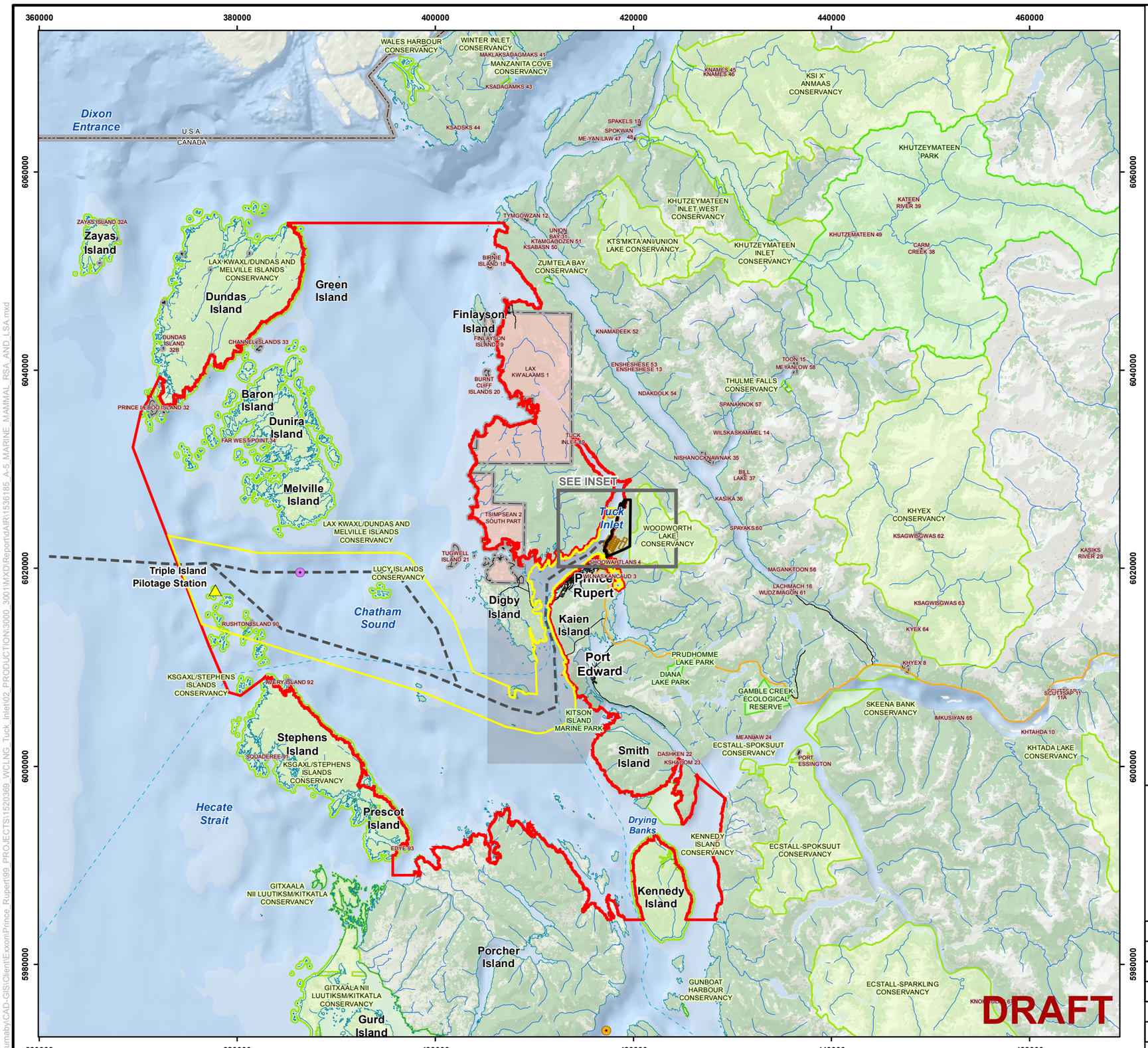
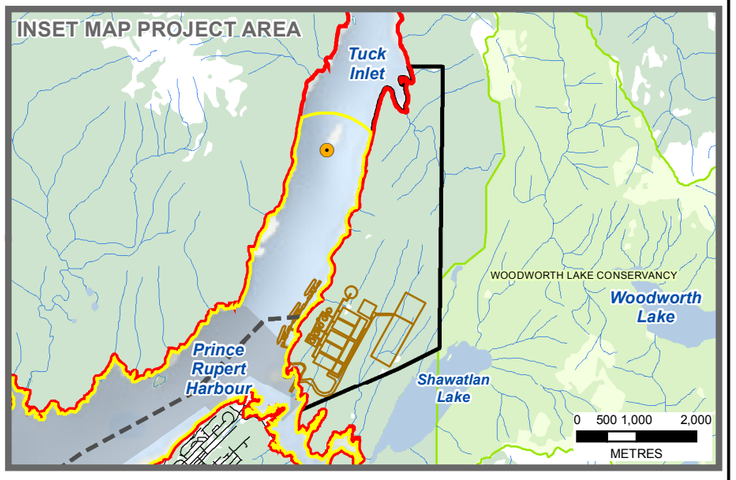


LEGEND

- PROJECT AREA
- LOCAL STUDY AREA (LSA)
- REGIONAL STUDY AREA (RSA)
- PRINCE RUPERT PORT AUTHORITY BOUNDARY
- ACTIVE DISPOSAL AT SEA SITE (BROWN PASSAGE)
- INACTIVE DISPOSAL AT SEA SITE
- PILOTAGE STATION
- CONCEPTUAL FACILITY ARRANGEMENT
- PROPOSED NAVIGATION ROUTE
- CANADIAN AND UNITED STATES BORDER
- HIGHWAY
- ROAD
- FERRY ROUTE
- COASTLINE
- WATERCOURSE
- INDIAN RESERVE
- CONSERVANCY AREA
- PARK OR PROTECTED AREA
- VEGETATION



NOTES:
LOCATIONS OF PROPOSED NAVIGATION ROUTES ARE APPROXIMATE.

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DRAFT APPLICATION INFORMATION REQUIREMENTS

MARINE RESOURCES - MARINE MAMMALS
REGIONAL AND LOCAL STUDY AREAS

REV	DESCRIPTION	DATE	INITIALS
1	DRAFT 2	15-11-10	R.H.
0	INITIAL DRAFT	15-04-28	J.W.

N
0 3,000 6,000 12,000
METRES
1:400,000
UTM NAD83 ZONE 9

PROJECT 1314220010
FIGURE A-5
REV. 1

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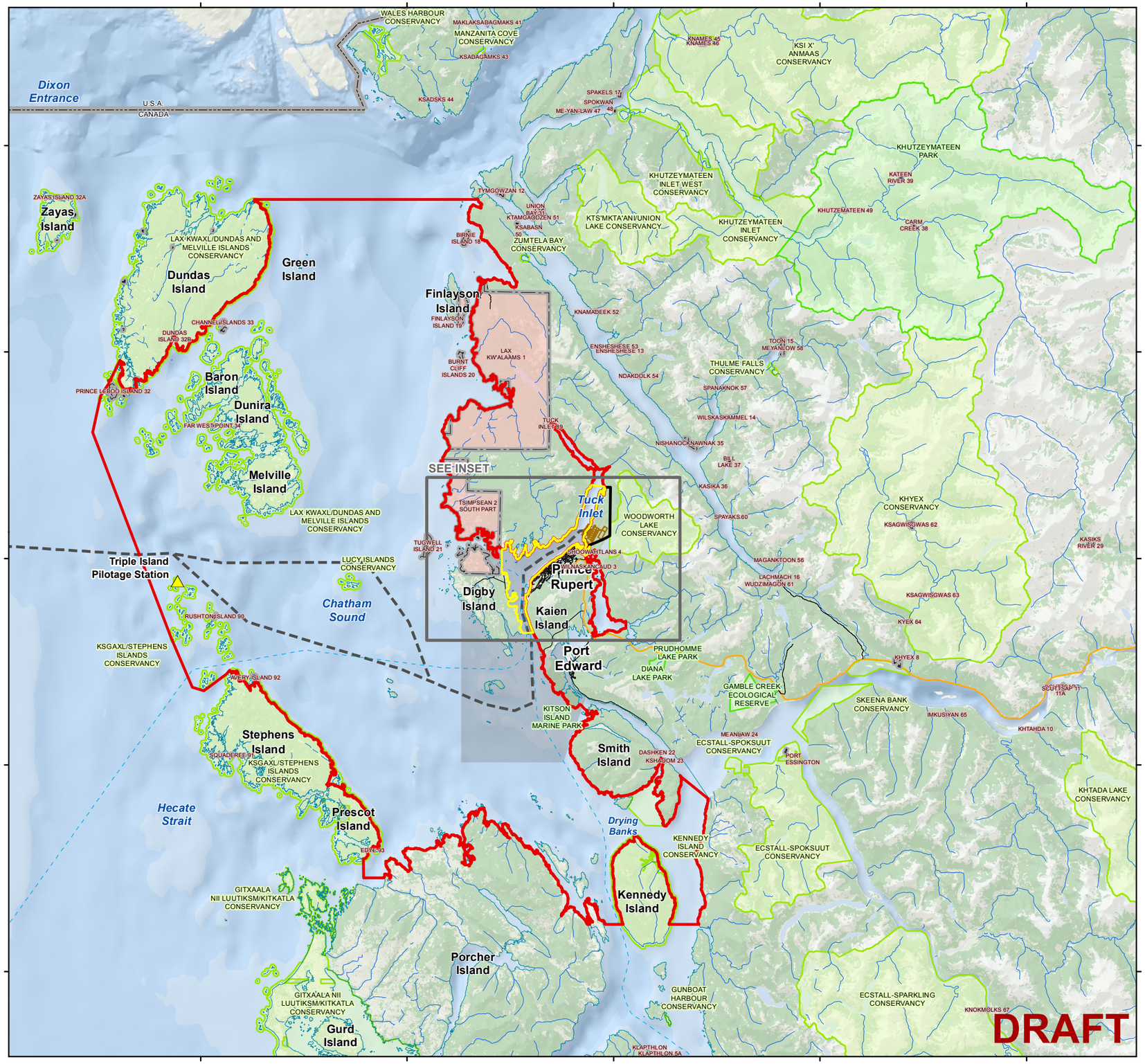
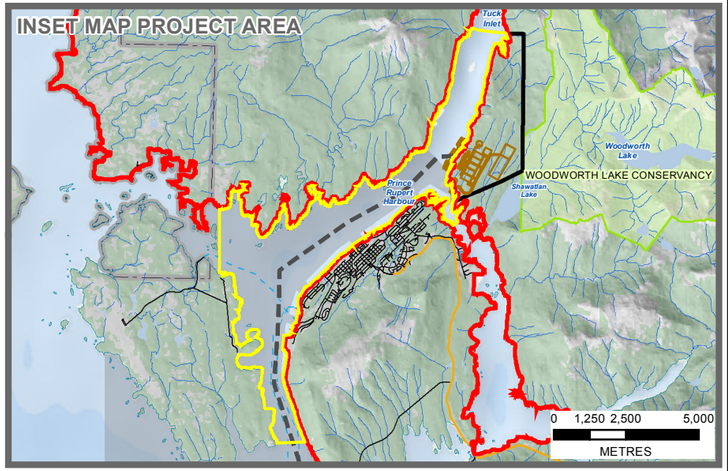


LEGEND

- PROJECT AREA
- LOCAL STUDY AREA (LSA)
- REGIONAL STUDY AREA (RSA)
- PRINCE RUPERT PORT AUTHORITY BOUNDARY
- PILOTAGE STATION
- CONCEPTUAL FACILITY ARRANGEMENT
- PROPOSED NAVIGATION ROUTE
- CANADIAN AND UNITED STATES BORDER
- HIGHWAY
- ROAD
- FERRY ROUTE
- COASTLINE
- WATERCOURSE
- INDIAN RESERVE
- CONSERVANCY AREA
- PARK OR PROTECTED AREA
- VEGETATION



NOTES:
LOCATIONS OF PROPOSED NAVIGATION ROUTES ARE APPROXIMATE.

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DRAFT APPLICATION INFORMATION REQUIREMENTS

MARINE RESOURCES – MARINE FISH AND FISH HABITAT REGIONAL AND LOCAL STUDY AREA

REV	DESCRIPTION	DATE	INITIALS
1	DRAFT 2	15-11-10	R.H.
0	INITIAL DRAFT	15-04-28	J.W.

N

0 2,500 5,000 10,000
METRES

1:400,000
UTM NAD83 ZONE 9

PROJECT 1314220010

FIGURE A-6

REV. 1

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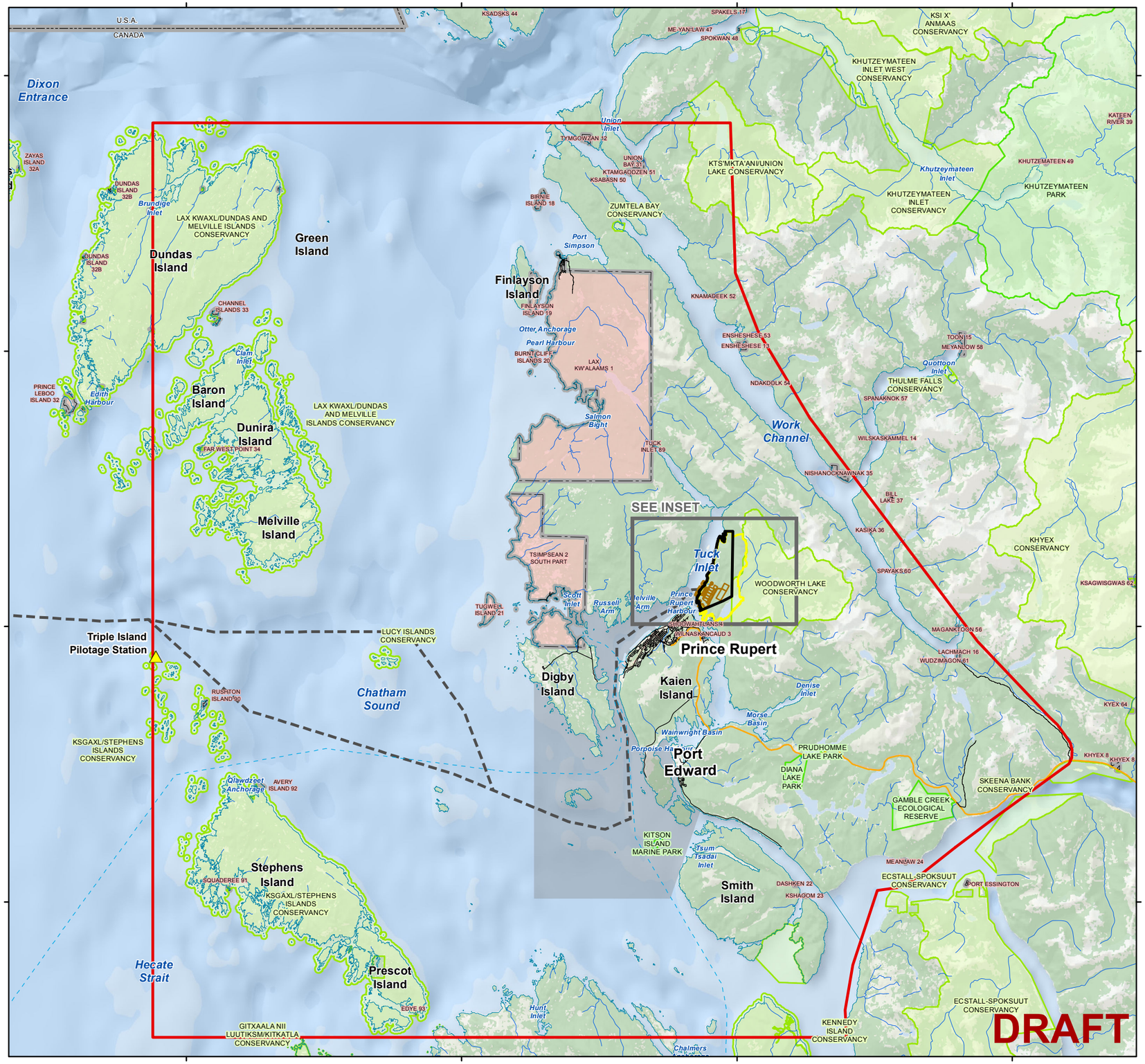
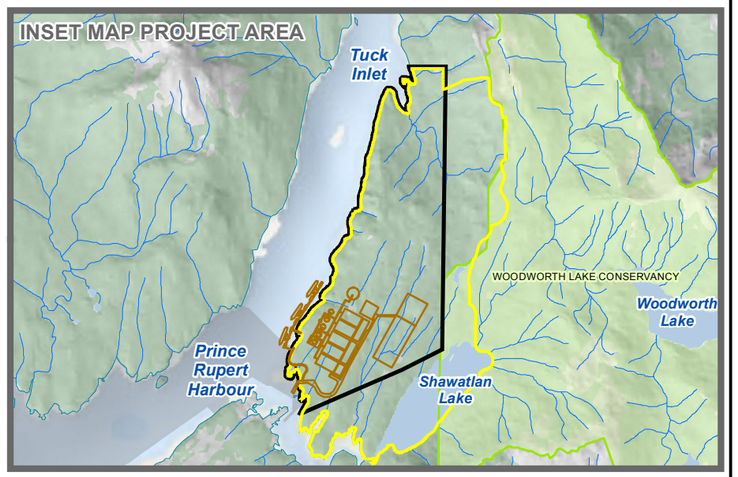


LEGEND

- PROJECT AREA
- LOCAL STUDY AREA (LSA)
- REGIONAL STUDY AREA (RSA)
- PRINCE RUPERT PORT AUTHORITY BOUNDARY
- PILOTAGE STATION
- CONCEPTUAL FACILITY ARRANGEMENT
- PROPOSED NAVIGATION ROUTE
- CANADIAN AND UNITED STATES BORDER
- HIGHWAY
- ROAD
- FERRY ROUTE
- COASTLINE
- WATERCOURSE
- INDIAN RESERVE
- CONSERVANCY AREA
- PARK OR PROTECTED AREA
- VEGETATION



NOTES:
LOCATIONS OF PROPOSED NAVIGATION ROUTES ARE APPROXIMATE.

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DRAFT APPLICATION INFORMATION REQUIREMENTS

FRESHWATER FISH AND FISH HABITAT REGIONAL AND LOCAL STUDY AREAS

REV	DESCRIPTION	DATE	INITIALS
1	DRAFT 2	15-11-10	R.H.
0	INITIAL DRAFT	15-04-28	J.W.

N

0 2,500 5,000 10,000
METRES
1:300,000
UTM NAD83 ZONE 9

PROJECT 1314220010

FIGURE A-7

REV. 1

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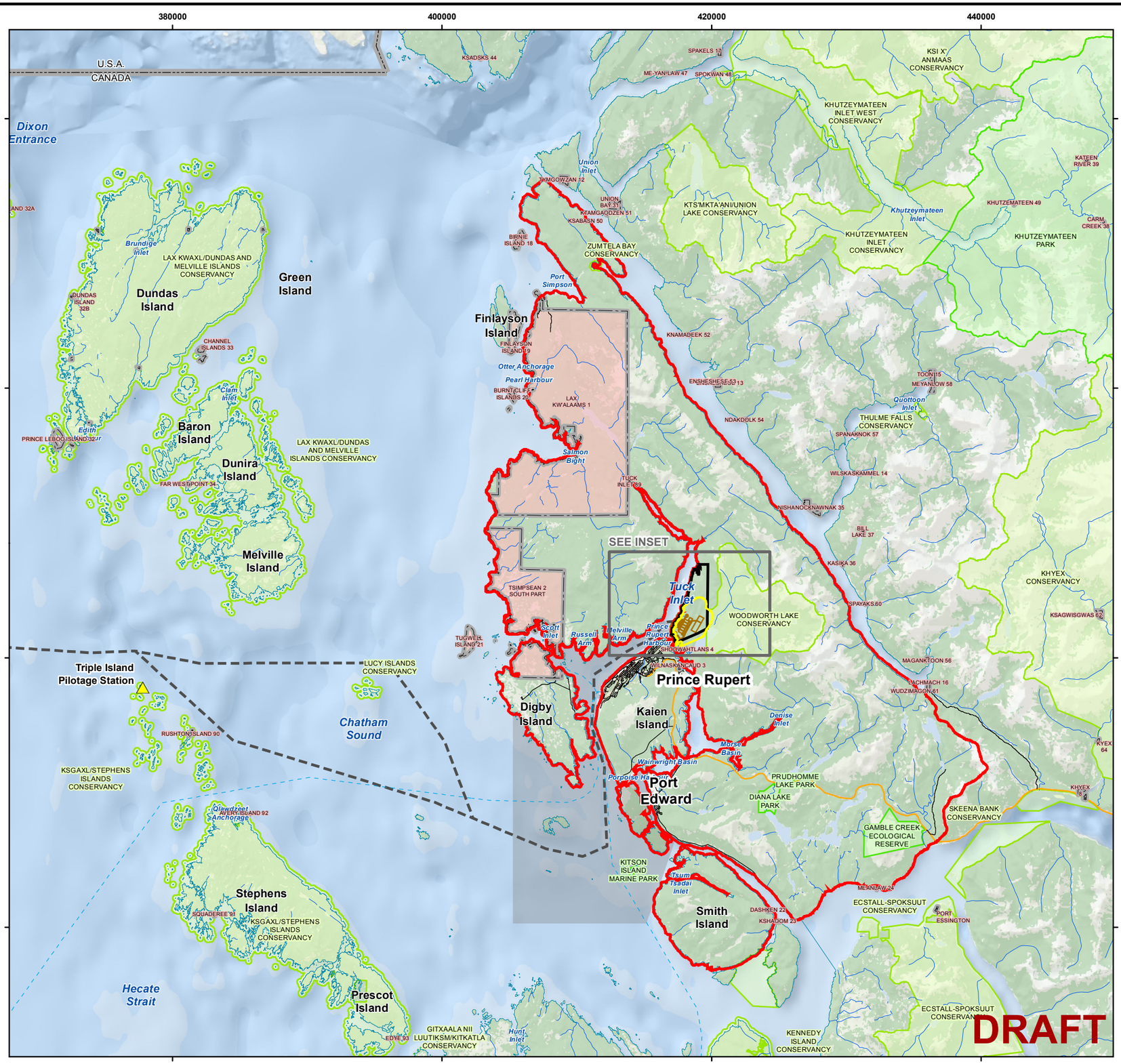
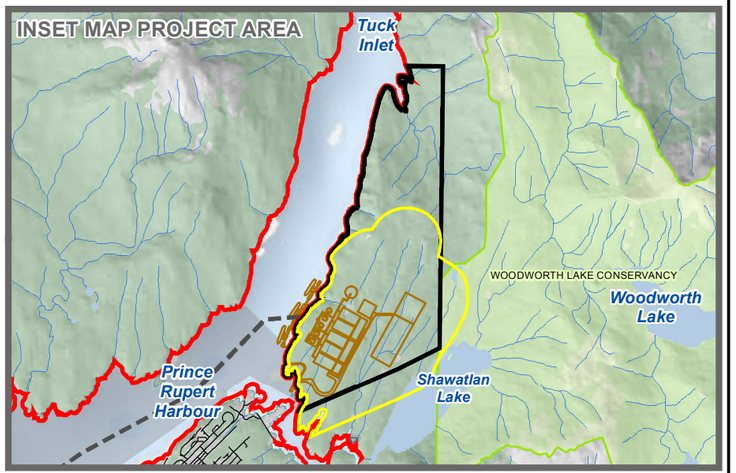


LEGEND

- PROJECT AREA
- LOCAL STUDY AREA (LSA)
- REGIONAL STUDY AREA (RSA)
- PRINCE RUPERT PORT AUTHORITY BOUNDARY
- PILOTAGE STATION
- CONCEPTUAL FACILITY ARRANGEMENT
- PROPOSED NAVIGATION ROUTE
- CANADIAN AND UNITED STATES BORDER
- HIGHWAY
- ROAD
- FERRY ROUTE
- COASTLINE
- WATERCOURSE
- INDIAN RESERVE
- CONSERVANCY AREA
- PARK OR PROTECTED AREA
- VEGETATION



NOTES:
LOCATIONS OF PROPOSED NAVIGATION ROUTES ARE APPROXIMATE.

SOURCE:
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DRAFT APPLICATION INFORMATION REQUIREMENTS

VEGETATION AND WILDLIFE
REGIONAL AND LOCAL STUDY AREAS

REV	DESCRIPTION	DATE	INITIALS
1	DRAFT 2	15-11-10	R.H.
0	INITIAL DRAFT	15-04-28	J.W.

N

0 2,500 5,000 10,000
METRES
1:300,000
UTM NAD83 ZONE 9

PROJECT 1314220010

FIGURE A-8

REV. 1

Y:\burnaby\CAD-GIS\Client\Exxon\Prince_Rupert\99_PROJECTS\1520369_WCLNG_Tuck_Inlet\02_PRODUCTION\3000_3001\MXD\ReportVdAIR1536185_A-8_TERRESTRIAL_RSA_LSA.mxd

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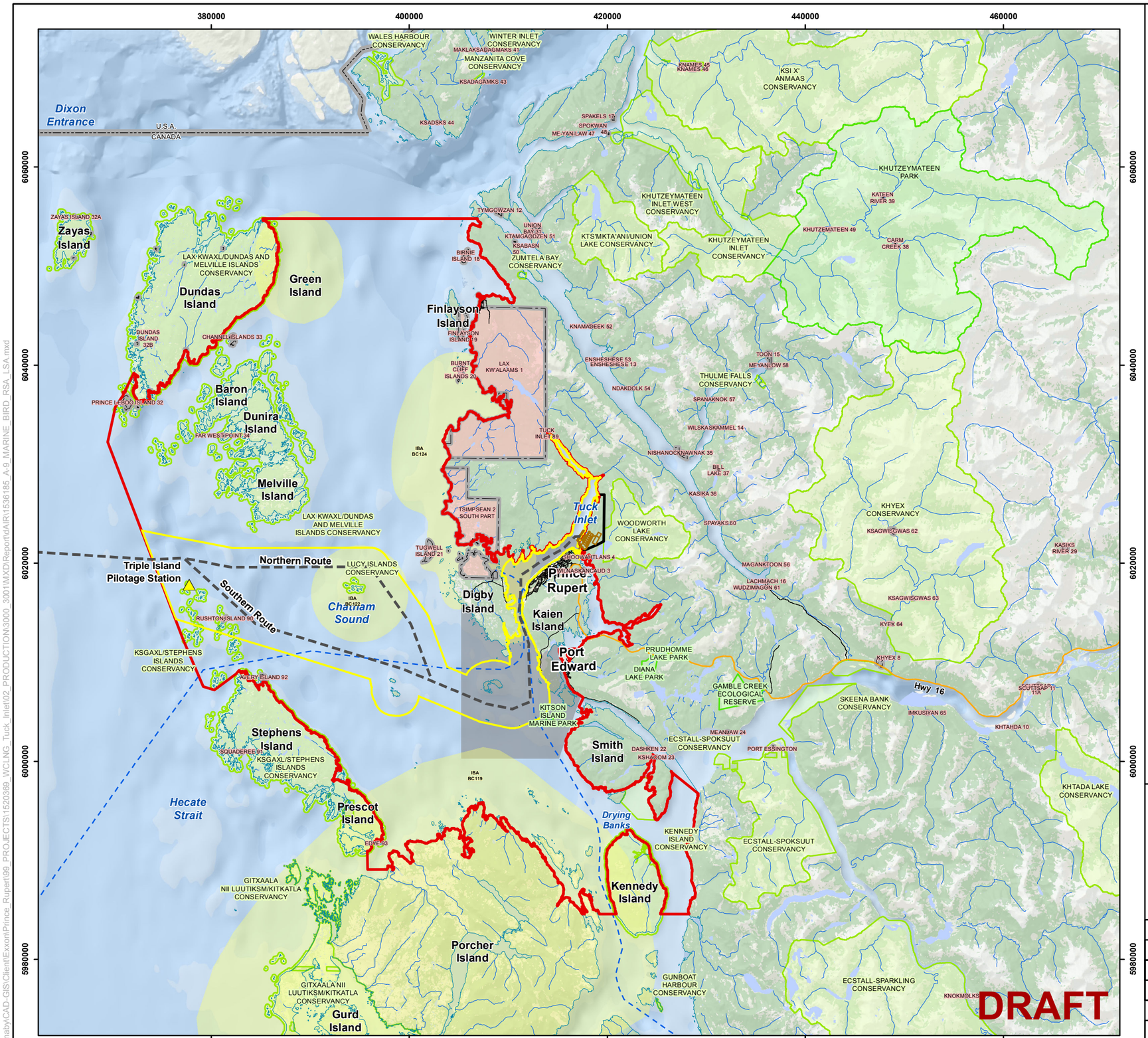

LEGEND

- PROJECT AREA
- LOCAL STUDY AREA (LSA)
- REGIONAL STUDY AREA (RSA)
- PRINCE RUPERT PORT AUTHORITY BOUNDARY
- PILOTAGE STATION
- CONCEPTUAL FACILITY ARRANGEMENT
- PROPOSED NAVIGATION ROUTE
- CANADIAN AND UNITED STATES BORDER
- HIGHWAY
- ROAD
- FERRY ROUTE
- COASTLINE
- WATERCOURSE
- IMPORTANT BIRD AREA (IBA)
- INDIAN RESERVE
- CONSERVANCY AREA
- PARK OR PROTECTED AREA
- VEGETATION

NOTES:
LOCATION OF PROPOSED NAVIGATION ROUTES ARE APPROXIMATE.

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DRAFT APPLICATION INFORMATION REQUIREMENTS

MARINE BIRD REGIONAL AND LOCAL STUDY AREAS (MARINE COMPONENT)

REV	DESCRIPTION	DATE	INITIALS
1	DRAFT 2	15-11-10	R.H.
0	INITIAL DRAFT	15-04-28	J.W.

N

0 3,000 6,000 12,000
METRES
1:400,000
UTM NAD83 ZONE 9

PROJECT 1314220010

FIGURE A-9

REV. 1

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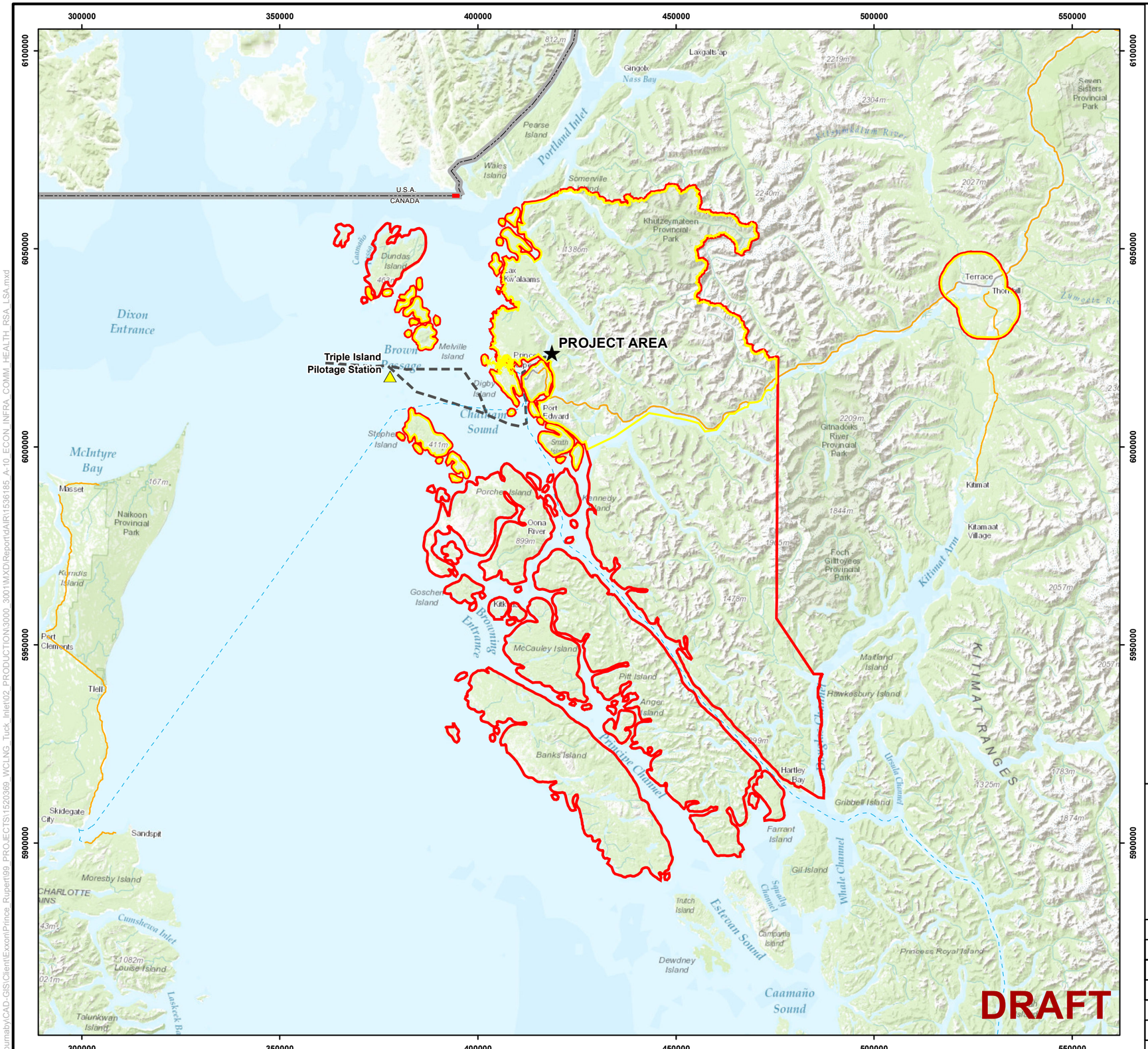

LEGEND

- PROJECT AREA
- LOCAL STUDY AREA (LSA)
- REGIONAL STUDY AREA (RSA)
- PILOTAGE STATION
- POTENTIAL NAVIGATION ROUTE
- CANADIAN AND UNITED STATES BORDER
- HIGHWAY
- FERRY ROUTE
- WATERCOURSE
- VEGETATION

NOTES:
LOCATIONS OF PROPOSED NAVIGATION ROUTES ARE APPROXIMATE.

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DRAFT APPLICATION INFORMATION REQUIREMENTS

ECONOMY/ ECONOMIC CONDITIONS & COMMUNITY HEALTH AND WELLBEING & INFRASTRUCTURE AND SERVICES REGIONAL AND LOCAL STUDY AREAS

REV	DESCRIPTION	DATE	INITIALS
1	DRAFT 2	15-10-28	J.W.
0	INITIAL DRAFT	15-04-28	J.W.

N

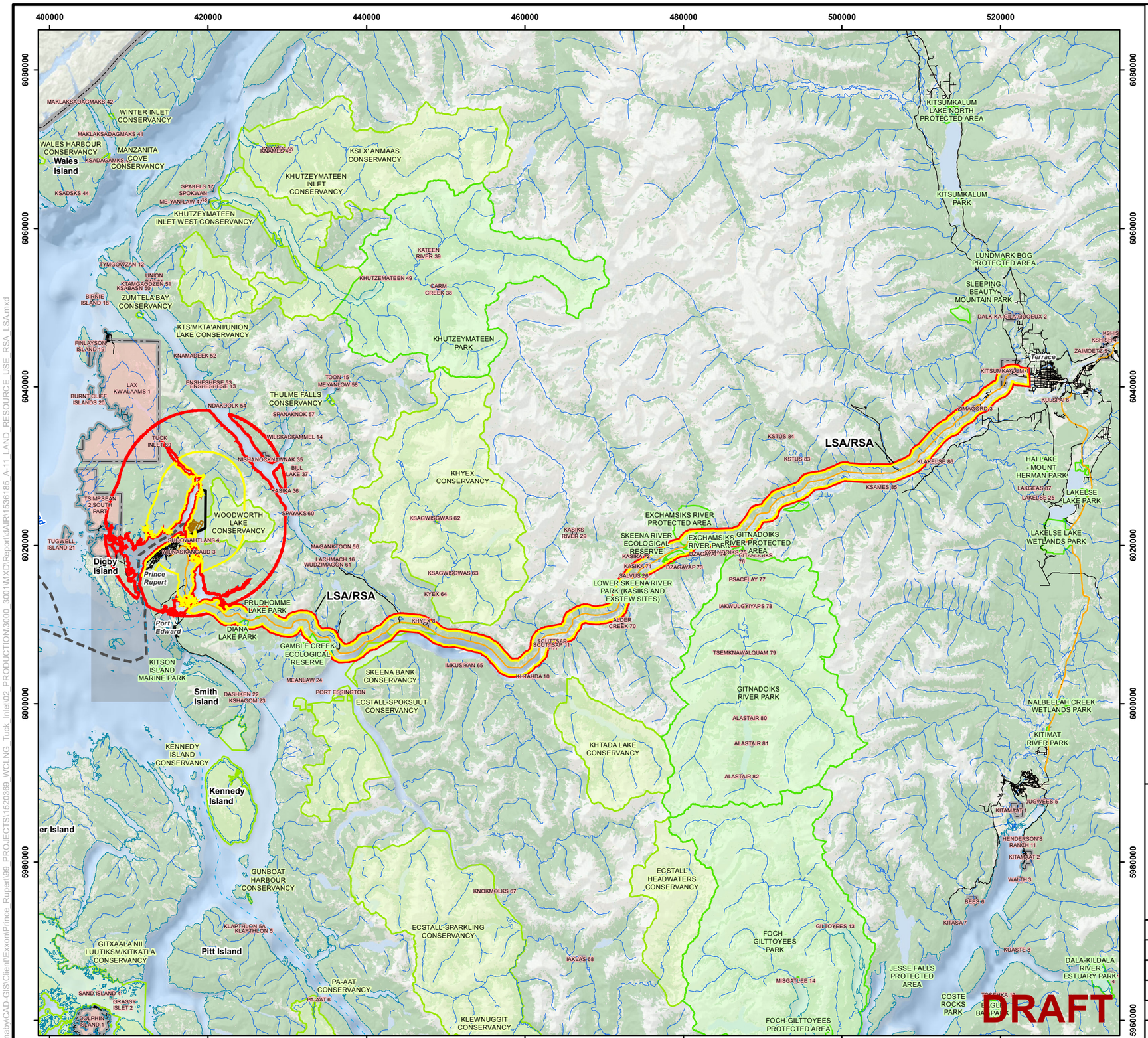
0 7.5 15 30
KILOMETRES
1:1,000,000
UTM NAD83 ZONE 9

PROJECT 1314220010

FIGURE A-10

REV. 1

Y:\burnaby\CAD-GIS\Client\Exxon\Prince Rupert\99_PROJECTS\1520369_WCLNG_Tuck Inlet\02_PRODUCTION\3000_3001\MXD\ReportAIR\1536185_A-10_ECON_INFRA_COMM_HEALTH_RSA_LSA.mxd



LEGEND

- PROJECT AREA
- LOCAL STUDY AREA (LSA)
- REGIONAL STUDY AREA (RSA)
- PRINCE RUPERT PORT AUTHORITY BOUNDARY
- CONCEPTUAL FACILITY ARRANGEMENT
- PROPOSED NAVIGATION ROUTE
- CANADIAN AND UNITED STATES BORDER
- HIGHWAY
- ROAD
- FERRY ROUTE
- COASTLINE
- WATERCOURSE
- INDIAN RESERVE
- CONSERVANCY AREA
- PARK OR PROTECTED AREA
- VEGETATION

NOTES:
LOCATIONS OF PROPOSED NAVIGATION ROUTES ARE APPROXIMATE.

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DRAFT APPLICATION INFORMATION REQUIREMENTS

LAND AND RESOURCE USE REGIONAL AND LOCAL STUDY AREAS

REV	DESCRIPTION	DATE	INITIALS
1	DRAFT 2	15-11-10	R.H.
0	INITIAL DRAFT	15-04-28	J.W.

N

0 4,000 8,000 16,000
METRES
1:500,000
UTM NAD83 ZONE 9

PROJECT 1314220010

FIGURE A-11

REV. 1

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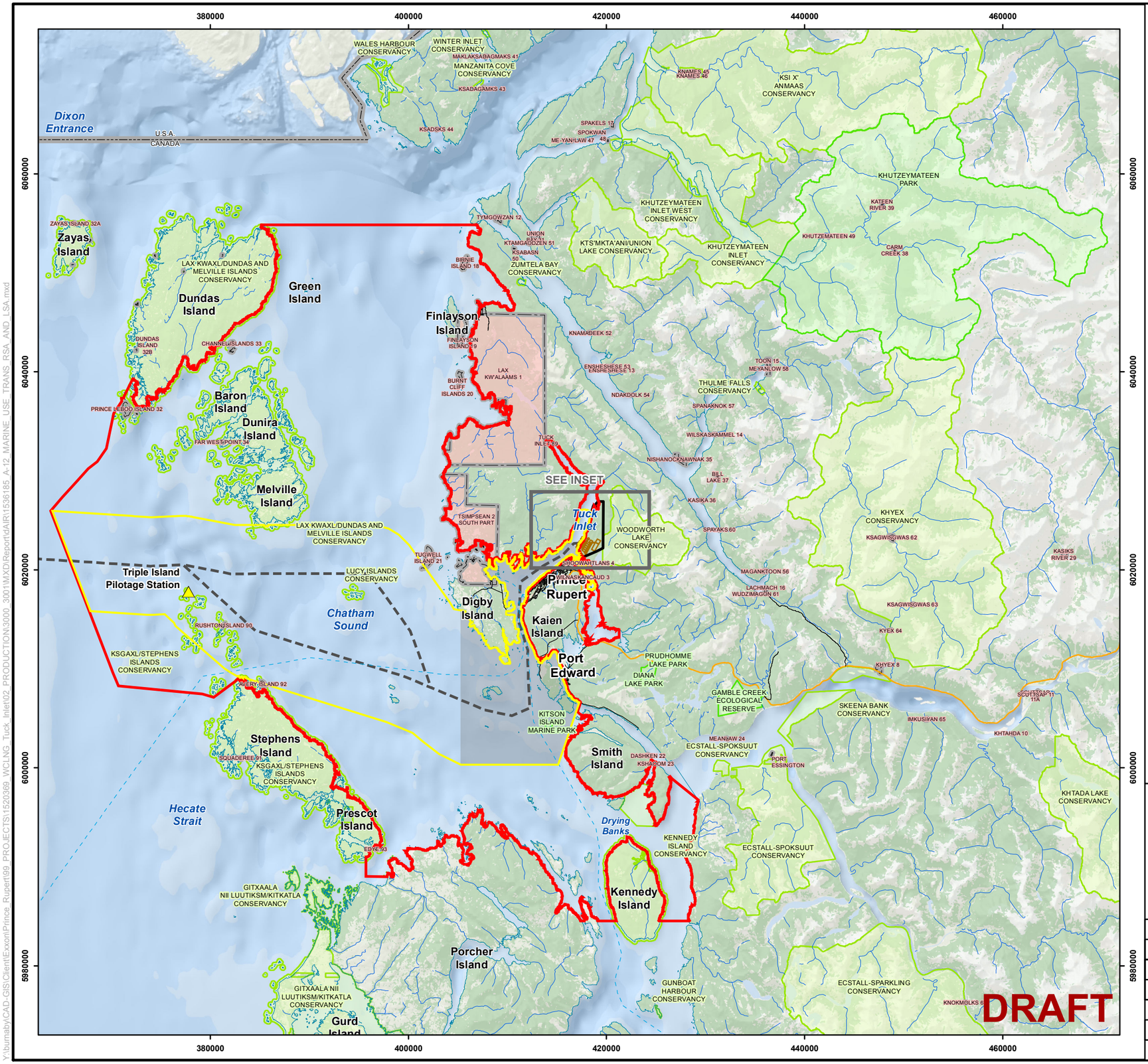
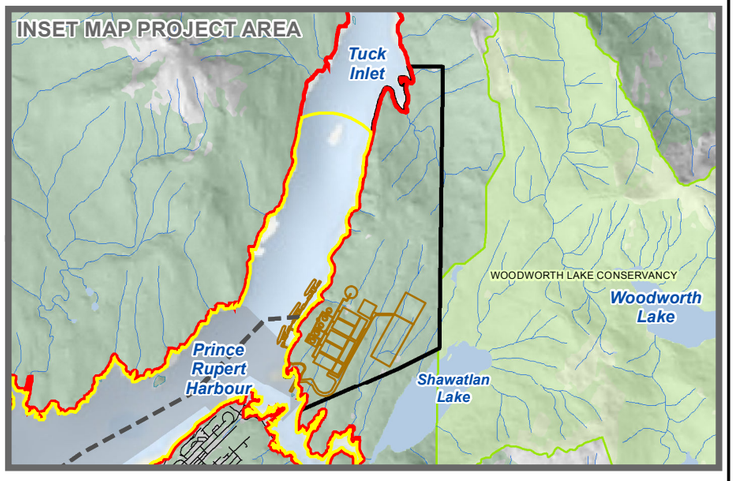


LEGEND

- PROJECT AREA
- LOCAL STUDY AREA (LSA)
- REGIONAL STUDY AREA (RSA)
- PRINCE RUPERT PORT AUTHORITY BOUNDARY
- PILOTAGE STATION
- CONCEPTUAL FACILITY ARRANGEMENT
- PROPOSED NAVIGATION ROUTE
- CANADIAN AND UNITED STATES BORDER
- HIGHWAY
- ROAD
- FERRY ROUTE
- COASTLINE
- WATERCOURSE
- INDIAN RESERVE
- CONSERVANCY AREA
- PARK OR PROTECTED AREA
- VEGETATION



NOTES:
LOCATIONS OF PROPOSED NAVIGATION ROUTES ARE APPROXIMATE.

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DRAFT APPLICATION INFORMATION REQUIREMENTS

MARINE USE AND TRANSPORTATION
REGIONAL AND LOCAL STUDY AREAS

REV	DESCRIPTION	DATE	INITIALS
1	DRAFT 2	15-11-10	R.H.
0	INITIAL DRAFT	15-04-28	J.W.

N

0 3,000 6,000 12,000
METRES
1:400,000
UTM NAD83 ZONE 9

PROJECT 1314220010

FIGURE A-12

REV. 1

Y:\burnaby\CAD-GIS\Client\Exxon\Prince_Rupert\99_PROJECTS\1520369_WCLNG_Tuck_Inlet\02_PRODUCTION\3000_30011\MXD\Report\dAIR1536185_A-12_MARINE_USE_TRANS_RSA_AND_LSA.mxd

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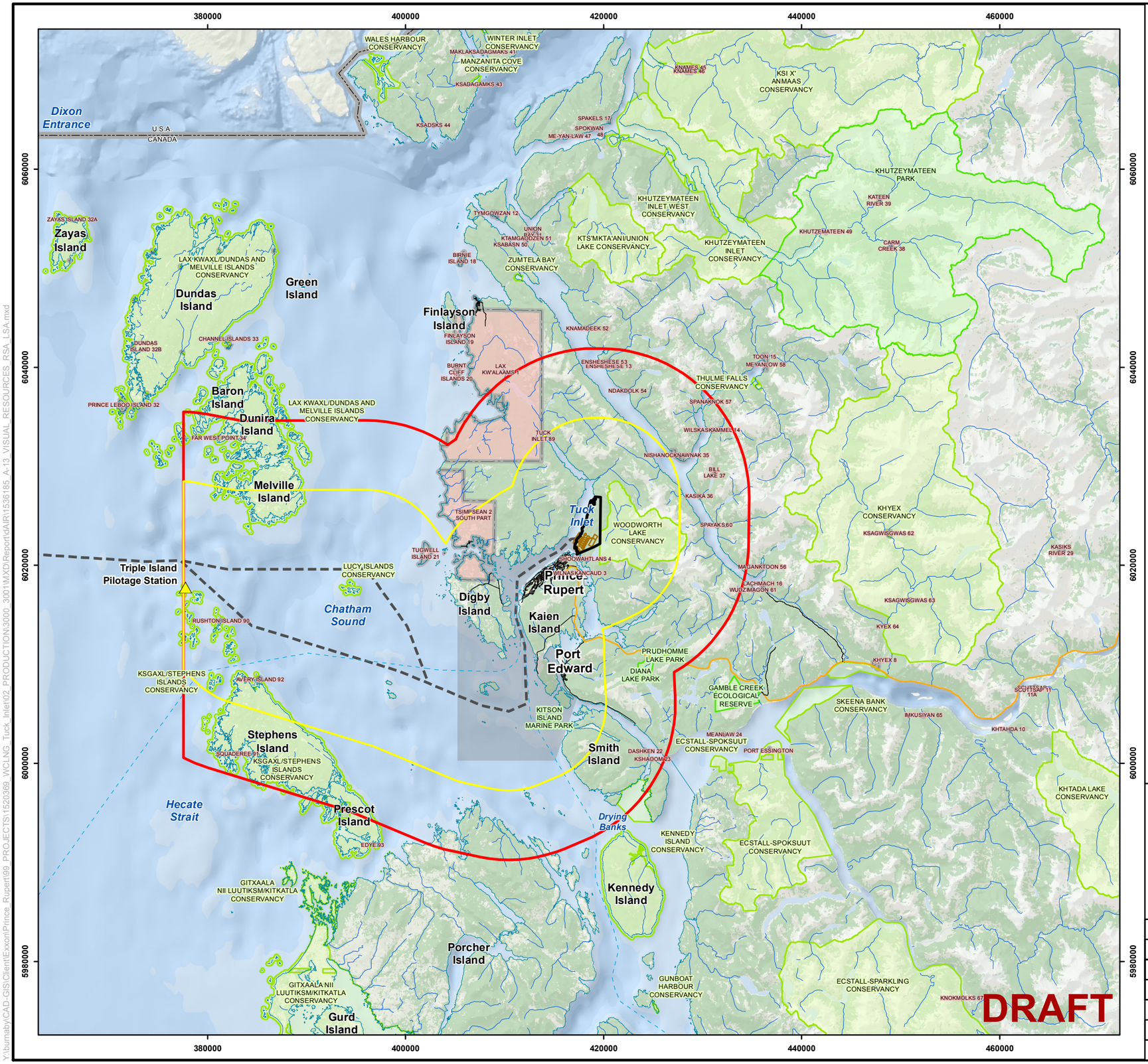

LEGEND

- PROJECT AREA
- LOCAL STUDY AREA (LSA)
- REGIONAL STUDY AREA (RSA)
- PRINCE RUPERT PORT AUTHORITY BOUNDARY
- PILOTAGE STATION
- CONCEPTUAL FACILITY ARRANGEMENT
- PROPOSED NAVIGATION ROUTE
- CANADIAN AND UNITED STATES BORDER
- HIGHWAY
- ROAD
- FERRY ROUTE
- COASTLINE
- WATERCOURSE
- INDIAN RESERVE
- CONSERVANCY AREA
- PARK OR PROTECTED AREA
- VEGETATION

NOTES:
LOCATIONS OF PROPOSED NAVIGATION ROUTES ARE APPROXIMATE.

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DRAFT APPLICATION INFORMATION REQUIREMENTS

VISUAL QUALITY REGIONAL AND LOCAL STUDY AREAS

REV	DESCRIPTION	DATE	INITIALS
1	DRAFT 2	15-11-10	R.H.
0	INITIAL DRAFT	15-04-28	J.W.

N

0 3,000 6,000 12,000
METRES
1:400,000
UTM NAD83 ZONE 9

PROJECT 1314220010

FIGURE A-13

REV. 1

Y:\burnaby\CAD-GIS\Client\Exxon\Prince_Rupert\99_PROJECTS\1520369_WCLNG_Tuck_Inlet\02_PRODUCTION\3000_3001\MXD\Report\AIR\1536185_A-13_VISUAL_RESOURCES_RSA_LSA.mxd

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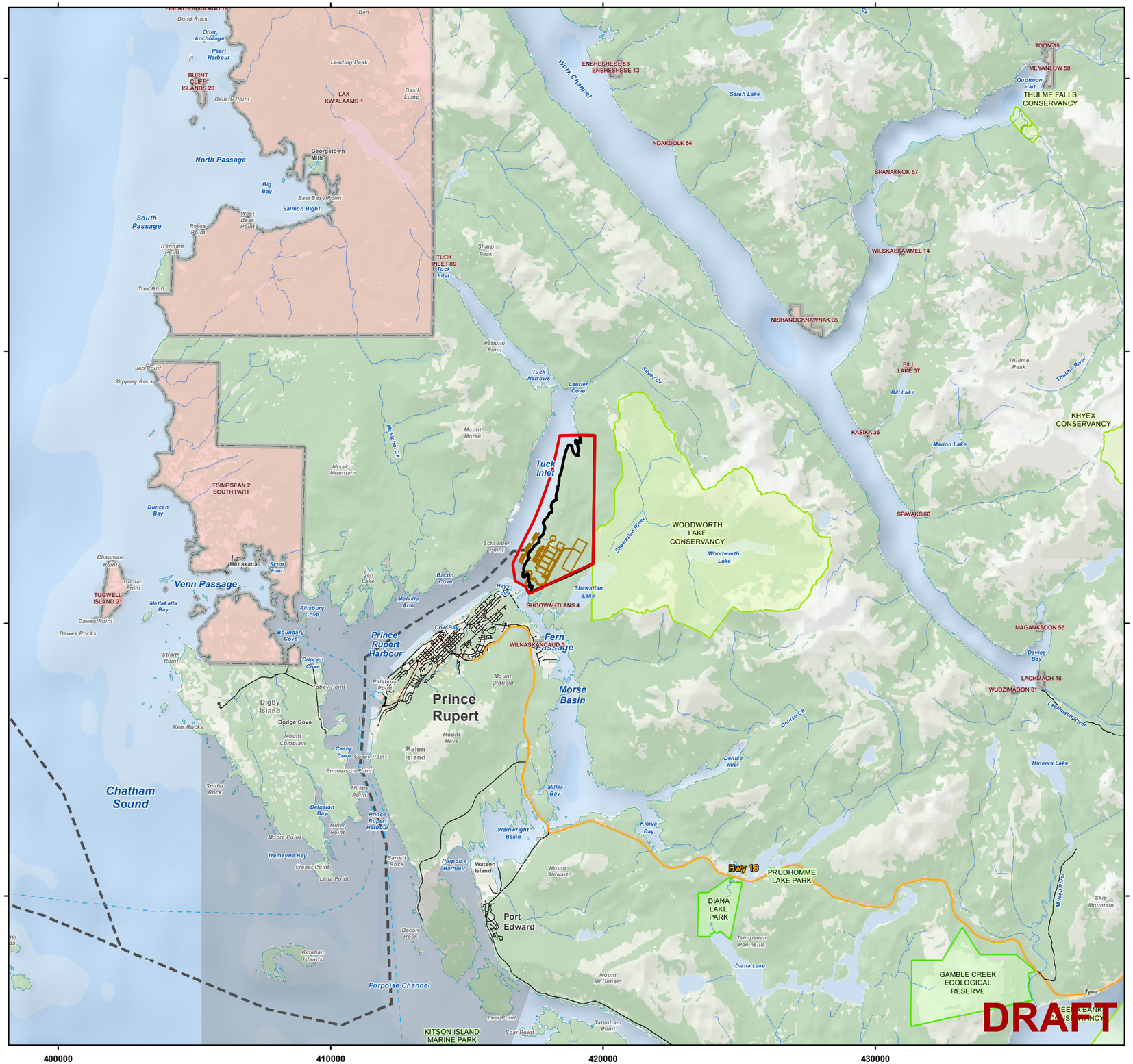

LEGEND

- PROJECT AREA
- REGIONAL AND LOCAL STUDY AREA (RSA + LSA)
- PRINCE RUPERT PORT AUTHORITY BOUNDARY
- CONCEPTUAL FACILITY ARRANGEMENT
- PROPOSED NAVIGATION ROUTE
- HIGHWAY
- ROAD
- FERRY ROUTE
- COASTLINE
- WATERCOURSE
- INDIAN RESERVE
- CONSERVANCY AREA
- PARK OR PROTECTED AREA
- VEGETATION

NOTES:
LOCATIONS OF PROPOSED NAVIGATION ROUTES ARE APPROXIMATE.

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DRAFT APPLICATION INFORMATION REQUIREMENTS

ARCHAEOLOGY AND HERITAGE RESOURCES
REGIONAL AND LOCAL STUDY AREA

REV	DESCRIPTION	DATE	INITIALS
1	DRAFT 2	15-11-10	R.H.
0	INITIAL DRAFT	15-04-28	J.W.

N

0 1,000 2,000 4,000
METRES
1:150,000
UTM NAD83 ZONE 9

PROJECT 1314220010

FIGURE A-14

REV. 1

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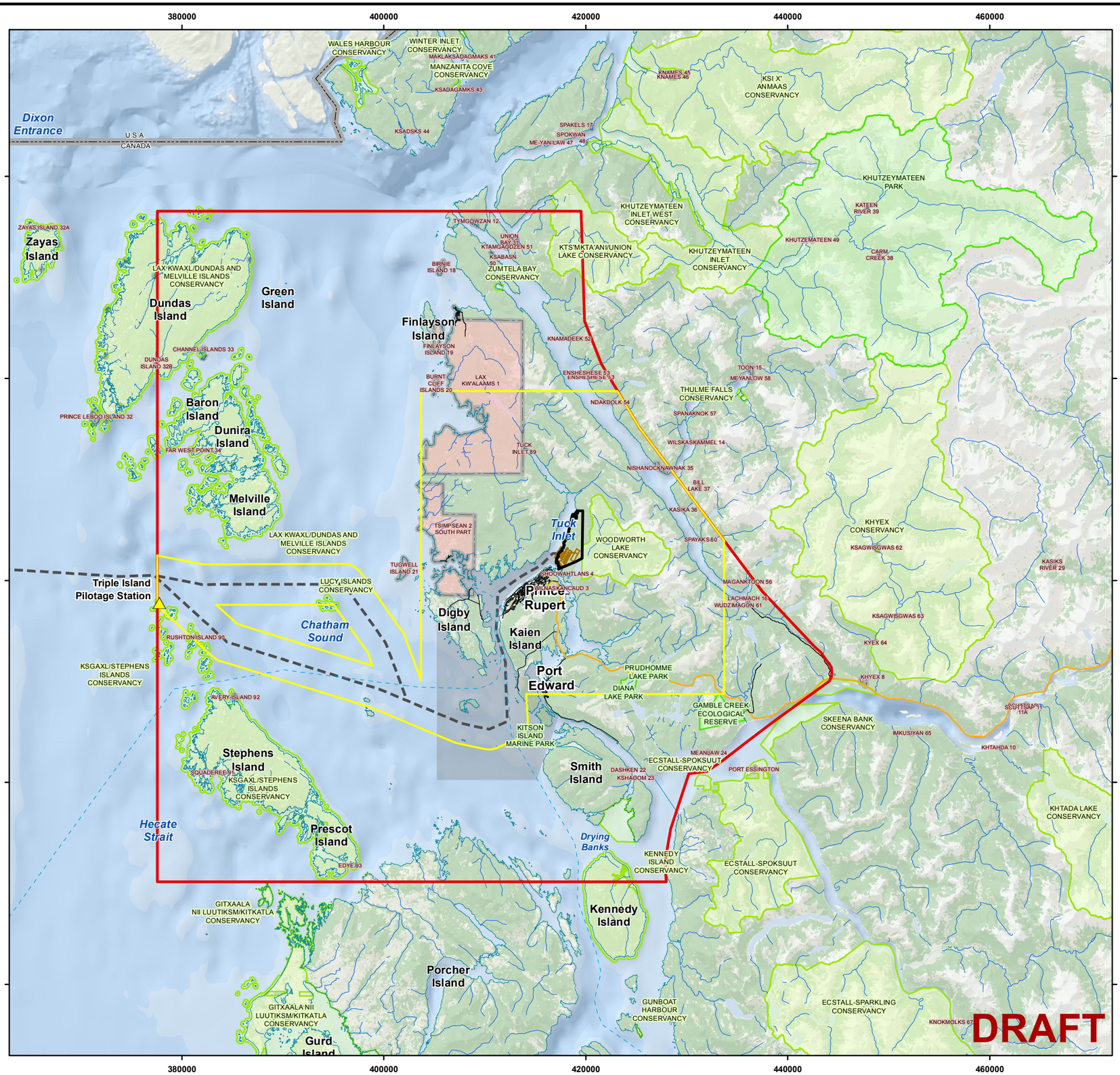

LEGEND

- PROJECT AREA
- LOCAL STUDY AREA (LSA)
- REGIONAL STUDY AREA (RSA)
- PRINCE RUPERT PORT AUTHORITY BOUNDARY
- PILOTAGE STATION
- CONCEPTUAL FACILITY ARRANGEMENT
- PROPOSED NAVIGATION ROUTE
- CANADIAN AND UNITED STATES BORDER
- HIGHWAY
- ROAD
- FERRY ROUTE
- COASTLINE
- WATERCOURSE
- INDIAN RESERVE
- CONSERVANCY AREA
- PARK OR PROTECTED AREA
- VEGETATION

NOTES:
LOCATIONS OF PROPOSED NAVIGATION ROUTES ARE APPROXIMATE.

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DRAFT APPLICATION INFORMATION REQUIREMENTS

HUMAN AND ECOLOGICAL HEALTH
REGIONAL AND LOCAL STUDY AREAS

REV	DESCRIPTION	DATE	INITIALS
1	DRAFT 2	15-11-10	R.H.
0	INITIAL DRAFT	15-04-28	J.W.

N
0 3,000 6,000 12,000
METRES
1:400,000
UTM NAD83 ZONE 9

PROJECT 1314220010

FIGURE A-15

REV. 1

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Appendix B: Summary of *Canadian Environmental Assessment Act, 2012* Requirements

This Appendix will include a summary table and will summarize how all requirements in Sections 5(1), 5(2) and 19(1) of CEAA 2012 have been met or addressed in the Application. The summary table will:

- Describe how each environmental effect listed in Section 5 and each factor to be considered listed in Section 10(1) of CEAA 2012 were considered in the Application;
- Identify any potential environmental effects as described in Section 5 of CEAA 2012, including cumulative effects;
- List mitigation measures that are proposed to reduce any potential environmental effects described in the Section 5 of CEAA 2012;
- State the significance of residual effects, or with respect to Section 5(1)(c) considerations, provide a conclusion on the adequacy of mitigation measures related to any Section 5 environmental effects;
- List any follow-up programs to be undertaken by the Proponent; and
- Reference the section in the Application where additional information can be found in consideration of Sections 5 and 19 of CEAA 2012.

The summary will also identify the sections in the Application where additional information on Section 5 and 19(1) requirements can be found. The summary will be presented in a summary table, in format similar to Table 42.

Table 42: Location and Additional Information on *Canadian Environmental Assessment Act, 2012* Requirements

CEAA 2012 Effect or Factor	Summary of Assessment	More Information