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BG GROUP

Project Description

PRINCE RUPERT LNG

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Project Number:
60284368

Date:
April 2013

AECOM


PRINCE
RUPERT
LNG

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List of Abbreviations

AGRU	Acid Gas Removal Unit
AIS	Automatic identification System
AOA	Archaeological Overview Assessment
APEC	Aboriginal and Public Engagement and Consultation
APUs	Accelerated Processing Units
Ar	Argon
bar(a)	Absolute pressure
BC	British Columbia
BCAQOS	British Columbia Air Quality Objectives and Standards
BCEAO	BC Environmental Assessment Office
BCEAA	BC *Environmental Assessment Act*
BCIHA	BC Interior Health Authority
BCMOE	BC Ministry of Environment
BCOGC	BC Oil and Gas Commission
BCUC	BC Utilities Commission
BG Canada	BG International Limited, conducting business in Canada as BG Canada
BOG	Boil-off gas
°C	Degrees Celsius
CAC	Criteria Air Contaminants
CCR	Central Control Room
CD	Chart Datum
CEA Agency	Canadian Environmental Assessment Agency
CEAA, 2012	*Canadian Environmental Assessment Act, 2012*
cm	Centimetre
CMHC	Canadian Mortgage and Housing Corporation
CMT	Culturally Modified Tree
CN Rail	Canadian National Railway Company
CO	Carbon monoxide
CO_2	Carbon dioxide
CPI	Corrugated plate interceptor
CSA	Canadian Safety Association
CTA	Canadian Transportation Agency
CWHvh2	Coastal Western Hemlock - Very Wet Hypermaritime Subzone - Central Variant Biogeoclimatic Zone
DAF	Dissolved Air Flotation
dBA	A-weighted decibels
DFO	Fisheries and Oceans Canada (Department of Fisheries and Oceans)
DLE	Dry Low Emissions
EA	Environmental Assessment
EAC	Environmental Assessment Certificate
EBM	Ecosystem-based management
EC	Environment Canada
EIS	Environmental Impact Statement
ESA	Environmental Site Assessment
EVQO	Established Visual Quality Objectives
GHGs	Greenhouse gases
ha	Hectare

HADD	Harmful alteration, disruption or destruction of fish habitat
HAPs	Hazardous Air Pollutants
HCA	BC *Heritage Conservation Act*
HHV	Higher heating value
HP	Horsepower
HSDA	Health Service Delivery Area
HST	Harmonized Sales Tax
HVAC	Heating, ventilating and air conditioning
INMS	Institute for National Measurement Standards
ISO	International Organization for Standardization
km	Kilometre
kph	Kilometres per hour
L	Litre
L_{dn}	Day night average sound level
L_{eq}	Equivalent sound level
LFL	Lower flammable limit
LNG	Liquefied natural gas
LRMP	Land and Resource Management Plan
m	Metre
MCC	Master Control Centre
MCTS	Marine Communication Traffic Services
MDEA	Methyl diethanolamine
MJ	Megajoule
mm	Millimetre
mmscfd	Million standard cubic feet per day
MOF	Material offloading facility
mtpa	Million tonnes per annum
MW	Megawatt
NAAQO	National Ambient Air Quality Objectives
N_2	Nitrogen
NEB	National Energy Board
NO_2	Nitrogen dioxide
NO_x	Mono-nitrogen oxides
NRC	Natural Resources Canada
O_2	Oxygen
OCP	Official Community Plan
%	Percent
PD	Project description
PGU	Power Generation Unit
PJ	Petajoule, 10^{15} joules
PM	Particulate matter
PM_{10}	Particulate matter less than 10 micrometres (microns) in diameter
$PM_{2.5}$	Particulate matter less than 2.5 micrometres (microns) in diameter
PRG	Prince Rupert Grain
PRPA	Prince Rupert Port Authority
QA/QC	Quality Assurance and Quality Control
RCMP	Royal Canadian Mounted Police
RO	Reverse osmosis
RTI	Ridley Terminals Inc.

RWT	Regional Workforce Tables
s	second
SARA	*Species at Risk Act* (Federal)
SC	Special Concern
SCR	Selective catalytic reduction
SIS	Safety Instrumented System
SLM	Sound level meters
SO_2	Sulphur dioxide
SO_x	Sulphur oxides
SPMT	Self Propelled Module Transporters
STC	Sound transmission class
t	tonne (1,000 kilograms)
t/d	Tonnes per day
TC	Transport Canada
TEM	Terrestrial ecosystem mapping
TLSA	Terrestrial Local Study Area
Trains	LNG production trains
TSP	Total suspended particulate
TUS	Traditional Use Studies
UPS	Uninterruptible power supply
US	United States
USEPA	United States Environmental Protection Agency
UTM	Universal Transverse Mercator
VOC	Volatile Organic Compounds
VSEC	Valued Socio-Economic Component
VSC	Visual Sensitivity Class
VSU	Visually Sensitive Unit
WSC	Water Survey of Canada

1. General Information and Contacts

Prince Rupert LNG Limited (PRLNG) proposes to develop a Liquefied Natural Gas (LNG) facility on Ridley Island at the Port of Prince Rupert British Columbia (BC). The name of the project is Prince Rupert LNG (the Project).

CEAA Guide 1.0, 1.2.

1.1 Project Overview

CEAA Guide 1.1
CEAA Regs 1.0
BCEAO Guide General Background Information

The Project includes construction of a natural gas liquefaction plant and associated port and infrastructure facilities to export natural gas to international markets. The LNG facility (the Facility) will be developed in two phases, reaching a nominal capacity of up to 21 million tonnes per annum (mtpa) when all three parallel LNG production trains[1] (trains) are constructed and operational.

The Project site (the Site) covers approximately 125 hectares (ha) of land on the southwestern part of Ridley Island (Figure 1.1). The Site was selected because of its available deep-water port and safe navigation access, road access, and existing infrastructure. Ridley Island is Federal Crown Land under the administration of the Prince Rupert Port Authority (PRPA) and has been designated for industrial use by the PRPA (Prince Rupert Port Authority, 2011).

Ridley Island is partially developed, with the Ridley Terminals Inc. (RTI) coal trans-shipment facility, the Prince Rupert Grain (PRG) Terminal and the Quickload Container Examination Facility located on the northern portion of the island. The former Skeena Cellulose pulp mill site on Watson Island is located to the east of the Site. The Canpotex potash export terminal is expected to be constructed north of the Site on Ridley Island. The Ridley Island Road, Rail and Utility Corridor Project will extend access from the north and loop around the central part of the island. The Pacific Northwest LNG Project is being proposed by Progress Energy Canada Ltd. on the adjacent Lelu Island, to the south of the Site. The locations of these developments relative to the Project are depicted in Figure 1.2.

The northeast boundary of the project footprint will be approximately 850 metres (m) from the nearest residences in the community of Port Edward, across Porpoise Harbour. Ridley Island is 17 kilometres (km) from the city of Prince Rupert and 15 km from Port Edward via road (Figure 1.3).

The communities of Metlakatla and Port Simpson (Lax Kw'alaams) are both located north of Prince Rupert. The Metlakatla reserve, S 1/2 Tsimpsean 2 is the closest to the Project at approximately 12 km away. The Lax Kw'alaams reserve, Lax Kw'alaams 1, is approximately 22 km away from the Project (Figure 1.3).

[1] *An LNG train is the term used to describe the liquefaction and purification facilities in a liquefied natural gas plant.*

Basemapping from Department of Natural Resources Canada, Microsoft Bing, ESRI Basedata and AECOM 2013.

N
W E
S

0 250 500
Meters

1:20,000

NAD 1983 UTM Zone 9N

Legend

- Land Lease
- Water Lease

BG Baseline Studies
Location: Ridley Island, BC

Proposed Site Location on Ridley Island

April 2013
Project: 60284368

AECOM

Figure 1-1

File Location: P:\60284368\000-CADD\050 GIS WIP\02_Maps\SOCIO_ECONOMIC_PROGRAM\2013-01-16-ProjectDescription\Fig1-1-2013-04-03-ProposedSiteLocation-60284368.mxd Date Revised: April 03, 2013 Prepared by: DL Project: 60284368

Basemapping from Department of Natural Resources Canada and ESRI Basedata.

N
W E
S

0 250 500
Meters

1:20,000

NAD 1983 UTM Zone 9N

Legend

- Land Lease
- Water Lease
- Canpotex Potash
- Pacific Northwest LNG
- Ridley Island Road, Rail and Utility Corridor Project

BG Baseline Studies
Location: Ridley Island, BC

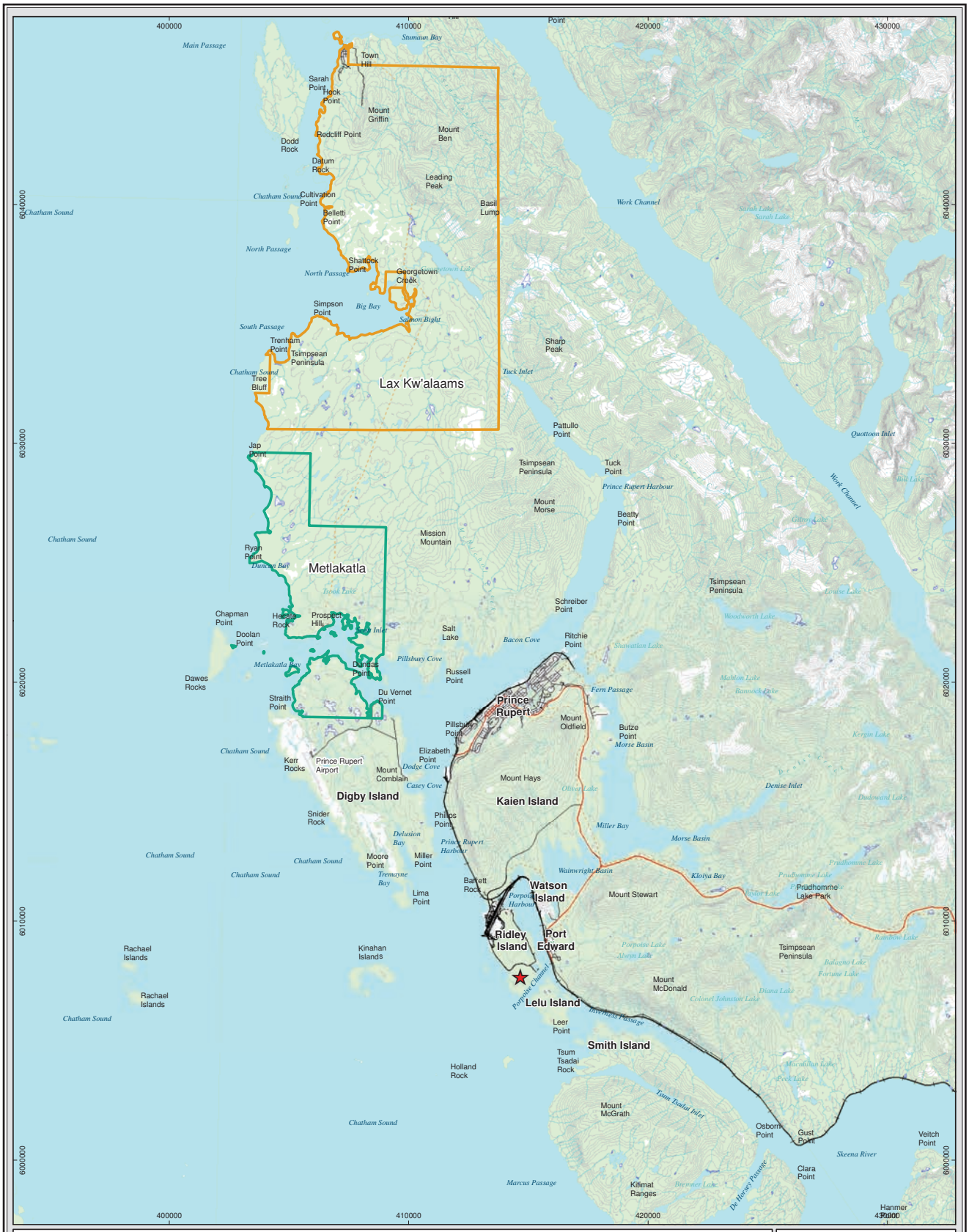
Proximity of the Development to Other Sites

April 2013
Project: 60284368

AECOM

Figure 1-2

File Location: P:\60284368\000-CADD\050 GIS WIP\02_Maps\SOCIO_ECONOMIC_PROGRAM\2013-01-16-ProjectDescription\Fig1-2-2013-04-03-ProximityOfDevelopmentToOtherSite-60284368.mxd Date Revised: April 04, 2013 Prepared by: DL Project: 60284368



Basemapping from Department of Natural Resources Canada and ESRI Basedata.

N
W E
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0 1 2 3 4 5
Kilometers

1:150,000

NAD 1983 UTM Zone 9N

Legend

- Project Site
- Rail
- Road
- Highway
- River
- Lake
- Wetland

First Nation Reserves

- Lax Kw'alaams
- Metlakatla

BG Baseline Studies
Location: Ridley Island, BC

Overview Map

April 2013
Project: 60284368

AECOM

Figure 1-3

1.2 Proponent and Corporate Information

CEAA Guide 1.2
CEAA Regs 2.0
BCEAO Guide
Proponent Information

The Project will be designed, owned and operated by PRLNG[2], a wholly owned subsidiary of BG International Limited, a corporation incorporated under the law of England and Wales and extra-provincially registered in BC and conducting business in Canada as BG Canada.

PRLNG is part of BG Group plc (BG Group), a leader in the global energy market and a top-20 publicly listed company on the London Stock Exchange.

BG Group operates worldwide throughout the gas supply chain in exploration, production, transmission and distribution. With interests in 25 countries, BG Group has developed a leading position in the global LNG industry, based upon flexible, long-term supply contracts and a fleet of modern LNG carriers that are able to meet the needs of a rapidly changing market.

BG Group has a core fleet that it owns or has under long-term charter. In addition, BG Group contracts additional shipping as required on a short or medium-term basis to capture business opportunities and maintain a balanced shipping position. During 2012, BG Group utilized between 23 and 30 LNG carriers at any one time giving it control of one of the largest fleets of modern LNG carriers of any international oil and gas company.

BG Group has equity stakes in liquefaction facilities in Egypt and Trinidad and Tobago. BG Group's equity share of liquefaction volumes from these interests in 2011 was 5.7 mtpa. A two-train 8.5 mtpa liquefaction plant on Curtis Island in Queensland, Australia, is also being developed by BG Group.

BG Group operates under a series of Business Principles that clearly establish its core values in the areas of social performance, health, safety, security and environment:

- We work to ensure that neighbouring communities benefit from our presence on an enduring basis.
- We listen to neighbouring communities and take account of their interests.
- We support human rights within our area of influence.
- We believe that all injuries are preventable.
- We provide healthy, safe and secure work environments.
- We make a positive contribution to the protection of the environment.
- We go beyond compliance with local environmental regulation to meet internationally accepted best practice.
- We reduce to the minimum practicable any adverse effects of our operations on the environment.

Our social performance objectives will be met through:

- establishing and maintaining relationships with interested and affected stakeholders.

[2] *PRLNG may contract operation of the facility to a BG Group affiliate company, which will comply with applicable legal and regulatory requirements for operation of the Facility.*

- avoiding or controlling the negative impacts of our activities.
- creating and delivering on opportunities to enhance benefits to society.

Our environmental objectives will be met through:

- the use of Best Available Techniques to prevent significant harm to the environment or people.
- actively managing and controlling emissions of greenhouse gases.
- managing the physical risks to facilities resulting from climate change[3].
- preventing significant harm to the environment or people from air emissions.
- eliminating the emission of ozone depleting substances.
- preventing significant harm to the environment or people from aqueous discharges.
- recognizing limitations in resource availability and minimizing demand on those resources.
- controlling noise impacts on third parties.
- controlling adverse impacts on biodiversity and maximizing opportunities to enhance biodiversity management.
- ensuring adequate preparation to deal effectively with a spill or leakage of oil.

BG Group has implemented an Environmental Standard[4] and a Social Performance Standard[5] to ensure that compliance with the Business Principles is achieved[6]. The BG Group Environmental Standard requires that all new projects such as PRLNG consider environmental impacts as well as commercial or financial considerations and ensures these are taken into account when making capital or operations decisions. BG Group references external guidelines and organizations as benchmarks for determining best practice. Various industry associations and international organizations set standards and create guidance documents to further best practice within the oil and gas industry.

CEAA Guide 1.2
CEAA Regs 2.0
BCEAO Guide
Proponent Information

1.2.1 Proponent Contact Information

Project Name:	Prince Rupert LNG Project		
Project Website:	www.princerupertlng.com		
Proponent:	Prince Rupert LNG Limited	Company Representative:	
Address:	1330 - 1075 West Georgia St.	Name:	Stephen J. Swaffield
	Vancouver, BC, Canada, V6E 3C9	Title:	Acting President, BG Canada
Phone:	+1 604 683 4545	Email:	steve.swaffield@bg-group.com
Fax:	+1 604 683 2566	Phone:	+1 604 683 0056

[3] *Available at: http://www.bg-group.com/OurBusiness/ourbusiness/pages/climatechange1.aspx*
[4] *Available at: http://www.bg-group.com/sustainability11/ManagementSystems/Pages/Environment.aspx*
[5] *Available at: http://www.bg-group.com/sustainability11/ManagementSystems/Documents/BG-ST-PCA-SOC-001-Social-Performance.pdf)*
[6] *BG Group Standards are updated and revised regularly based on lessons learned and project specific information.*

1.2.2 Consultant Contact Information

Consultant:	AECOM Canada Ltd.	Company Representative:	
Address:	3292 Production Way, Floor 4	Name:	Joanne Petrini
	Burnaby, BC, Canada, V5A 4R4	Title:	Associate Vice President,
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Fax:	+1 604 294 8597	Email:	joanne.petrini@aecom.com
		Phone:	+1 604 444 6516

1.3 Overview of Engagement and Consultation to Date

CEAA Guide 1.3
CEAA Regs 3.0
BCEAO Guide
Consultation Activities

PRLNG has engaged with local communities and First Nations through meetings, open houses, correspondence, community newsletters and mail-outs. A representative of the Project resides in Prince Rupert and is responsible for outreach to local communities and is available to answer questions and receive feedback on the Project. Open houses were conducted in November 2012 in Port Edward and Prince Rupert.

PRLNG has identified the following categories of groups that would be engaged and consulted as part of the environmental assessment (EA) of the Project:

- Aboriginal Groups
- Federal government
- Provincial government
- Local government
- Landowners and Land / Resource Users
- PRPA
- Other stakeholders

The following sections describe the Aboriginal Groups and stakeholders identified to date that will be consulted and engaged. As the EA progresses and further planned engagement occurs, the list of parties and their interest in the Project is expected to grow and evolve. PRLNG seeks to engage with all members of local communities and to be responsive to community questions and concerns throughout the EA process.

1.3.1 Aboriginal Groups to be Consulted and Engaged

BG Group's Social Performance Standard commits PRLNG to follow an approach in all aspects of project development and operation that recognizes and respects the rights of Indigenous People potentially affected by their activities. Aboriginal Groups have been identified that will be consulted and engaged as part of the EA process and with whom PRLNG hopes to form meaningful and respectful lasting relationships (Table 1.1).

Table 1.1. List of Aboriginal Groups

Aboriginal Group	Contacted to Date
Lax Kw'alaams	Yes
Metlakatla	Yes
Gitxaala	Yes
Kitselas	Yes
Kitsumkalum	Yes
Council of the Haida Nation	No
Coastal First Nations Great Bear Initiative	Yes

PRLNG initiated engagement with Aboriginal Groups from the very early stages of the Project in October 2011. Engagement has included meetings with Aboriginal community leaders, community meetings, telephone conversations and written correspondence by letter and e-mail.

At the Project's inception, the leadership of Lax Kw'alaams and Metlakatla First Nations, collectively known as the "Coast Tsimshian", chose to engage with PRLNG jointly. During later discussions in March 2012 and by correspondence, the representatives and leadership of Lax Kw'alaams and Metlakatla conveyed their mutual decision to continue further discussions with PRLNG independently of one another. Further information on consultation with Aboriginal Groups is provided in Section 6.

1.3.2 Stakeholders to be Consulted and Engaged

Stakeholders are defined by BG Group as interested and affected parties (organization/s, governmental entity/entities or individual/s), who have either real or perceived stakes (both financial and non-financial) in the Project. A Project's stakeholders include those who are affected by the Project as well as those who can affect the Project.

Stakeholders involved to date in the Project include those with a direct interest in the Project and those who have been consulted for advice and information related to the social, environmental and regulatory context of the Project. A preliminary list of Stakeholders has been developed (Table 1.2). Further information on consultation with stakeholders is provided in Section 7.

Table 1.2. List of Stakeholders

Stakeholder	Consulted
Federal Government	
Aboriginal Affairs and Northern Development Canada (AANDC)	Yes
Canadian Environmental Assessment Agency (CEA Agency)	Yes
Environment Canada (EC)	Yes
Fisheries and Oceans Canada (DFO)	Yes
Health Canada (HC)	No
Major Projects Management Office	Yes

Stakeholder	Consulted
Natural Resources Canada (NRCan)	Yes
Transport Canada	Yes
PRPA	Yes
Provincial Government	
BC Ministry of Aboriginal Relations and Reconciliation (BC MARR)	Yes
BC Ministry of Energy, Mines and Natural Gas and Responsible for Housing (BC MEMNG)	Yes
BC Ministry of Environment (BC MOE)	Yes
BC Ministry of Forests, Lands and Natural Resource Operations (BC MFLNRO)	No
BC Ministry of Jobs, Tourism and Innovation (BC MJTI)	Yes
BC Ministry of Transportation and Infrastructure (BC MOTI)	No
British Columbia Environmental Assessment Office (BCEAO)	Yes
BC Oil and Gas Commission	Yes
Northern Health Authority	No
MLA North Coast	Yes
NDP Minister, Energy Critic	Yes
Local Government	
City of Prince Rupert (Mayor and Council)	Yes
City of Prince Rupert staff (planning public works, recreation and community services)	Yes
DFO Marine Communications and Traffic Services in Seal Cove	Yes
District of Port Edward (Mayor and Council)	Yes
Royal Canadian Mounted Police (RCMP)	No
School District 52	Yes
Skeena Queen Charlottes Regional District	Yes
Landowners and Land / Resource Users	
Prince Rupert Port Authority	Yes
Rikki Dickens (Trapline holder)	No
Other Stakeholder	
Local residents	Yes
Northern Health	Yes
Chatham Sound Charter Boat Association	No
Community Futures of Pacific Northwest	Yes
Hecate Strait Employment Development Society	Yes
North Coast Forest District	No
Northwest Community College	No
Port Edward Harbour Authority	Yes
Prince Rupert & Port Edward Economic Development Corporation	Yes
Prince Rupert Chamber of Commerce	Yes

Stakeholder	Consulted
School District	Yes
T Buck Suzuki	Yes
Tourism operators (various)	No
Tourism Prince Rupert	Yes
United Fisherman and Allied Workers Union	Yes

1.4 Federal and Provincial Environmental Assessment

CEAA Guide 1.4
CEAA Regs 4.0(a)
BCEAO Guide General Background Information

PRLNG is seeking approval under the *Canadian Environmental Assessment Act, 2012* (CEAA 2012) and an Environmental Assessment Certificate under the *BC Environmental Assessment Act* (BCEAA). PRLNG expects that if the Project is required to undergo both a federal and provincial EAs that the EA process would be harmonized into a single process pursuant to the Canada-British Columbia Agreement on Environmental Assessment Co-operation (2004) or a new agreement developed in light of CEAA 2012.

1.4.1 Federal and Provincial Environmental Assessment Thresholds

CEAA Guide 2.2
CEAA Regs 6.0
CEAA Regs 8.0
BCEAO Guide General Background Information

The Project is a facility for the liquefaction of natural gas into LNG with a processing capacity of more than 3,000 tonnes per day (t/d). The anticipated processing capacity is 19,726 t/d per train. Therefore, it meets the criteria of a designated project pursuant to section 13 (d) of the schedule to the federal *Regulations Designating Physical Activities.*

Power generation requirement of the Project are 540 MW (Phase 1) with an addition 260 MW (Phase 2) therefore activity 2(a) in the schedule of the *Regulation Designating Physical Activities*, which is “The construction, operation, decommissioning and abandonment of a fossil fuel-fired electrical generating station with a production capacity of 200 MW or more” applies to the Project.

The Facility will have the capability to store energy that can yield, by combustion, more than 3 petajoules (PJ) of energy. The LNG storage capacity is 540,000 m^3, and, by using a typical energy density (lower heating value) of LNG of 21 megajoule per litre (MJ/L), the LNG volume stored would have an energy content upon combustion on the order of 11.34 PJ. Therefore, it meets the criteria of a reviewable project pursuant to Part 4 of the provincial *Reviewable Projects Regulation.*

1.4.2 Project Description Format

Under CEAA 2012, a project description is required to initiate the federal EA process. The project description triggers the screening process that is used by the Canadian Environmental Assessment Agency (CEA Agency) to determine whether a federal EA is required. A project description is also required to initiate the provincial EA process.

This document is intended to satisfy both federal and provincial requirements for a project description. For ease of reference, notations to the applicable federal and provincial guidance for project descriptions are included in the right hand margin of this document. The federal process requires that a summary of the project description be provided in both English and French. The

English summary and the French summary have been submitted as separate supporting documents.

Section 4 provides information on additional federal and provincial permits, licences, approvals and authorizations that might be required for the Project.

1.5 Regional Environmental Studies

CEAA Guide 1.4
CEAA Regs 4.0(b)

The Project is located in a region that has not been the subject of federal regional environmental studies.

2. Project Information

CEAA Guide 2.0
CEAA Guide 2.1
CEAA Reg 5.0
BCEAO Guide
Project Overview Information

PRLNG proposes to develop an LNG export facility on Ridley Island at the Port of Prince Rupert, BC. From the Facility, gas sourced from northeastern BC will be exported to world markets.

2.1 Project Summary

The production capacity of the Facility will be developed in two phases: Phase 1, will include Trains 1 and 2, and construction is anticipated to begin in 2016. Phase 2 will achieve full build-out of the processing capacity of the Facility with addition of Train 3. The timing of Phase 2 and addition of Train 3 will depend on market conditions. Section 2.4 provides more detail on construction phases and timing. When fully developed, the Facility will include three LNG processing units, or "trains" with a total capacity of up to 21 mtpa, approximately 7 mtpa each.

LNG is produced by cooling natural gas to -162 degrees Celsius (^{o}C), the temperature at which it becomes liquid. This process reduces the volume of the natural gas by more than 600 times, enabling its safe and efficient transport by sea. LNG is non-corrosive and non-toxic, and is stored at low pressures near atmospheric levels.

LNG from the liquefaction process will be held in one to three LNG storage tanks, each with a capacity of up to 180,000 m^3. The tanks will be full containment type with an inner free standing metal tank fully enclosed in outer concrete walls and concrete roofs.

The marine terminal will initially include one trestle (jetty) and one ship-loading berth (Figure 2.1). The berth will accommodate current Q-Flex LNG carriers (Photograph 2.1), with cargo capacity of up to 210,000 m^3. When Train 3 is constructed, a trestle extension and second ship loading berth will be added. Each berth will have a ship loading capacity of up to 12,000 m^3/hr. The marine terminal and deepwater channel approach will include navigation aids conforming to the standards under the *Canada Shipping Act*.

Photograph 2.1. LNG Carrier

For Phase 1, there will be an estimated 189 vessel calls per year or three to four calls per week. When Train 3 comes into operation in Phase 2, an additional 95 vessel calls will be made per year, for a total of five or six carriers visiting the Facility per week.

During operations, power for the Facility will be generated by burning natural gas in turbines onsite. The Facility will be self-sufficient for all of its power needs.

During construction, temporary infrastructure will be required for access roads, borrow sites, construction laydown areas, and the construction camp. At Project completion the construction camp will either be fully decommissioned or partially decommissioned and retained for turnover (labour intensive periods of facility maintenance). Temporary docks for off-loading equipment and materials during construction will also be required. A permanent material offloading facility (MOF) will also be required.

2.2 Purpose and Rationale

CEAA Guide 2.1
BCEAO Guide General Background Information

In 2009, global demand for LNG was 183 mtpa, but forecasts estimate that global LNG demand will rise by more than 50% to 280 mtpa by 2015 (BG Group, 2013b). Asia continues to be the primary source of LNG demand: alongside historical markets Japan and Korea, PRLNG also expects to see high growth in China and India.

PRLNG believes that several large scale LNG export projects will be required to meet this demand and that BC is well positioned to compete in the international LNG market. BC has substantial reserves of natural gas and export facilities located on the north coast of BC are advantageously located to ship LNG to areas of demand growth.

BG Group is well placed to capture additional demand with potential supply positions in the United States (US), East Africa and PRLNG's Project in Western Canada. This Project is needed to add long-term stable supply to BG Group's portfolio of LNG capacity for the company's existing and future client base.

2.3 Capital Cost and Employment

BCEAO Guide General Background Information

The operational life of the Facility is 30 years but can be extended up to 60 years.

The estimated capital cost of the Project is approximately US$11 billion for Phase 1 and US$5 billion for Phase 2.

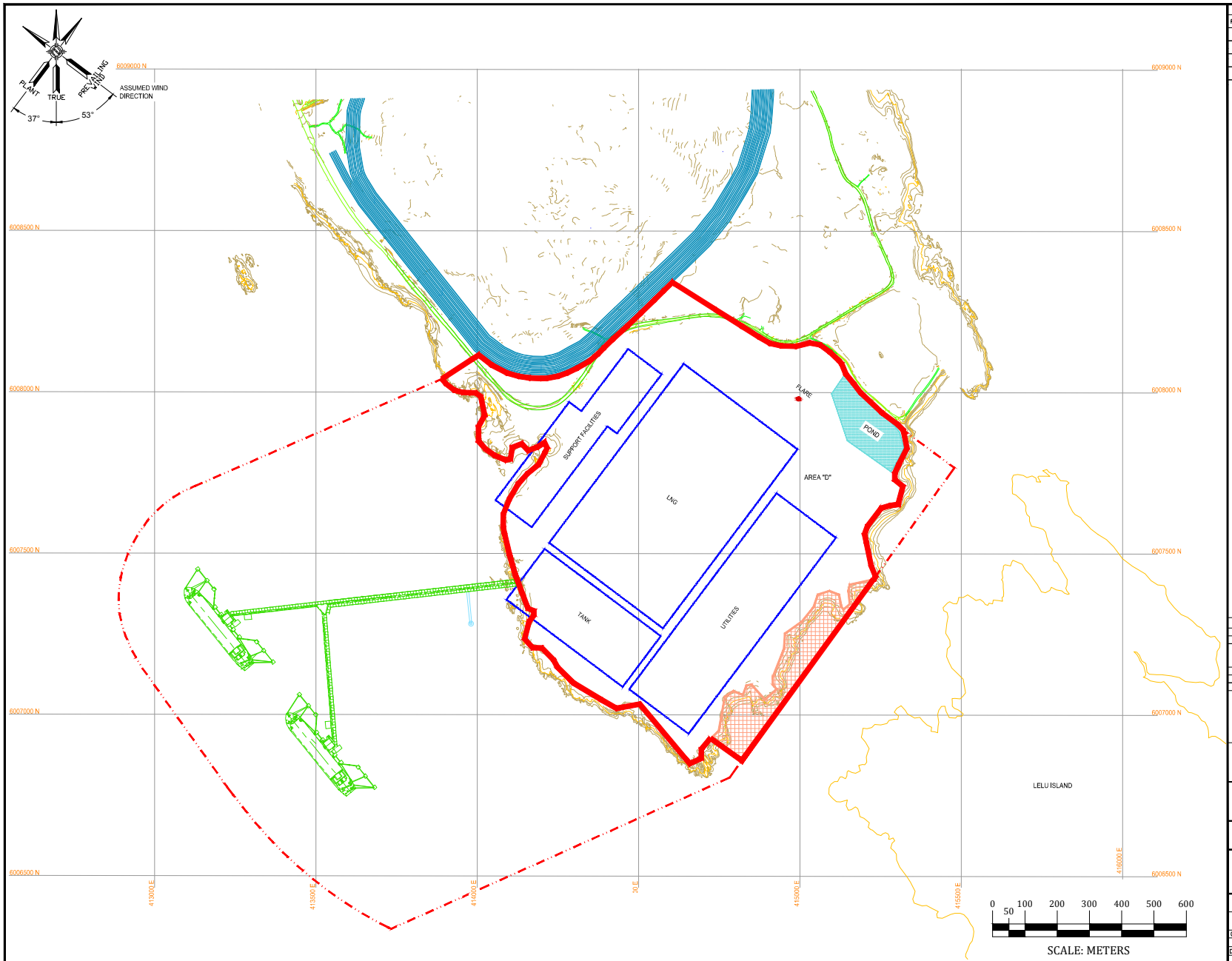
It is anticipated that 9,000 person-years of employment will be created during Phase 1 and 3,500 person-years during Phase 2.

The operations phase of the Project will create many types of potential employment opportunities as outlined below:

- **Project Employees** – The Project is expected to employ about 250 people directly (at completion of Phase 2) across the following job types: facility staff (skilled technician / operators, management and supervision, unskilled workers) and office staff (management, professional engineers, office support staff).
- **Contracted Employment** – Many operational activities for the Project will be undertaken by contractors, and these may include: tug operators, boat pilots, cleaning and catering services, local transportation services, safety, audit and monitoring services. A precise estimate of the total employment opportunities with contracted companies is not available at this time.

- **Indirect Employment** – The Project will require food, fuel, transportation, information technology, and office equipment and other supplies. This demand will create job opportunities within businesses that manufacture, process, or market these goods.
- **Induced Employment** – The jobs and extra household income created by the Project during the operations phase will lead to extra spending in the local economy. This extra spending will in turn lead to higher employment in multiple sectors, such as: housing and real estate services, recreation, entertainment, and food services.

The workforce will be sourced locally, from elsewhere within Canada, and then from outside of Canada as required to meet Project needs.



REVISIONS							
REV	DATE	BY	DESCRIPTION	CHKD	ENG	APPVD	APPVD
A			ISSUED FOR INFORMATION				

NOTES:

DRAWING KEY

- DENOTES NEW MATERIAL OFFLOADING FACILITIES (MOF)
- DENOTES AREA RESERVED FOR STORM WATER RETENTION
- DENOTES APPROXIMATE AREA "D" BOUNDARY
- DENOTES APPROXIMATE WATER LOT BOUNDARY
- DENOTES UNIT BOUNDARY BUFFER AREA (NORMAL BUFFER AREA = 15m)
- DENOTES GRAVEL ROAD

APPROVALS					
OWNERS	SUBMITTED	APPROVED	ABS	SUBMITTED	APPROVED
U.S.C.G.	SUBMITTED	APPROVED		SUBMITTED	APPROVED

CONFIDENTIALITY STATEMENT: CONFIDENTIALITY CATEGORY: C2

Technip
TECHNIP USA, Inc.

PRINCE RUPERT LNG
PRINCE RUPERT, BC

PRELIMINARY SITE LAYOUT PLAN

DRAWN	CHECKED	ENGINEER	SCALE
GN			NOTED
DATE	DATE	DATE	SHEET
8-23-12			SHT. 1 OF 1

CLIENT APPROVAL
DRAWING NUMBER
FIGURE 2-1
DATE:
TPUSA DRAWING NUMBER REV.
DH031224-0000-DW-0051-SK0FR A
DATE:

2.4 Project Construction – Components, Activities and Emissions

2.4.1 Construction Phases

CEAA Guide 2.5
CEAA Regs 11.0
BCEAO Guide Proposed Development Schedule

The Project will be constructed in two phases. Phase 1 is planned to commence in 2016 and is expected to last 60 months. Phase 1 will encompass the construction of two LNG processing units (Trains 1 and 2) and the supporting onshore and marine infrastructure for the Facility. The construction of the two trains will occur concurrently with approximately six to twelve months between commissioning of Train 1 and Train 2. Train 1 is expected to be operational as Train 2 construction is completed.

Phase 2 is expected to last 42 months and will include construction of the third LNG processing unit (Train 3), an additional marine berth and LNG storage tank, and the decommissioning of any temporary construction facilities no longer required. The start date for Phase 2 will depend on market conditions. The two construction phases may immediately follow each other or there could be a time lag. In Phase 2, Trains 1 and 2 will already be in operation and construction of Train 3 will be undertaken simultaneously.

2.4.2 Construction Activities and Sequencing

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CEAA Guide 2.5
CEAA Regs 7.0
CEAA Regs 11.0
BCEAO Guide Project Overview
BCEAO Guide Proposed Development Schedule

To address space constraints on the Site and limitations of labour availability identified by early constructability studies, a modularized construction methodology will be used for the Facility. Modules are key pieces of pre-fabricated, pre-assembled and tested equipment supplied by specialized companies sourced for their specific technical excellence in process facilities and code stamped piping/equipment. These modules are expected to range from about 500 tonnes up to 6,000 tonnes and will be delivered to the Site on ocean-going barges that will be either self-powered or pulled by tractor tugs. The description of the construction process below is based on the use of these pre-assembled modules. Significant elements of the Facility cannot be modularized, and those will be built or pre-assembled into smaller units onsite.

Construction during the two phases will occur in the following sequence with some activities occurring concurrently. Construction will take place 24 hours per day, 7 days per week. Construction activity during night time hours will be planned to control noise and vibration. Mitigation measures to control potential effects on wildlife and marine mammals during the construction phase will be considered as described in Section 5. Tree-clearing or habitat-altering activities will be limited to time periods outside of the critical life stage (e.g., not during breeding season for birds or amphibians) where possible. Blasting or other noisy construction will be avoided when marine mammals are in the area.

Phase 1:

- Site preparation
- Construction of the MOF
- Civil works, foundations and structures
  - Onshore facilities
  - Marine facilities
    - Dredging of berth areas and turning basin
    - Pile installation

  - Erection of the jetty
- Erection of pre-assembled modules
  - LNG Trains 1 and 2
  - Utility area and Power Generation Unit (PGU)
  - Two LNG storage tanks
- Erection of structures
  - Flare
  - Gas inlet facilities
  - Pipe rack to the flare
- Mechanical and electrical installation
- Systems pressure, strength and integrity testing

Phase 2:

- Installation of pre-assembled modules for Train 3
- Erection of the second marine jetty
- Erection of the third LNG storage tank (if required)
- Completion of interconnecting and utilities pre-assembled modules
- Installation of the PGU for Train 3
- Systems pressure, strength and integrity testing

These construction activities are described in more detail in the following sections. Pre-commissioning of the Facility is described under plant operation.

2.4.2.1 Phase 1 Construction

Site Preparation

Site preparation will begin with clearing vegetation across the footprint of the Facility, and other areas where vegetation clearing is required for ancillary facilities (e.g., firebreaks and perimeter fence access). The ground surface will be levelled and prepared for construction. Activities will include grubbing the root mat, stripping and placement of top soils, disposal of the root mat and topsoil to designated disposal sites, excavation of existing soil materials, and placement of compacted engineered fill. Controlled blasting will be required to loosen or remove shallow rock layers to sufficiently level the site for subsequent stages of construction. Rock material will be reused onsite for site levelling to the maximum extent possible. Disposal alternatives will be sought for any surplus material, if needed.

A temporary dock will be constructed to allow mobilization of personnel and equipment to the Site early in the Project and in advance of construction of the permanent MOF. A site security fence will be erected around the perimeter of the Site. Onsite access roads and a haul road from the MOF location to laydown areas will be constructed.

Material Offloading Facility (MOF)

The MOF is a permanent dock that will be used to transfer materials and equipment to the Facility during construction and operation. Construction of the MOF will be undertaken from onshore and from floating barges and cranes, with sheet piling for the MOF undertaken from piling rigs working from oceangoing equipment. The MOF will be primarily used during construction. There will be short periods during safety-critical operations when access around the MOF and within the channel will be temporarily restricted (typically less than 24 hours). Dredging for the MOF is discussed below in the Civil Works for Marine Facilities section.

Civil Works, Foundations and Structures

Civil Works for Onshore Facilities – Will begin with foundation construction for the LNG processing area. Foundations for modularized structures (pipe-racks, process structures, etc.) will be designed to allow a direct approach by Self Propelled Module Transporters (SPMT) and avoid heavy lifting by cranes. Construction activities will include excavation, dewatering, and placement of a reinforced concrete base. Construction of reinforced foundations for the compressors, pipe racks and other major equipment will begin within the processing facility areas. Additional foundation work will be completed throughout the site for the interconnecting pipe racks, buildings, LNG storage tanks, structures and supporting equipment that are located outside of the main processing areas.

Following completion of underground and foundation works, a final grade for the Site will be established. The grade may vary across the Site. To make best use of the Site PRLNG will seek to optimize use of the Site when locating equipment relative to the surrounding environment.

During construction, a temporary drainage system will be established to collect and control stormwater flows over the Site (Section 2.4.4). The temporary drainage system will include the following control measures: perimeter ditches, internal ditches, and cut-off swales. Civil work will include construction of the permanent storm water management infrastructure, including storm sewers and drains.

Civil Works for Marine Facilities – Phase 1 will proceed concurrently with the onshore civil and concrete installation program. Marine facilities will include the LNG jetty and trestle. Construction of the jetty will involve drilling or driving piles for foundations. The trestle will extend from the shoreline across a pile supported deck connecting to the jetty head. Blasting for marine facilities is not anticipated but will continue to be evaluated.

Dredging is required for the MOF and the LNG berth and turning basin to increase the depth of navigable water to -14.0 m Chart Datum (CD) for the LNG swing basin, and -11.0 m CD for the MOF approach (along Porpoise Channel). The volume to be dredged is estimated to be 2,615,000 m^3 over a water surface of roughly 432,000 m^2 extending over near-shore areas contiguous with the Site shoreline.

Erection of Pre-assembled Modules – Will be assembled offsite by different module yards. Modules (e.g., pipe-rack modules, process modules, building modules) will be delivered by barge to the MOF and immediately transferred by means of SPMTs from the MOF to the Site using the heavy haul road. The module is then erected onsite. If needed, a module staging area will be set up to store the modules until they are ready for installation. The overall Facility assembly sequence will include:

- **Erection of the LNG Trains** – The sequence starts with erection of the main pipe-rack, then the secondary pipe-racks, erection of the stick built vessels constructed onsite, the process units, the technical rooms, the vendor large modules and the vendor ancillary modularized systems.
- **Erection of the Utility Area and PGU** – The sequence starts with erection of the tanks, then the pipe-racks and the technical rooms.
- **Erection with Crane** – The equipment to be erected as stick built (not on module) is transported by trailers and erected with cranes.
- **Modules Hook-up** – As soon as a module is placed on the foundation the hook-up can be started, involving erection of secondary steel structures, piping closure welds at modules battery limit, hydraulic testing, paint touch up, insulation and cable tray connections.
- **Erection of LNG Tanks** – The site for each tank is graded and subjected to dynamic compaction. If required, foundation piles are then installed to support the load of the tank, followed by pouring of the tank-bottom slab supported by the piles and an upper slab and poured concrete wall temporarily supported by forming. Once the concrete tank walls are in place, the tank's steel roof and vapour barriers are installed. In the final stages of tank construction, the tank bottom plate and insulation are affixed to the inner surfaces of the tank. Nickel steel plating is used for this purpose. The plates are rolled at the offsite workshop, sand blasted, primed and painted. As the last steps in the tank construction sequence, the tank is purged with nitrogen and prepared for LNG delivery.
- **Erection of Other Onshore Structures** – Additional onshore construction includes erection of the flare stack, installation of the gas inlet facilities, and installation of the pipe rack to the flare.

Mechanical and Electrical Installation

Major deliveries of equipment and materials for the mechanical and electrical installation will begin once the MOF and temporary construction facilities are in place (i.e., site security fence, onsite access roads and haul road, and laydown areas). Deliveries will include structural steel, mechanical equipment, electrical equipment, and piping materials.

Initial electrical installation activities will consist of grounding the network and pulling the underground cables. The secondary cables are already pulled within a module, from the junction box to the instrument panel. The primary cables are pulled at the Site, once all the modules of a unit are installed and hooked up and the substation and controls rooms are completed. Mobile cranes are used to erect the structural steel and to set the major mechanical and electrical equipment. Pipe spools and straight run pipes will be installed and welded concurrently with steel erection.

Energizing the lighting is a high priority during this step to enable safer and more effective working conditions.

Systems Pressure, Strength and Integrity Testing

Following installation, all mechanical, electrical and control systems will be tested for integrity. Tests involving water, air, and inert gasses will be used for piping and other pressure and retaining systems. Safety and shutdown systems of the automated facility control will also be tested at this time.

2.4.2.2 Phase 2 Construction

The process components and supporting infrastructure to support LNG production will mainly be constructed and brought into operation during Phase 1. Construction of Phase 2 will be similar to Phase 1 activities described above. The principle distinction is that the Facility will already be operating. Construction of additional production, loading and supporting infrastructure required for Phase 2 include:

- installation of pre-assembled modules for LNG Train 3.
- erection of the second marine jetty.
- erection of the third LNG storage tank, if required.
- completion of interconnecting and utilities pre-assembled modules.
- installation of the PGU for Train 3.

2.4.3 Construction Facilities

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Facilities required to support the construction effort include:

- a construction camp (offsite).
- transportation infrastructure.
- docks and rail receiving facilities.
- warehouses, materials lay down areas and construction offices.
- a concrete batch plant and rock quarry.
- utilities.

Construction Camp

Several options are being investigated for housing project personnel during construction. The objective is to find the optimum mix of housing options that will maximize benefits to local communities, control negative effects and be operationally effective.

Notwithstanding adoption of different housing options, a construction camp will still be required to accommodate the numbers of construction workers required for the Project and to effectively mobilize workers to the Site without causing undue disruption to local traffic.

The construction camp will be designed to accommodate 3,850 people during Phase 1 of construction and 2,000 people in Phase 2. The capacity of the camp is currently sized for a larger number than may be required. PRLNG will endeavour to draw as much of the construction workforce that is practical and available from local communities. The construction camp will be built in stages, with an initial capacity for 1,000 persons and planned expansion in 1,000-person increments. This staged approach will complement progressive buildup in staffing to support construction activities. It will also allow for right sizing the camp based on alternative accommodation options that may be identified as Project design progresses. In Phase 2, the camp will be reduced to 2,000 persons or less. Following completion of construction of the Facility, the camp will then be either fully de-commissioned, partially decommissioned with the remainder retained for maintenance shutdowns, handed over for legacy purposes with right to space for maintenance shutdowns, or fully handed over for legacy purposes.

Third party service companies and management will secure accommodations in Prince Rupert or Port Edward, with the vast majority likely housed in Prince Rupert, as it is the significantly larger community. While the camp is under construction, temporary housing will be required in these communities for up to 400 people.

The camp will be operated on 12-hour shifts, with transport to the Facility and airport by boat and bus.

An area along the Ridley Island Road has been investigated for potential camp locations. The engineering, environmental and social aspects of the area will be evaluated and assessed during coming months to determine whether there is a suitable camp location. Additional areas aside from Ridley Island Road may also be investigated.

An area of about 16 ha will be required for the camp. This space will be adequate for all camp facilities, utilities, and other elements, such as parking and a bus turn-around. The camp will include typical facilities and services such as accommodation, canteen, laundry, recreation, camp administration, personnel lockers, emergency and medical services, sewage and waste management, security, garages and parking. Additional information on utilities to support the construction camp, including power, water supply, and sewage, is discussed below in the Utilities section.

Transportation Infrastructure

Transportation infrastructure needed to support movement of equipment and people on- and offsite will include onsite access and haul roads, motor pool, and parking lots. Onsite access will be provided by a network of internal roads linking principal site facilities. A heavy haul road will be established from the MOF to laydown areas. External access to the Site on Ridley Island and to potential camp locations will be along Ridley Island Road and the existing public road network.

A motor pool and parking lots will be established for bus transport of construction workers from the camp to the Site, and for motor vehicles and equipment that are centrally managed for the use of construction staff.

Docks and Rail Facilities

Docks and rail receiving facilities for construction materials and equipment will be required. A temporary dock for offloading equipment and materials during early construction stages will be

constructed during the Site preparation stage. A permanent MOF will be constructed to receive equipment and materials during construction and operation of the Facility. Rail receiving facilities may also be constructed.

Warehouses, Laydown Areas and Construction Offices

Construction support facilities will include warehouses, laydown areas, construction offices, fuel storage, fabrication workshops, and paint shop. A small warehouse will be located onsite for storing materials and equipment that are sensitive to exposure to the elements. Additional operational warehousing and maintenance facilities will be located offsite. All buildings will be pre-fabricated, climate controlled and insulated structures. Laydown areas are required for:

- civil engineering material and materials preparation.
- steel structures piping.
- equipment.
- batching plants.
- electrical cables.
- instrument cables.
- modules.

The construction office area will include:

- offices for PRLNG.
- an office for the main contractor.
- an office for the subcontractors.
- a first aid facility and ambulance service.
- safety training facilities.
- a canteen and mess hall.
- a utility area, water storage, and gas station to supply gasoline to the construction equipment.

Concrete Batch Plant, Rock Quarry and Processing Areas

Concrete Batch Plant – A concrete batching plant will be commissioned and built for construction works. The LNG storage tanks are anticipated to place the greatest demand on single and continuous operation of the plant and drive the production rate. The plant will meet the following performance criteria:

- Raw water including water from batching and wash down water where possible, will be recycled through the batching plant.
- Batching of raw materials will where appropriate and possible be done in a closed system to prevent emissions to the atmosphere prior to batching water being introduced.

Cement bulks and fly-ash will be stored in sealed silos, and aggregates and sands will be stored in open stockpiles.

Rock Quarry – In addition to the cement, sand, and aggregate required for concrete batching and rock crushing, additional aggregate and rock materials are required for:

- final grading.
- surfacing temporary access roads, working pads and sheeting.
- road sub-base and base materials.
- marine coastal armour and scour protection.

Aggregates and rock materials may be sourced from aggregate suppliers or, depending on available supply, a rock quarry may be established specifically for the Project.

Utilities

Utilities to support camp and construction operations will include power, water supply, and sewage.

Power – Electric power required during construction of the camp and Site will be supplied from the BC Hydro grid. Arrangements will be made to power all static construction equipment from this source, leaving only mobile equipment, emergency back-up generators and vehicles to be powered by liquid fuels. There are existing electrical transmission lines to Ridley Island and the area along Ridley Island Road being investigated as a potential location for the camp. Power for construction will be supplied by tying into existing transmission lines. No additional transmission lines are planned to support construction activities.

Electric power required during construction is estimated to be 10 megawatts (MW), for the Site and 8.5 MW for the camp, The electric power demand at the Site is evaluated based on the contemporary running of electrical equipment.

Water Supply – Water for the Site and construction camp will be sourced from the municipal water supply. Untreated water will be used for general construction purposes, such as compacting soil and dust control (15 m^3/day at peak). Treated potable water at the Site will be used for human consumption (280 m^3/day at peak) and for hydrotesting and civil works (e.g., mixing concrete) (45 m^3/day at peak). Total potable water consumption at the Site is estimated to be 340 m^3/day at peak.

Potable water supply for the construction camp will be based on the occupancy of 3,850 people at peak. Estimated water usage is anticipated to be 480 m^3/day for human consumption. The construction camp and Site potable water may be supplied from the municipal water supply and either piped or trucked to the site and stored in a dedicated tank (with two days capacity, about 900 m^3) for use onsite.

Sewage – Packaged sanitary sewage treatment plants will be installed to treat sanitary waste from the construction camp, and to treat sewage from other temporary construction facilities prior to discharge. The treatment of sanitary sewage will meet all applicable regulatory requirements. During construction works prior to establishment of sanitary treatment plants, portable toilets will be available onsite, supplied and maintained by a licenced contractor, with offsite disposal to an appropriately licenced facility.

2.4.4 Emissions, Noise, Discharges and Wastes

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CEAA Regs 10.0
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Air Emissions

Air emissions will be generated from construction activities and operation of construction equipment. Air emissions from construction activities will consist primarily of dust or particulate matter (PM). These emissions will be generated during earthwork operations, such as clearing, grading, blasting and compaction of the Site, and during construction of buildings and other structures. Dispersion of dust is expected to be less than 1 km from the Site, adverse effects on air quality during construction are considered to be local and intermittent.

Construction equipment will produce atmospheric emissions from combustion of fuels, such as diesel and gasoline. These emissions include mono-nitrogen oxides (NOx), hydrocarbons, carbon monoxide (CO), PM, and sulphur dioxide (SO_2). These emissions are expected to be temporary and intermittent during the construction phase of the Project, producing low-level reductions in air quality.

Green House Gases (GHG)s

During the construction phase, road traffic, site clearing and grubbing, and operation of construction equipment may affect GHG levels. A number of mitigation measures will be considered, as outlined in Sections 5.1.1 and 5.1.2.

Noise

Construction noise will be generated by pile installation (sheet piling for MOF, piling for LNG jetty, tank and module foundations), by earthmoving works and equipment, facility assembly, concrete batching plant operation, rock blasting, equipment movement, bolt tightening, pneumatic testing, line cleaning and pressure testing of pipework and pressure vessels onsite. A preliminary assessment of construction noise sources is included in Section 5.1.3.

Stormwater and Accidental Discharges

Stormwater discharge during construction will be directed to the site temporary drainage system. To control adverse effects of erosion and sedimentation on surface waters, construction activities will be conducted in accordance with a Sediment Control Plan and Stormwater Management Plan.

Precautions will be taken during construction to avoid hydrocarbon spills, both onshore and in near shore areas. However, small spills and leaks of hydrocarbons (fuel, grease and oils) or other substances from construction equipment are possible.

The potential for spills to enter marine waters or freshwater ponds and streams will be controlled through: trained fuel-handling personnel, establishing a Spill Prevention Plan and spill prevention procedures, equipping barges and ferries with spill containment and clean-up equipment, and maintaining spill cleanup equipment in accordance with contingency plans.

Process Discharges

Process water from construction activities includes: dewatering, spent hydrotest water, discharges from concrete batch plants, water from maintenance shops, or equipment wash water. Process discharges will be collected and reused where possible. When the waste water can no longer be reused it will be sent to a sedimentation pond, treated onsite and monitored to ensure compliance with applicable permit requirements prior to being released to the environment.

Sanitary Sewage

The construction camp and temporary construction facilities will generate sanitary sewage. During construction works prior to establishment of sewered site facilities, portable toilets will be available onsite, supplied and maintained by a licenced contractor, with offsite disposal to an appropriately licenced facility. Packaged sanitary sewage treatment plants will be used to treat sanitary waste from the construction camp, and to treat sewage from other temporary construction facilities prior to discharge. The treatment of sanitary sewage will meet all applicable regulatory requirements.

Liquid and Solid Wastes

Liquid and solid wastes that will be generated from construction and operation of the construction camp are listed in Table 2.1.

Table 2.1. Wastes Generated from the Construction Camp

Liquid Wastes	Solid Wastes
• Oil and oily wastes • Adhesives and lubricants • Spent paint and solvents • Spent antifreeze/radiator coolant	• Trees, brush, vegetation (once-only waste stream during site preparation) • General inert construction debris • Dunnage and scrap timber • Empty material containers • Office waste • Food waste • First-aid medical waste • Empty aerosol cans • Scrap metal (e.g., rebar, cable and piping) • Used welding rods • Empty aerosol cans • Sand blast waste • Dredge materials

A Construction Waste Management Plan will be developed that describes procedures for minimizing, segregating, safely storing, and disposing of all wastes. A waste reduction program will be implemented to reduce the volume of wastes generated during construction. The waste reduction program will be addressed by systematically assessing opportunities for reduction at source, reuse, recycling, and recovery of materials, or converting waste into useable materials.

Solid non-hazardous waste will be collected in a central secured area at the construction camp and at the Site, for collection and disposal in the local municipal landfill or to another suitable offsite facility. Camp and construction site domestic waste may be incinerated in a permitted incinerator, but only if local landfill capacity is restricted.

Solid and liquid hazardous waste will be collected in a secure enclosed facility and then shipped offsite by a licenced waste hauler to an existing licenced waste facility. An area for bioremediation of hydrocarbon contaminated soils may be established onsite.

Topsoil and organic material, mostly peat, generated during site preparation will be stockpiled in a specially allocated space on Ridley Island, north of the Site. This is an area of about 22 ha managed by the PRPA as an organic disposal site. Other stockpile locations will also be investigated should there be insufficient capacity in this area.

As discussed in Section 2.4.2, the Project will require dredging. Dredging will be conducted with appropriate controls to manage re-suspension of sediment in the water column. Dredged materials will be disposed of at sea in a permitted area selected to avoid possible future redeposit in sensitive zones. To find a suitable dredgeate disposal area, regulatory authorities, Aboriginal groups and the public will be engaged, and siting studies will be conducted in 2013.

2.5 Facility Operation – Components, Activities and Emissions

CEAA Guide 2.0
CEAA Guide 2.3
CEAA Guide 2.5
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The various components and activities associated with operation of the Project are discussed in detail in this section and summarized in Table 2.2. The three main operational activities of the Project are LNG production, ship loading, and shipping. Supporting activities include utilities, security and emergency preparedness, maintenance, onsite and offsite transport, warehousing, and administration.

Table 2.2. Operational Components

Production	LNG Loading	Shipping	Supporting Infrastructure
Gas receiving and metering Gas pre-treatment facilities Acid Gas (CO_2 & H_2S) removal unit Amine regeneration unit Dehydration and mercury removal unit Liquefaction unit LNG storage tanks Vapour recovery systems	LNG jetty / trestle LNG Loading Berth(s)	LNG carrier transit Tug and pilot boat operation Shipping of equipment and other materials to the MOF	MOF Fire protection and safety systems Flare and vent systems Safety, Shutdown and depressurization systems Offsite accommodation for Facility turn-arounds (Utilities and supporting services) Process control systems Site buildings Administration building (offsite) Master Control Centre (MCC) building Control and laboratory building Fire, safety & first aid building Guard houses Main switchgear building Marine terminal building Maintenance building Warehouse Security General utilities Process heating Fuel and chemical storage and handling Compressed air and nitrogen systems Power Generation

2.6 Pre-Commissioning, Commissioning and Start-Up

The Facility will be brought into commercial production in two phases. Phase 1 is the development and commissioning of Trains 1 and 2, and Phase 2 is the development and commissioning of Train 3. PRLNG plans to commission Train 1 in 2020 and Train 2 six to twelve months later in early-to-mid 2021. Timing of Phase 2 will depend on market conditions. Once the three producing LNG trains have been progressively brought online, the Facility will have a total annual LNG production capacity of up to 21 mtpa. The average production capacity of each train will be approximately 6.5 mtpa, taking into consideration the expected average feed-gas flow rates, ambient temperature variations and long-term availability of processing equipment.

Pre-commissioning will include checks, cleaning, and tests required to ensure that permanent production components, LNG loading components, and supporting infrastructure have been installed correctly and are ready for commissioning. Commissioning will verify that facilities can be started and will operate within design parameters and specifications. Start-up will involve introducing process fluids and hydrocarbons into the facilities to produce LNG.

Most process components and supporting infrastructure to support LNG production will be constructed and brought into operation during Phase 1. The additional production, loading and supporting infrastructure required for Phase 2 will include:

- Train 3.
- the second marine jetty and loading berth.
- the third LNG storage tank (depending on need).
- a power generation unit for Train 3.
- supporting infrastructure.

2.7 LNG Production

CEAA Guide 2.3
CEAA Regs 8.0
CEAA Regs 9.0

The LNG production process includes receiving feed gas, gas pre-treatment, liquefaction, and storage (Figure 2.2). Canadian Standard CSA Z276-11, LNG - Production, Storage, and Handling, sets out detailed technical requirements to be met by the Facility.

2.7.1 Pre-treatment

The feed-gas supply pipeline will be connected to the Facility from the west via a subsea approach route yet to be finalized. The pipeline will make landfall within the property boundary and within a dedicated Pipeline Delivery Station. Gas received from the pipeline will be metered at the inlet to verify inventory transfer. Custody of gas from pipeline to Facility inlet will be transferred in this location following metering.

Inlet Receiving and Metering

The Facility will be equipped with natural-gas-pipeline receiving infrastructure that will enable removal of debris entrained in the gas prior to metering. The gas will then pass through a metering system and onto the gas pre-treatment sections in the main gas processing unit. If required when the inlet temperature is low, a feed gas heater will be used to prevent hydrates forming when gas pressure is reduced. At the end of this process the gas will typically be dry and contain no free water or hydrocarbon condensate.

The gas delivery pressure is expected to be in the range 56 to 95 absolute pressure (bar(a)). The optimal gas liquefaction pressure has yet to be determined but may be up to 90 bar(a); therefore, feed gas delivered via pipeline may require compression from the arrival pressure to the optimum liquefaction pressure. This inlet compression will be located in the inlet or pre-treatment facilities.

A pig receiver for the gas transmission line will be located within the Facility boundary fence, and be provided for maintenance pigging operations. Pigging of the gas pipeline will be conducted periodically to confirm operability and the condition of the line. Mainline gas pipelines transporting dry, clean natural gas with little to no presence of natural gas liquids are pigged very infrequently. The pigging facilities will operate without affecting other operations at the Facility. Appropriate safety systems will be installed.

Carbon Dioxide and H_2S Removal by Amine Regeneration

The Facility will require the carbon dioxide (CO_2) content of the feed gas to be reduced prior to liquefaction, to prevent freezing during the cryogenic process. Trace levels of H_2S, if present will also be removed and incinerated. Gas entering the Facility will be directed to a conventional Acid Gas Removal Unit (AGRU) that consists of an absorber, an amine regeneration unit, and associated equipment. The CO_2 will be removed by countercurrent contact of the feed gas with a circulating amine solution. An amine regeneration unit is designed to remove CO_2 from feed gas typically using methyl diethanolamine (MDEA) as a solvent. MDEA absorbs CO_2, which is subsequently stripped from the solution and vented to the atmosphere. Amine gas treating is a common process used in natural gas processing facilities.

Dehydration and Mercury Removal

Feed gas must also be dehydrated to prevent water from freezing during the cryogenic process. Dehydration of the gas occurs in two stages. In the first stage, the gas is cooled in heat exchangers and condensed water is removed. The treated gas is then passed through molecular sieve beds for adsorption of the remaining water vapour. The dehydrated, treated gas from the Molecular Sieve Dehydrators flows to the Mercury Removal Unit.

Mercury must then be removed from the dehydrated, treated gas stream as mercury could cause degradation of aluminium used in the LNG process equipment. The level of mercury within the feed gas is negligible. However, this procedure is a routine safeguard within the process-gas stream even though the presence of mercury in the gas may not even have been detected or confirmed. Mercury removal beds are located upstream of the liquefaction process.

The mercury removal beds will be replaced approximately every five years, the beds are usually returned to the vendor for safe handling and mercury recovery.

2.7.2 Liquefaction

During the liquefaction process the treated gas is cooled to about -162ºC through a cryogenic process undertaken in parallel processing units, or trains. At this low temperature, the gas becomes a liquid. Essentially, liquefaction reduces gas volume and makes it more economical to safely store and transport natural gas.

The liquefaction process utilizes a combination of integrated refrigeration circuits to cool, liquefy and then subcool the natural gas into LNG. Subject to the liquefaction technology type, the refrigerant circuits use hydrocarbons, such as methane, ethane, ethylene and propane, to provide the refrigeration requirements for the process. Multistage compressors are used to supply refrigerants at different pressure levels and to ensure the cooling and liquefaction is performed efficiently. The heat removed from the natural gas is transferred between the refrigerant circuits before being discharged to the atmosphere via air coolers. The overall capacity of the liquefaction process is limited by the power available from the gas turbines supplying the refrigeration compressors.

Primary and secondary seal systems are incorporated within the compressors to control refrigerant losses.

2.7.3 LNG Storage

Following the liquefaction process, the LNG will be stored in specially designed, full containment storage tanks. Two LNG storage tanks each with capacity of up to 180,000 m^3 will be constructed during Phase 1 for Trains 1 and 2. A third tank of similar capacity may be constructed during Phase 2 when the third LNG train is built. The tanks will be equipped with in-tank pumps to transfer the LNG to ship-loading operations.

The full containment LNG storage tank will consist of either a 9% nickel steel cryogenic metal or composite membrane inner container designed to hold the LNG with a reinforced concrete outer tank designed to contain the natural gas vapours. The outer concrete tank is also designed to contain LNG in the event of an inner tank leak or rupture so no additional external spill containment is required. Insulation surrounds the inner tank to maintain the storage temperature.

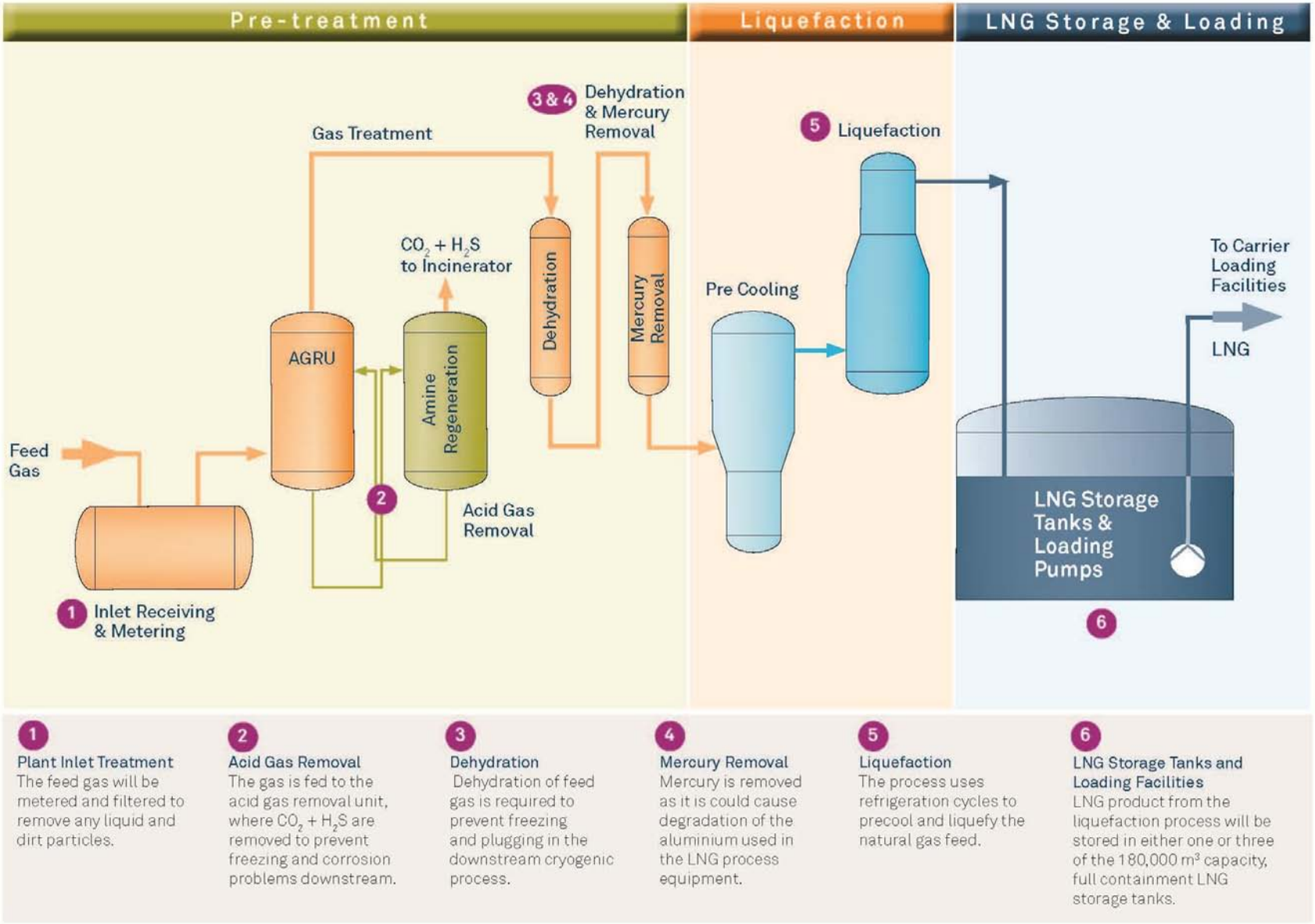
Vapour in the LNG Storage Tanks is collected by a vapour recovery system. Vapours will be returned to the process for re-liquefaction, used for power generation, or may be flared or vented in case of process upsets.

Propane may be required at times to “spike” LNG prior to export. Spiking consists of injecting propane into the natural gas stream to increase the LNG higher heating value (HHV) so as to satisfy regional market requirements. One tank with capacity of approximately 4,800 m^3 may be used to store propane. A vapour recovery system will be provided for the propane tank.

LNG Spill Containment Systems

Depending on configuration of the Facility and the loading systems cryogenic spill containment systems may be required. These systems will be designed to prevent cryogenic temperature LNG from harming personnel or damaging equipment. Vapours will be collected, contained and returned to the vapour recovery systems.

Figure 2.2. Typical LNG Export Terminal



Refrigerant Storage

The Facility will require back-up volumes of liquefaction refrigerants to be stored onsite to make up for operational losses in the liquefaction process. Initial studies suggest that about 1,600 m^3 of stored propane and 500 m^3 of stored ethane will be required per liquefaction train. These volumes will be rationalized wherever possible, however, based on supply chain analysis. Refrigerants will be transported to the Site by rail or truck. Though the storage technology is yet to be confirmed, pressurized storage would likely be preferred over atmospheric refrigerated storage.

2.7.4 LNG Loading

Based on the planned LNG production rate, approximately 189 LNG carriers will be loaded per year with two trains operating, and about 284 LNG carriers per year with three trains operating (with some variation due to carrier capacity).

LNG will be pumped from the storage tank through a cryogenic pipeline to the loading platform at the jetty head. It is expected that there will be four 16-inch (41 cm) diameter LNG cargo arms for a maximum LNG loading rate of 12,000 m^3 per hour. The loading system is expected to be sized to load LNG carriers within 13 hours to 20 hours, including two hours to ramp up to, and down from, the normal loading rate.

Vapour Return from LNG Storage

A separate vapour-recovery arm will handle vapours generated during final flash (when LNG is used to cool down a warm LNG carriers) into storage, along with boil off vapours from ship-loading and vapourized gas produced during loading line cool-down. This gas will be returned to shore through a separate pipeline. There will be no flaring of process or ship vapour return during normal operation.

The amount of vapour is a function of the size of the LNG tank and the length and size of the loading lines and other system components. The design case for the vapour recovery system is based on the concurrent and combined vapour loads from both final flash from the tank(s) and recovered ship-loading vapours.

LNG carriers arrive at the loading jetty with a heel (small volume) of LNG, such that the compartments are already cooled to the LNG temperature of about -160°C. Warm cargo tanks (usually defined as carriers arriving with LNG stored at temperatures greater than -160°C, although they could be as warm as ambient) can be accommodated. A period of cool-down will be required before such carriers can be loaded with LNG. Flaring or venting will only be required when:

- LNG carriers arrive directly from dry dock (typically filled with inert gas).
- vapour recovery systems are offline due to maintenance, or system upset inhibits the return of vapour to the LNG tank (i.e., high pressure in the LNG tank due to failure of boil-off gas (bog) compressor).

2.8 Supporting Infrastructure

Supporting infrastructure includes all permanently installed facilities that support the safe operation of the plant.

2.8.1 Marine Loading Facilities

Jetty

Marine infrastructure will include a jetty/trestle and loading berths to enable loading of LNG onto carriers. The jetty will be designed to accommodate LNG carriers ranging from 138,000 m^3 to 210,000 m^3 in capacity. A single jetty/trestle and loading berth will be required for operation of the first two LNG trains and an additional jetty/trestle and loading berth will be required for operation of the third LNG train.

The purpose of the LNG loading berths is to provide safe, efficient deep-water berthing for the range of LNG carrier sizes. To accomplish this, the LNG berth will include breasting and mooring dolphins, a fender system, mooring hooks, and a ship docking assistance system. The second objective of the LNG berth is to provide a platform to support the mechanical equipment, communications and safety systems required for loading LNG carriers.

Berth locations have been selected to optimize a number of criteria, including navigational approach and departure conditions, adequate water depth at the berth face with minimum requirements for dredging, approximate alignment of moored LNG carriers with predominant current and wind directions, minimal depth for marine structures, proximity to the uplands Facility site, and optimization of cryogenic piping and manifold requirements. For the Site, the location of the LNG carrier berths aligns with the PRPA's Master Plan for future industrial developments.

Jetty Platform

The jetty platform accommodates the LNG loading equipment, including loading arms, vessel monitoring system, gangway tower, product delivery and vapour return pipelines and racks, and other miscellaneous equipment. The jetty platform will be approximately 60 m wide at the berth face and 30 m deep, and located at mid ship.

Access Trestle

The loading platform access trestle provides structural support from shore to the loading platform for the LNG product piping, auxiliary mechanical and electrical systems, and access roadway. The roadway is capable of accommodating service vehicles.

Breasting (Berthing) Dolphins

The primary function of the breasting dolphins is to absorb the energy of the berthing LNG carrier, to provide contact points for the moored carrier, and to provide spring line mooring points as appropriate. Each breasting dolphin supports an independent fender system that consists of a fender panel supported by a rubber energy absorbing element located behind the panel. The fender panel provides the impact surface against which the berthing LNG carrier makes contact and the rubber element absorbs the impact energy, thus protecting the berth structures. The breasting dolphins are also equipped with integrated electric-powered capstans and quick-release

mooring hooks to tether the LNG carrier's mooring spring lines. The tension forces in the mooring spring lines and the quick-release mooring hooks are monitored by the ship monitoring system. The breasting dolphin structures are accessible from the loading platform via catwalks. Each breasting dolphin is equipped with a quick access chain ladder extending from the top of the dolphin to a location below the low water level to enable egress from or escape to the water.

Mooring Dolphins

The function of the mooring dolphins is to secure the LNG carrier's fore and aft breasting lines, and the bow and stern lines, as required. The mooring dolphins are typically pile-supported structures and accessible via catwalks from the breasting dolphins. The mooring dolphins are also equipped with integrated electric-powered capstans and quick-release mooring hooks to tether the LNG carrier's bow and stern mooring lines. The tension forces in the mooring lines and the quick-release mooring hooks are monitored by the ship mooring monitoring system. Each mooring dolphin is equipped with a quick access chain ladder extending from the top of the dolphin to a location below the low water level to enable access from or escape to the water or boat.

Access Catwalks

Berthing and mooring dolphins are connected to each other and to the central loading jetty platform via access catwalks. Catwalks are prefabricated aluminum or steel truss-type structures equipped with nonslip grating, toe rails, hand rails and guardrails, and lighting.

2.8.2 Materials Offloading Facility

The MOF will be constructed early during the Project and will remain throughout the life of the Project. It will form the primary entry and exit point for the Facility throughout construction and operations, enabling movement of equipment, supplies and materials. MOF construction is described under construction in Section 2.4.2.1.

2.8.3 Diesel/Gasoline Storage System

An above-ground diesel storage tank will provide fuel for:

- engine-driven equipment, such as fire pumps and emergency generators.
- vehicles.
- tugboats.

2.8.4 Chemical Storage and Handling

Storage will be provided onsite for propane and other chemicals, including oils drums, heat-transfer fluid, mercury-removal absorbent, ethylene, bulk nitrogen, and treatment chemicals to be used by the LNG process or ancillary activities.

Storage facilities, including chemical and diesel and gasoline storage systems, will be set up to prevent spills into the environment through:

- **Containment Integrity** – All process piping will be welded where possible, with an emphasis on minimizing flanged connections, and screwed piping will not be used in any hydrocarbon services.
- **Secondary Containment** – For storage areas, 110% secondary containment will be provided for storage areas.
- **Drainage and Collection** – Flammable liquid-hydrocarbons process and storage areas will be provided with a drainage system designed to remove a spill as quickly as possible and to control heat flux damage to equipment if ignition occurs.

2.8.5 Fire Protection and Safety Systems

The Fire Protection System will be designed in accordance with applicable national and international codes and standards. Firewater will consist of a closed-loop water system that uses raw water to protect the Facility.

The firewater pipeline will run along the trestle to the jetty. An international ship-to-shore connection will be provided at the trestle head for connection between a LNG carrier and the firewater supply. Firewater to the trestle will be provided from the Facility firewater tank.

In addition to firewater, the Facility will employ active and passive safety measures, systems and equipment to mitigate incidents associated with LNG spills and vapour releases and to protect Facility personnel, equipment, and the surrounding areas.

2.8.6 Flare and Vents Systems

Flaring is a necessary but infrequent activity to ensure safe operation of the Facility. PRLNG general policy is that there should be no continuous flaring or venting of gas.

The Flare and Blowdown System provides reliable and safe disposal of the hydrocarbon stream during Facility start-up, shutdown, upsets or emergency scenarios. In addition, the Flare System will dispose of hydrocarbons released during regular maintenance operations, such as venting, draining, gas purging, and heating and cooling of equipment and piping.

The flare system consists of a warm/wet flare to dispose of streams that contain moisture or that may freeze or form hydrates at low temperature, and a cold/dry flare to dispose of cryogenic or moisture-free streams. Liquids are collected in flare knock out drums, upstream of the flare stack, where they may be disposed of appropriately. Each flare will be fitted with small, gas fired pilot lights that will be permanently lit to ensure safe operation of the main flare when required.

In total, four flare stacks, servicing all liquefaction trains, will be located on a common derrick structure for all liquefaction trains. The four stacks are:

- High pressure warm/wet flare stack
- Low pressure warm/wet flare stack

- High pressure cold/dry flare stack
- Low pressure cold/dry flare stack

In addition, a dedicated low pressure “Marine Flare” system will enable natural gas vapour disposal from the LNG Storage Tanks, the Vapour Recovery System and the marine facilities.

2.8.7 Safety, Shutdown and Depressurization Systems

Safety, shutdown and depressurization of the Facility will be performed by the Safety Instrumented System (SIS) functions. The SIS will include separate components for each LNG process train and for ship-loading facilities, and include a combination of manual and automatic shutdown processes.

2.8.8 Process Heat System

A closed-loop, circulating process-heating system will provide process-heating requirements for the amine regeneration unit, feed gas heaters, amine reclaimer, regeneration boiler, and make-up fuel gas heaters. Waste heat recovered from the liquefaction units will be used to heat the oil. The process heating system is a closed system with no venting to the atmosphere.

2.8.9 Compressed Air and Nitrogen Systems

The Facility will be equipped with a combined air system to supply compressed air for Facility utilities and instruments and feed air to the nitrogen generation system. Other uses of compressed air in the Facility include pneumatic devices, turbine air filter cleaning, general blowing and maintenance, flame generators and air dryer regeneration.

The Facility will use inert nitrogen gas for purging or blanketing of equipment. Nitrogen will be produced onsite or imported.

2.8.10 Process Control Systems

The process and utility operations at the Facility will be monitored from a Central Control Room (CCR). Equipment and facilities will be installed to enable any emergency or unusual event to be evaluated, monitored and managed from within the CCR.

Equipment installed in the CCR will include environmental monitoring and a full internal and external communications suite, and a telecommunications system that includes a tower. Personnel in the CCR will be able to start, control and stop any major or critical functions of the Facility. Local shutdown facilities will also be provided.

2.9 Shipping Activities

Shipping activities include:

CEAA Guide 2.3

CEAA Regs 9.0

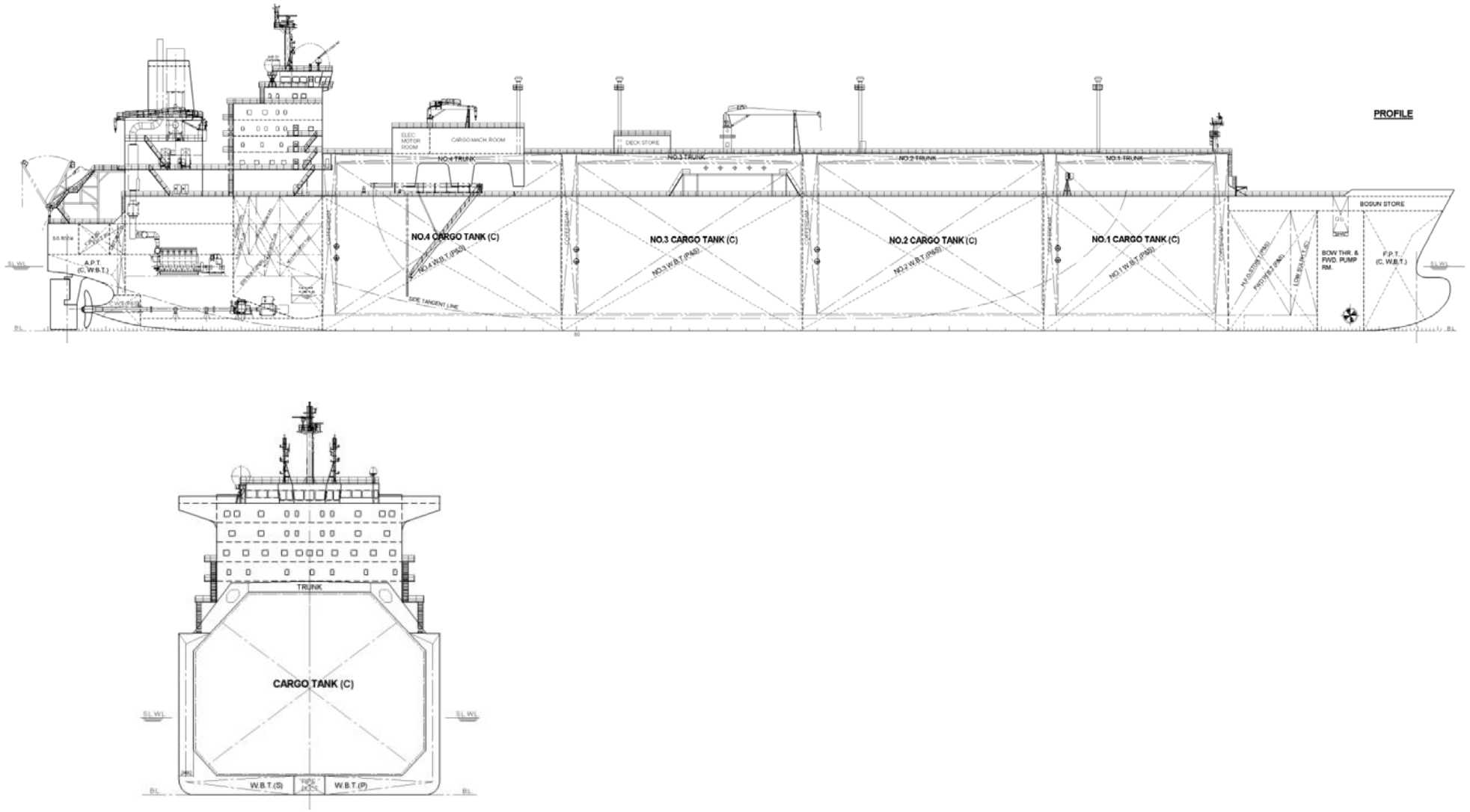
- regular transit of LNG carriers, with up to 189 vessel calls per year or three to four calls per week for Phase 1 (two trains) and an additional 95 vessel calls per year for Phase 2 (three trains), for a total of five or six LNG carriers per week.
- tug and pilot boat operation to support safe passage of LNG.
- shipping of equipment and other materials to the MOF.

LNG carriers will move through the Hecate Strait within designated shipping zones and be conducted in accordance with the *Canada Shipping Act, 2001* and by-laws established by the PRPA. LNG will typically be shipped out of the Port of Prince Rupert by PRLNG (or an affiliated BG Group entity), with LNG carriers either owned by BG Group or contracted by BG Group to carry cargo; on occasions throughout the Facility life, LNG carriers not contracted by BG Group may also be used, including where LNG is purchased Free on Board (FOB) from the Facility by a third party.

BG Group has a core fleet of LNG carriers that it owns or has under long-term charter. BG Group contracts additional LNG carriers as required on a short-, medium-, and long-term charter to capture business opportunities and maintain a balanced shipping position. During 2012, BG Group used between 23 and 30 LNG carriers at any one time, giving it control of one of the largest fleets of modern LNG carriers of any international oil and gas company.

All LNG carriers used will have double hulls and primary and secondary containment systems (Figure 2.3).

Figure 2.3. Schematic Cutaway of an LNG Vessel Hull



2.9.1 Navigational Arrangements

Outside Port of Prince Rupert – Shipping outside the bounds of the Port of Prince Rupert and within Canadian Territorial Waters will typically be undertaken within established shipping channels. There are two principal routes from the pilot station at Triple Island into Chatham Sound and towards the Port of Prince Rupert. The northern route leads south of Hanmer Rocks and north of another shoal. The southern route leads south of Stenhouse Shoal and northeast of Triple Island, Osborne Islands and Rushton Island (Moffat and Nichol, 2011).

Within Port of Prince Rupert – The Port of Prince Rupert and the approaches are covered by Canadian Charts 3957, 3958, and 3955 and Admiralty Chart 2435 (Prince Rupert Port Authority, 2009). The PRPA manages all the waters of Prince Rupert Harbour, which includes but is not limited to, the southern portion of Tuck Inlet, Morse Basin, Wainwright Basin, Porpoise Channel, and portions of Chatham Sound (Stantec, 2011a). Ships within this area are subject to the orders of the PRPA, which includes entry, departure, draught, jetty, anchorage, location, speed, direction and means and method of movement (Fisheries and Oceans Canada, Environment Canada and Canadian Transportation Agency, 2012). The Canadian Coast Guard's Marine Communication Traffic Services (MCTS) controls marine vessel traffic in the Prince Rupert area, including Chatham Sound, Prince Rupert Harbour and Porpoise Channel (Stantec, 2011a).

Prince Rupert Harbour is designated as a compulsory pilotage area under the *Pilotage Act*. Every ship over 350 gross tonnes is subject to compulsory pilotage. For Prince Rupert, the pilot boarding station is located off Triple Island approximately 42 km from port. Vessels may be instructed to follow the pilot boat into sheltered waters near Lucy Island for boarding during heavy weather. LNG carriers may approach Triple Island from the west, through Dixon Passage and north of Haida Gwaii or from the south, through Hecate Strait and east of Haida Gwaii depending on weather conditions at sea (Fisheries and Oceans Canada, Environment Canada and Canadian Transportation Agency, 2012).

Navigational Safety Zone – The PRPA has the authority to establish an exclusion zone within the Port of Prince Rupert, either fixed or moving, around any vessel or shore structure to ensure public safety. Large, heavy displacement vessels will normally be prohibited within two nautical miles (3.7 km) ahead and astern, and 0.5 mile (0.9 km) on either side of the transiting LNG carrier. Small vessels are not a safety concern but may be deemed a security concern. For manoeuvring and berthing the LNG carriers, a 600 m width swing is expected to be sufficient.

Traffic Controls – The PRPA is working with the Canadian Coast Guard to enhance and improve marine traffic control by implementing automatic identification system (AIS) and radar to the marine approaches. Traffic management systems are to be adapted to ensure an acceptable level of navigation safety, and may involve adding pilots and pilot boats, and additional anchorages as needed. The required level of safety systems to ensure proper risk management will be determined by the PRPA Harbour Master and TC (Canadian Environmental Assessment Agency, 2012).

Tug assist and escort requirements for LNG carriers will be directed by the PRPA within Harbour limits and in conjunction with the Pacific Pilotage Authority and the BC Coast Pilots for escort to and from the Pilot station. Tug requirements will be detailed in the PRPA Practices and Procedures.

Tugs and Navigation – Tugboats will be involved in the safe arrival and berthing of the LNG carriers for the transfer of LNG during ship-loading operations. Tugboat and utility service dock operations will include a tug boat berth, mooring dolphins, small utility dock, refuelling service, and maintenance service.

The marine terminal and deep water channel approach will include navigation aids conforming to standards under the *Canada Shipping Act* and *Navigable Waters Protection Act*. It is anticipated that a combination of new fixed and floating aids will be used.

2.9.2 Cargo Operations Safety Zone

Once the LNG carrier is moored, a 250 m radius from the loading platform exclusion zone will apply during cargo operations. The safety zone will be patrolled by the standby tug. While the jetty is unoccupied, a 50 m safety zone will be in effect at all other times.

2.9.3 Bunkering and Provisioning

Bunkering (refuelling) of LNG carriers will be undertaken as part of normal operations. Any bunkering will be carried out by a bunkering contractor either at anchor or alongside the LNG carrier at the jetty. Bunkering is not conducted while LNG is being loaded.

Food and other consumables are loaded onto LNG carriers direct from barges while a LNG carrier is at the jetty, either before or after cargo-loading operations. Removal of solid wastes may also be undertaken. Wastes will be disposed of by an appropriately licenced waste management contractor.

2.10 Facility Maintenance

CEAA Guide 2.3
CEAA Regs 9.0

The Facility will be subject to scheduled shutdowns for regular maintenance and major overhauls. Only one train would typically be on shutdown at any one time, and the other trains would remain fully operational during these maintenance periods.

Details of planned maintenance will be further refined during detailed engineering. The objective of maintenance will be to ensure maximum overall availability of the Facility while ensuring safe operating conditions. Equipment will be inspected and maintained in accordance with manufacturer recommendations and Canadian Safety Association (CSA) guidelines throughout the operational life of the Facility.

2.11 Site Buildings

CEAA Guide 2.3
CEAA Regs 8.0
CEAA Regs 9.0

Control and Laboratory Building – This building will include the control room, electrical room, battery uninterruptible power supply (UPS) room, auxiliary room, computer/printer rooms, laboratory, training simulation room and telecommunications room. The Laboratory will be located there and will accommodate equipment and staff for process analysis requirements. Space will be provided for operational staff, permit issue counter, waiting area, mess room/pantry, room for personal safety gear, conference room, filing, library, female/male toilets and heating, ventilating and air conditioning (HVAC) room.

Administration Building – This building will be located offsite to accommodate Site administration staff, and include conference rooms, archives, toilets, and other facilities. A centralized HVAC system will provide fresh-air intake.

Fire, Safety and First Aid Building – This Emergency Control Center and will house the communication systems to support emergency response and will be located near to the Control Building. The onsite Fire Station will serve the Facility and will contain the necessary fire-fighting and safety equipment for dealing with all foreseeable incidents on the Facility. Offices will be included for permanent fire/safety and security staff, as well as a small workshop and training ground. A small, open compound for storage of road signs and other items will be adjacent to this building. Hose-washing and drying facilities and foam storage tanks will be provided. Covered shelter will be provided for fire-fighting trucks and trailers. First-aid facilities will also be located in this building.

Maintenance Building – This building will be equipped to provide the maintenance needs of the Facility and support facilities. It will include office space, male and female toilet facilities, tool stores, workshop, instrument shop, electrical shop and facility rooms. All these areas will have air-conditioning and forced ventilation. The workshop will be provided with a transport rail system, embedded in the concrete floor. Overhead travelling cranes will be included.

Warehouse – There will be an onsite warehouse for essential items that cannot be removed to an offsite location. It will be located adjacent to the Maintenance Building and will house a bulk store, consumable and spare parts store, air-conditioned store, small items store, receiving/inspection and dispatch areas, offices and toilet facilities. The materials yard will consist of a fenced asphalt area located next to the materials Warehouse. Provisions will be made for an outside industrial gas cylinder store with roof, a scrap yard (concrete bays with low side wall and fencing) and a container receipt area. Apart from the air-conditioned offices and cold store, all other rooms/areas will have forced ventilation. Additional operational warehousing and maintenance facilities will be located offsite.

Chemical Store – The chemical storage area will accommodate drum storage, molecular sieves, heat transfer fluid, mercury removal absorbent, treatment chemicals, and other chemicals. Design and operation of chemical stores will include requirements for berms and handling of chemicals and potential spillage. The design will take into consideration ventilation, separation of chemicals stored, fire rating and firefighting requirements as per any applicable codes for general chemical storage. These chemical storage facilities are distinct from the bulk operational chemical storage systems described in Section 2.8.4.

Master Control Centre (MCC) Building – The MCC Building protects essential instrumentation for controlling the Facility operation. The MCC Building will be provided with adequate ventilation and a centralized HVAC system, with fresh air intake and a split-unit, air-conditioning system.

Main Switchgear Building – The main switchgear building houses and protects essential electrical and instrumentation for controlling the Facility operation.

Site Security – Site security will be established in accordance with the requirements of the *Marine Transportation Security Act* and will include perimeter fence, access gates, vehicle access, personnel access, site security control area and an intruder detection system. Guard houses will be set up at the MOF and at the road entrance to the Site.

2.12 Transport Requirements and Infrastructure

CEAA Guide 2.3
CEAA Regs 9.0

Transportation infrastructure is needed to support movement of equipment and people on and off site. It is anticipated that no new roads will be required for this Project, although some existing roads may require upgrading. The infrastructure required includes onsite access and haul roads, motor pool, and parking lots.

2.13 Electricity/Energy

CEAA Guide 2.3
CEAA Regs 9.0

The Facility will be designed to be self-sufficient for all power needs by onsite combustion of a proportion of the natural gas supply to the Facility in gas turbines. These gas turbines will be used for two purposes:

- Process Power – to drive refrigeration compressors for liquefaction.
- Utility Power – to drive electrical power generators for lighting, to power pumps, etc.

Although the Facility will be designed to be self-sufficient for power it will be connected to the BC Hydro grid. Where power from the grid is available and reliable it is anticipated that it will be used for utility power in preference to onsite electrical power generated by gas turbines.

The Facility will be tied into existing power transmission lines servicing Ridley Island. There is an existing transmission line to Ridley Island. A feeder line will be required from the existing transmission line to the Facility. No new transmission lines are planned.

Power generation requirements of the Project are identified in Table 2.3 by power type and Project phase.

Table 2.3. Power Requirements

Drive	Phase 1 (Two Trains)	Phase 2 (Three Trains)
Process Power	400 MW	600 MW
Utility Power	140 MW	200 MW
Total Power	**540 MW**	**800 MW**

2.14 Telecommunications

CEAA Guide 2.3
CEAA Regs 9.0

A telecommunication system will be required for the Site. Telecommunications options are currently being assessed and include:

- fibre-optic cables (co-located with the pipeline).
- telecommunication towers.
- overhead connection using WI-FI, served by the existing mobile phone network or a microwave system.

Consultation with the telecommunications provider is ongoing to ensure integration into existing systems.

2.15 Water Supply and Management

CEAA Guide 2.3
CEAA Guide 2.4
CEAA Regs 9.0
CEAA Regs 10.0

All water required for the operation of the Facility and for providing the needs of staff and other personnel will be imported by pipeline via the PRPA's existing raw water supply as feed to water treatment systems providing potable water, demineralized water, utility water and firewater.

Incoming raw water will be stored in a water storage tank at the Facility where it will then enter the relevant water systems. Potable water is consumed in the plant's plumbing system such as sinks and toilets as well as safety showers and eye washes. Demineralized water will be used in the AGRU for water washing gas turbine inlet blades, solvent make-up and flushing equipment. The demineralized water will be generated in a demineralization unit. Utility water is used for general purposes such as flushing and is normally made available at utility stations via a hose connection. Total water consumption by the Facility in normal use is estimated to be 108 m^3/hr.

The current rated capacity of Prince Rupert municipality is adequate to supply the Facility. While the rated capacity of Port Edward is significantly lower than Prince Rupert, it would also be sufficient to supply the Facility (Prince Rupert and Port Edward Economic Development Corporation, 2013). Optimization of water production and use, including opportunities for water recycling and reuse, will be considered during the detailed design phase of the water systems for this Project.

2.16 Emissions, Discharges and Wastes

2.16.1 Air Emissions

CEAA Guide 2.4
CEAA Regs 10.0

The primary sources of emissions from the operation of the Facility and related shipping activities are described below. Additional information on potential Project effects on air quality can be found in Section 5.1.2.

AGRU – CO_2 and trace levels of H_2S are extracted from the natural gas feed by the AGRU. These impurities are collected and sent to the incinerator where the H_2S is combusted together with any trace hydrocarbons still present. A skimming pot collects skimmed hydrocarbons from this unit. Any vapourized hydrocarbon from the skimmed hydrocarbons is collected by the closed vent system, sent to the flare and oxidized as discussed in more detail below.

Gas Turbines – Exhaust gas will be generated from the mechanical drive gas turbines and power generation gas turbines, if used. Exhaust gas will be emitted to the atmosphere and will include CO_2, nitrogen (N_2), oxygen (O_2), water (H_2O), argon (Ar), sulphur oxides (SO_x), CO, and NO_x.

Flare Tip – The flare system is designed to safely and reliably collect and dispose of liquid and vapour hydrocarbons during upset and emergency conditions and during operational controlled events such as start-up, normal shutdown, venting and purging. Gaseous emissions to the atmosphere from flaring include CO and NO_x. These events are only occasional and of short duration.

Shipping – Emissions from shipping, including LNG carriers and vessels transporting equipment, includes SO_2, NO_2, CO, particulate matter less than 10 microns (PM_{10}), particulate matter less than 2.5 microns ($PM_{2.5}$), and GHGs.

2.16.2 Noise Emissions

During the operational phase, potential noise sources include:

- daily operation of the Facility (air coolers, gas turbines, compressors).
- road traffic.
- marine vessel operation.
- loading of LNG carriers.

Refer to Section 5.1.3 for more detail on potential noise sources and mitigation measures.

2.16.3 Liquid Waste Streams

The design of the Facility includes provision for effluent collection, segregation, routing, treatment and monitoring followed by discharge to the sea once the effluents comply with discharge limits.

The Facility will be designed to ensure that liquid effluents are controlled and that discharges are treated to comply with statutory limits as a minimum.

Liquid waste streams anticipated during site operation include:

- stormwater runoff from non-process areas of the Site.
- process wastewater such as demineralization wastes.
- stormwater runoff from the Facility process areas.
- sanitary sewage.

Stormwater Runoff – Runoff from roads and buildings will drain to a drainage ditch system for discharge directly to the storm water outfall.

All runoff from the processing areas, process equipment and firewater system testing will be channelled to an American Petroleum Institute (API) gravity type oil separator where any oily residue will be skimmed off to a collection sump. Once fully treated, the effluent will be directed to the storm water outfall. Contamination of runoff water will typically only arise from oil and grease from gas turbines, compressors and pump machinery areas. As an additional precaution runoff from these areas will be treated in a corrugated plate interceptor (CPI) oil separator before being directed to the to the API separator along with the surface runoff from other Facility processing areas. The oil separated from the CPI separator will be collected in a slop oil tank. This tank will also be used for storing spent lubrication oil prior to being sent to offsite disposal or recycling.

Hydrotest and Flushing Water – Water used during flushing and hydrotest will be collected and reused for future testing needs. When the waste water can no longer be reused it will be sent to an onsite wastewater treatment facility or to an offsite treatment facility.

AGRU – AGRU effluents are generated from the amine sludge, feed gas separator drain, dehydration unit and skimming pot drain. All oily waste will be collected and sent to an offsite oily wastewater treatment facility.

Dehydration Unit – Produced water from the dehydration unit is routed back to the AGRU.

Demineralization – Effluents in the demineralization unit include the backwash water from the sand filters, reverse osmosis concentrate, and resins regeneration solution. The backwash water from the sand filters and the reverse osmosis concentrate will be collected, tested to ensure it meets all applicable federal and provincial regulatory requirements prior to discharge to the ocean via the outfall for the non-contaminated sewer. The regeneration solution will be neutralized, tested to ensure it meets all applicable federal and provincial regulatory requirements, and then sent to the non-contaminated sewer and discharged to the ocean.

Oily Wastewater Treatment – Slop oil will be collected from the oily wastewater storage. The dissolved air flotation (DAF) will produce treated water and scum for disposal. Slop oil (about 10% of oil in water) will be sent to an offsite facility. The treated oily water from DAF will be discharged to the ocean once it meets all applicable federal and provincial regulatory requirements. The scum (maximum 6% of oil and solids in water) from DAF will be sent to an offsite facility.

Chemical Sewer Neutralization – Any chemicals used to clean equipment, piping, or tubing systems will be collected in the chemical sewer for neutralization. The neutralized water will be the only effluent from chemical sewer neutralization. The neutralized chemical water will be routed to a tank for testing to ensure it meets all applicable federal and provincial regulatory requirements before discharge to the ocean.

Sanitary Wastewater Treatment – Sanitary wastewater from the Facility building sources will flow via an underground sewer system to centrally located lift stations. The sanitary wastewater will be pumped to the treatment units where the wastewater will undergo biological oxidation, clarification, and chlorination. The treated water will be monitored prior to discharge to the ocean to meet all applicable federal and provincial regulatory requirements.

2.16.4 Solid Waste

Sources of solid waste in the Facility will include administration and office buildings, plant area, amine and dehydration units, corrugated plate interceptor (CPI separator), DAF unit, and mercury adsorbent.

Solid waste streams anticipated during site operation include:

- non-hazardous wastes generated by the dehydration unit, including spent molecular sieve bed material, paper and cardboard; and domestic rubbish including food waste.
- hazardous wastes including waste oil and associated wastes, molecular sieve waste (generated by the dehydration and mercury removal unit), used batteries, and spent solvents.

Solid non-hazardous waste will be collected in a central secured area at the Site for collection. Non-hazardous waste that cannot be recycled or reused will be disposed of in the local municipal landfill if capacity allows or to another suitable offsite facility.

Solid and liquid hazardous waste will be collected in a secure enclosed facility. All hazardous waste will be shipped offsite by a licenced waste hauler to an existing licenced hazardous waste management facility. An area for bioremediation of hydrocarbon contaminated soils may be established on the Site.

PRLNG is committed to continual improvement in waste management and will develop a waste management plan in accordance with relevant legislation prior to the commencement of site construction and operations.

The primary sources of solid waste from the operation of the Facility are from the following components.

AGRU – Solid wastes from the AGRU are generated in the amine filtration package. This includes the dry cake sludge, spent filters cartridge, and carbon filters beds. Dry cake sludge, the filter cartridges and carbon filter beds will be sent offsite for treatment and disposal in a licenced facility.

Dehydration Unit – Spent molecular sieve bed material from the driers will be produced at the dehydration unit. These solid wastes are benign and hygroscopic and are typically returned to the vendor.

Mercury Removal Unit – In the mercury removal unit, solid wastes are generated from the replacement of the mercury removal bed and filter cartridges. These solid wastes can be hazardous depending on the level of mercury trapped. Mercury removal beds are usually returned to the vendor for safe handling and mercury recovery.

Demineralization – Spent filters, resin beds, and reverse osmosis membranes are the solid wastes generated from the demineralization unit. The spent filters, resin beds and reverse osmosis membranes are benign and are typically returned to the vendor.

Sanitary Water Treatment – An estimated 20 tonnes to 40 tonnes per year of sludge dry solids will be generated during operations and disposed of at a suitable facility.

2.17 Description of Related Activities

CEAA Guide 2.3

CEAA Regs 7.0

Related activities involve the construction of a proposed natural gas pipeline from the Cypress Area of northeast BC to meet the demands of the Project. Development of the pipeline delivering gas to the Facility is a separate project being proposed by Spectra Energy on behalf of the company 0948090 B.C. Ltd. A project description for the pipeline was filed with the BCEAO on 18 October 2012.

2.18 Project Schedule

2.18.1 Development Timeframes and Main Activities

CEAA Guide 2.5
CEAA Reg 11.0
BCEAO Guide Proposed Development Schedule

The federal and provincial EA processes and other regulatory approvals will influence the development timeframe. An outline of the preliminary timelines for the Project is provided in Figure 2.4.

The duration of the key Project phases are as follows:

- Construction will be approximately 60 months for Phase 1 (Trains 1 and 2) and 42 months for Phase 2 (Train 3).
- Operational life is 30 years extendable up to another 30 years.
- De-commissioning the Site is expected to take 24 months and be completed within the applicable lease period.

Figure 2.4. Outline of the Preliminary Timelines

2.18.2 Decommissioning Phase

CEAA Guide 2.5
CEAA Reg 11.0
BCEAO Guide
Proposed Development Schedule

Ridley Island is zoned for industrial use by the PRPA. It is anticipated that, at the end of the life of the Project, Site infrastructure would be removed or re-purposed to create space for another industrial development. Prior to decommissioning, a decommissioning plan will be developed in accordance with the applicable regulations.

Decommissioning activities will include dismantling the equipment and buildings, selling reusable equipment and materials, recycling scrap equipment and materials, demolishing concrete structures and disposing of the broken concrete, and generally preparing the Site for its next use in accordance with the decommissioning plan to be worked out with authorities at that time.

3. Project Location and Mapping

CEAA Guide3.0
CEAA Guide 3.1
CEAA Regs 12.0(a)

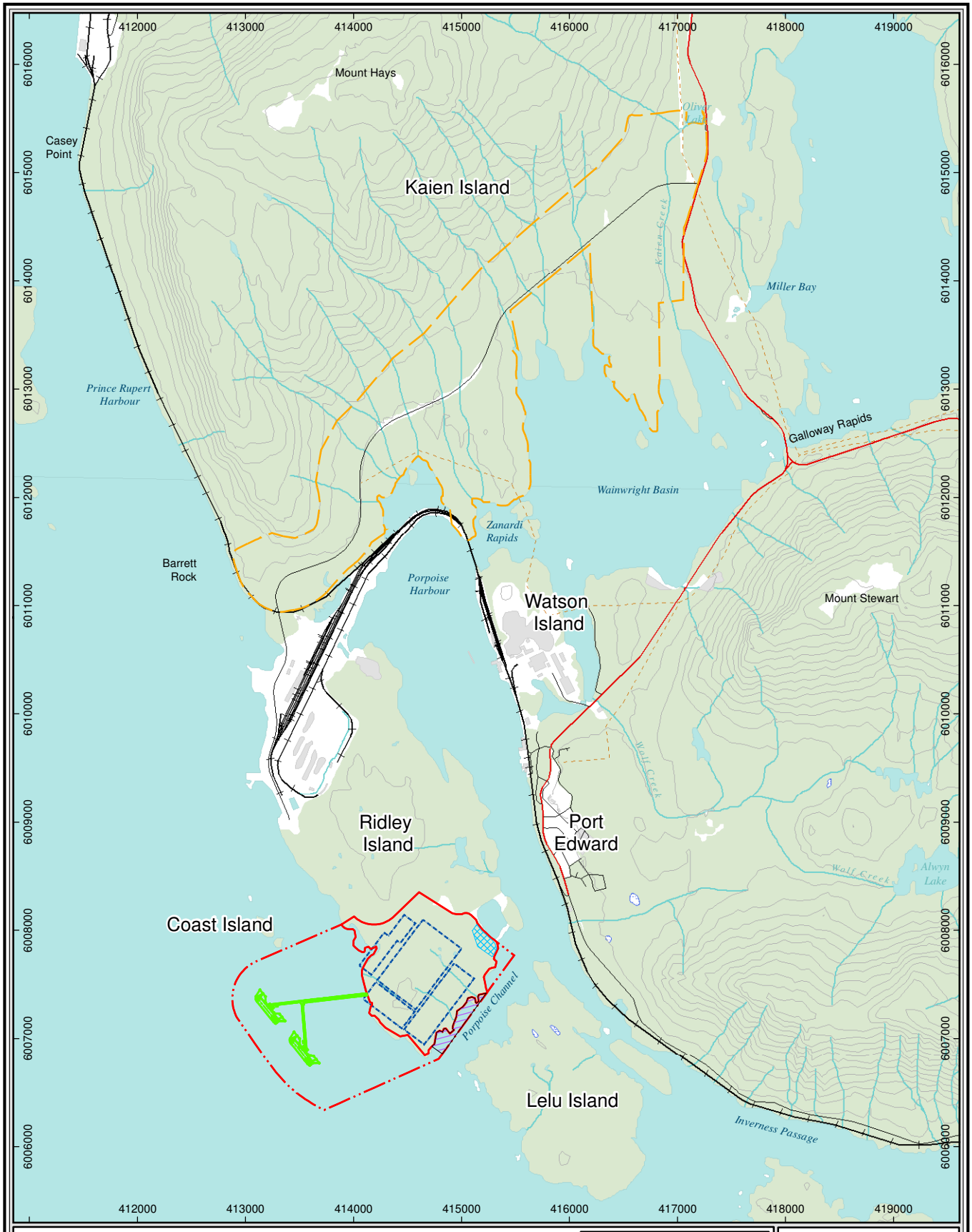
BCEAO Guide
General Background Information

3.1 Project Location and Coordinates

The Project will be located on Ridley Island, BC, 17 km from the City of Prince Rupert and 15 km from Port Edward by road. The Site covers approximately 125 ha of land on the southwestern part of Ridley Island (Figure 3.1). The edge of the Project footprint nearest to residences in Port Edward is approximately 850 m to the west. Appendix C includes a photographic series of the Site and environs.

The coordinates at the centre of the Site are 54.21601°N Latitude and 130.311584°W Longitude.

In Universal Transverse Mercator (UTM) coordinates, the Site is located in Zone 9 at 414458 E and 6007473 N.



Basemapping from ESRI (World Topology), Gov't of BC (GeoBC). All other data AECOM, 2013.

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Legend

- DENOTES BUILDING FOOTPRINT
- DENOTES APPROXIMATE LAND LEASE BOUNDARY
- DENOTES APPROXIMATE WATER LEASE BOUNDARY
- DENOTES JETTY
- DENOTES NEW MATERIAL OFFLOADING FACILITIES (MOF)
- DENOTES AREA RESERVED FOR STORM WATER RETENTION
- CONSTRUCTION CAMP SEARCH AREA

Overview Map

BG Baseline Studies
Location: Ridley Island (Prince Rupert), BC

Project Footprint with Construction Camp Search Area

April 2013
Project: 60284368

AECOM

Figure 3-1

File Location: P:\60284368\000-CADD\050 GIS WIP\02_Maps\SOCIO_ECONOMIC_PROGRAM\2013-01-16-ProjectDescription\Fig3-1-2013-04-03-ProjectFootprint-60284368v3.mxd Date Revised: April 03, 2013 Prepared by: DL Project: 60284368

3.2 Land and Water Use

3.2.1 Current Land Ownership

CEAA Guide 3.1
CEAA Guide 3.2
CEAA Guide 4.2
CEAA Regs 12.0(c)
CEAA Regs 12.0(f)
CEAA Regs 14.0

Ridley Island is Federal Crown Land under administration of the PRPA (Figure 3.2)[7]. Other lands and waters under administration of the PRPA include the inner harbour of Prince Rupert, the waters around Ridley Island, and a large water area around the south, east and west of Digby Island that includes Coast Island, Kinahan Islands, and Kitson Island, and Lelu Island, located immediately south of Ridley Island near Port Edward (Figure 3.3) (Prince Rupert Port Authority, 2011).

BCEAO Guide Land Use Setting

The Site is expected to be leased from the PRPA under a site lease agreement for at least 30 years with an option to extend the lease for up to a further 30 years.

The final location for the construction camp has not been determined; the southern end of Kaien Island along Ridley Island Road is currently being investigated for potential locations. Once the location of the construction camp is confirmed the appropriate land tenure agreements will be put in place.

3.2.2 Legal Description of Lands

CEAA Guide 3.1.5

There is no existing legal description of the Site. A surveyor is planned to be commissioned to survey the property to complete the legal description as part of the ongoing lease negotiations with the PRPA.

3.2.3 Zoning Designations

CEAA Guide 3.2

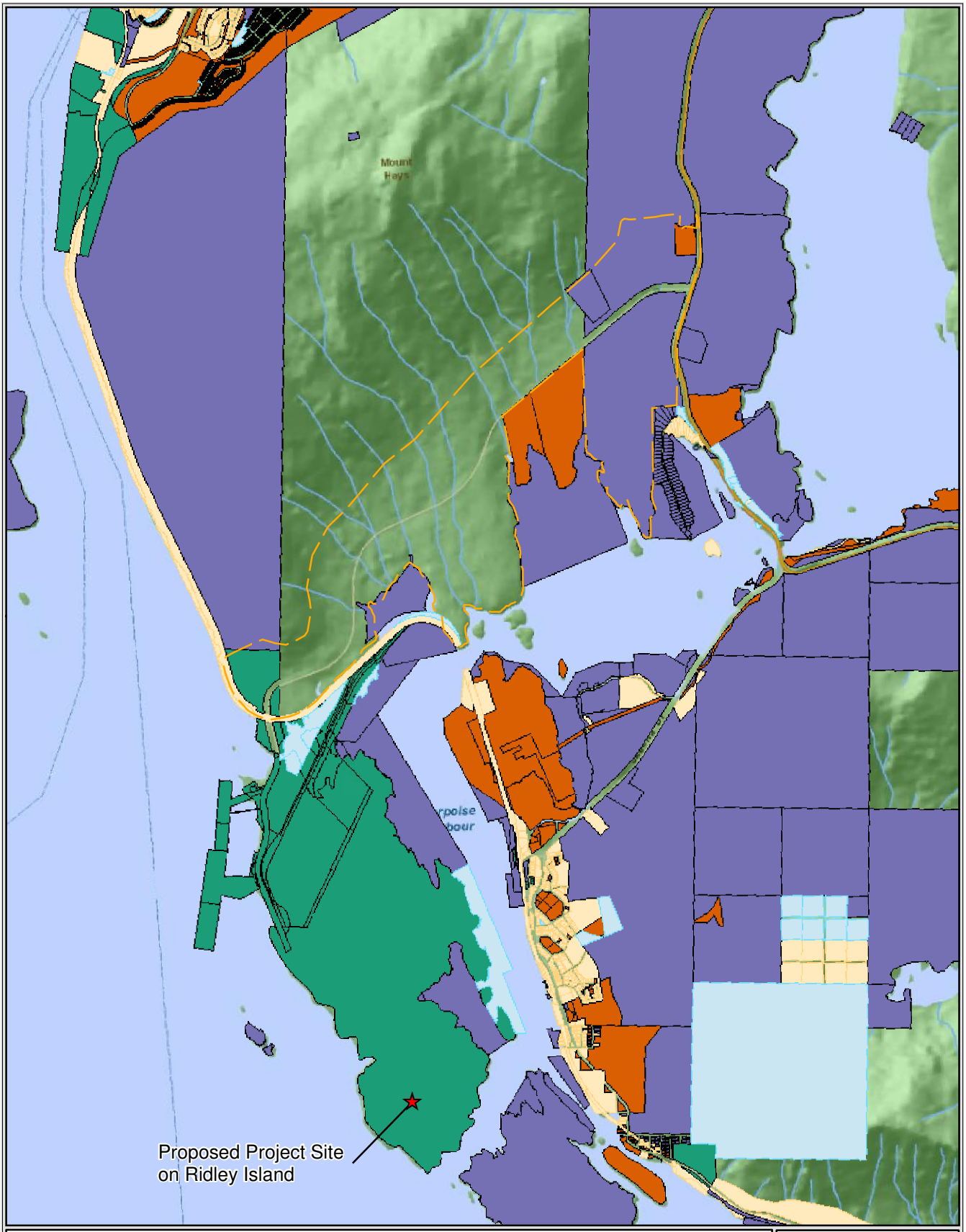
The Port of Prince Rupert 2020 Land Use Management Plan defines the development objectives for PRPA land. The plan is consistent with use of the Site for an LNG facility. The plan defines the appropriate major uses for the central, southern and western areas of Ridley Island as major industrial uses with a clear requirement for Port access. The plan underwent a comprehensive consultation program that included meetings with local community members, First Nations, the city of Prince Rupert and the town of Port Edward, port tenants and others. Input to the draft plan was obtained through an open house, and the final plan addressed a range of issues that were raised during the public consultation process (Prince Rupert Port Authority, 2011, p. 46).

Ridley Island is within the boundaries of the City of Prince Rupert and zoned under the City's Zoning Bylaw 3286 (2009) (City of Prince Rupert, 2009) as "M3 – Waterfront Industrial Zone". The permitted uses within this zone include: "marine transportation use", "general industrial use" and "bulk commodity storage and terminal" (City of Prince Rupert, 2009, p. 27). These permitted uses are consistent with development of an LNG facility on the Site.

The City's Official Community Plan (OCP) supports long term major industrial use for Ridley Island (City of Prince Rupert, 2010, p. 26). Under the Long Range Land Uses, which are designed to govern the intended future use of land, Ridley Island is classed as "Business Industrial". Business Industrial lands are "designed to accommodate major industrial sites

[7] *The land ownership data contained within Figure 3.2 was obtained from* http://webmaps.gov.bc.ca/imfx/imf.jsp?site=imapbc

(generally areas of 2 hectares and larger), including marine, transportation and port uses, and may include office and ancillary space" (City of Prince Rupert, 2010, p. 25).



Basemapping from ESRI (World Topology), Gov't of BC (GeoBC). All other data AECOM, 2013.

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NAD 1983 UTM Zone 9N

Legend

- Crown Federal
- Crown Provincial
- Crown Municipal
- Unknown Ownership
- Private Ownership

Site Components

- Construction Camp Search Area

Overview Map

BG Baseline Studies
Location: Ridley Island (Prince Rupert), BC

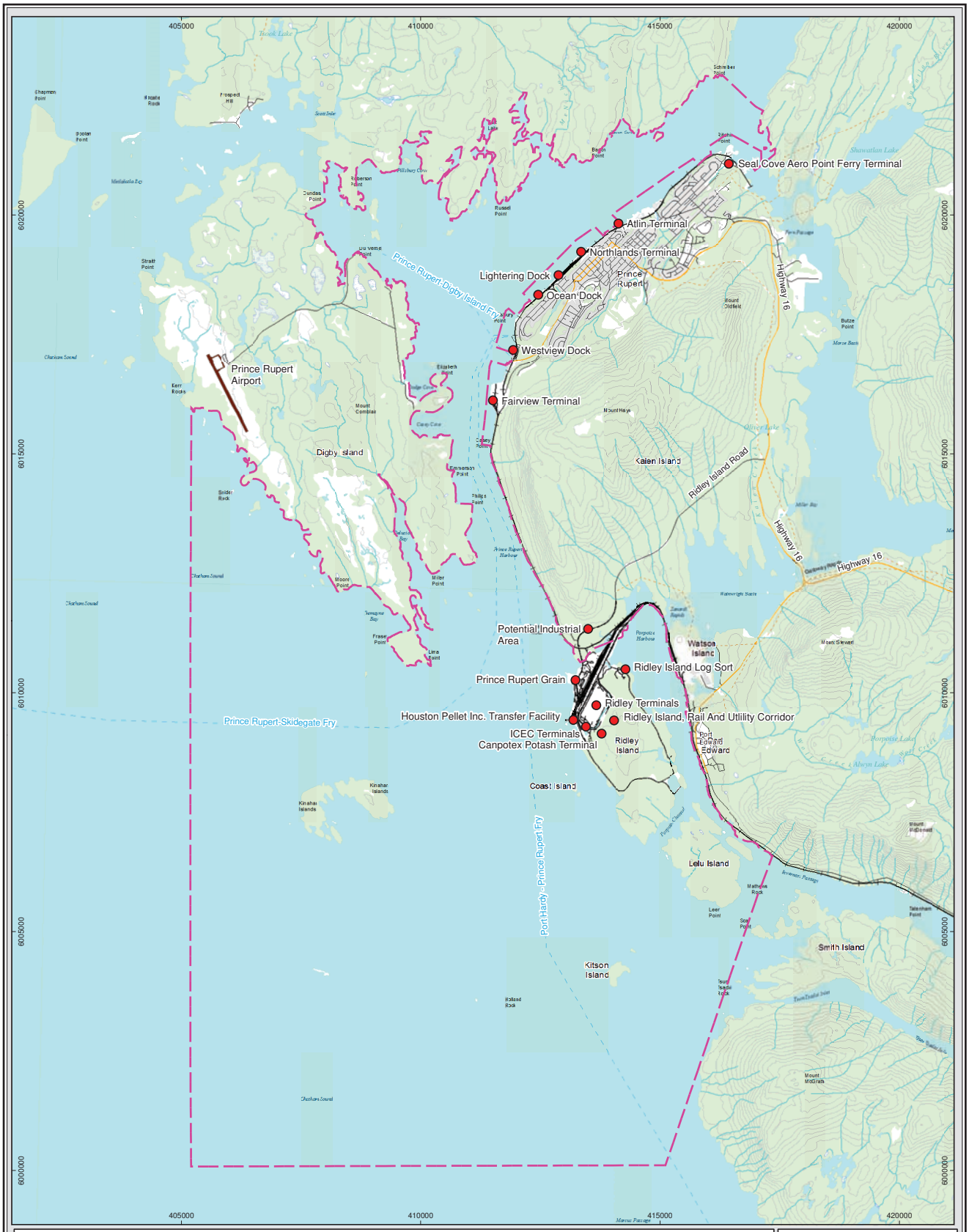
Land Ownership

April 2013
Project: 60284368

AECOM

Figure 3-2

File Location: P:\60284368\000-CADD\050 GIS WIP\02_Maps\SOCIO_ECONOMIC_PROGRAM\2013-01-16-ProjectDescription\Fig3-2-2013-04-03-LandOwnership-60284368.mxd Date Revised: April 01, 2013 Prepared by: DL Project: 60284368



Basemapping from Department of Natural Resources Canada and ESRI Basedata.

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Legend

- Prince Rupert Port Authority Projects
- Prince Rupert Port Authority Boundary

Overview Map

BG Baseline Studies
Location: Ridley Island, BC

Prince Rupert Port Authority Terminal Map

April 2013
Project: 60284368

AECOM

Figure 3-3

File Location: P:\60284368\000-CADD\050 GIS WIP\02_Maps\SOCIO_ECONOMIC_PROGRAM\2013-01-16-ProjectDescription\Fig3-3-2013-04-03-PrinceRupertPortAuthority-60284368.mxd Date Revised: April 03, 2013 Prepared by: DL Project: 60284368

The Prince Rupert OCP states that "depending on land absorption at Ridley Island and the existing industrial park along Highway 16, the City will positively consider long term preservation of an industrial site in the southeast area of Kaien Island, accessible from the Ridley Island access" (City of Prince Rupert, 2010, p. 27). The OCP further states that this area is served by a road already devoted largely to industrial traffic, with limited environmental impact, and that it has suitable slope conditions.

The areas at the southern end of Kaien Island are currently zoned as "P1 – Public Facilities Zone" (City of Prince Rupert, 2009, p. 29), which does not explicitly include the development of camps. However, under description of the Long Range Land Uses the OCP indicates that the area may be used for business industrial development, including office and ancillary spaces (City of Prince Rupert, 2010, p. 25). In light of these designations, a zoning amendment or variation to allow camp construction will be sought if needed.

3.2.4 Land and Water Management and Use

CEAA Guide 3.1
CEAA Guide 3.2
BCEAO Guide
Land use setting

3.2.4.1 Provincial Land Use Plans

The Site is located within the Central Coast and North Coast Land and Resource Management Plan (LRMP), which covers approximately 6.4 million ha of land in northern BC (Ministry of Agriculture and Lands, 2006).

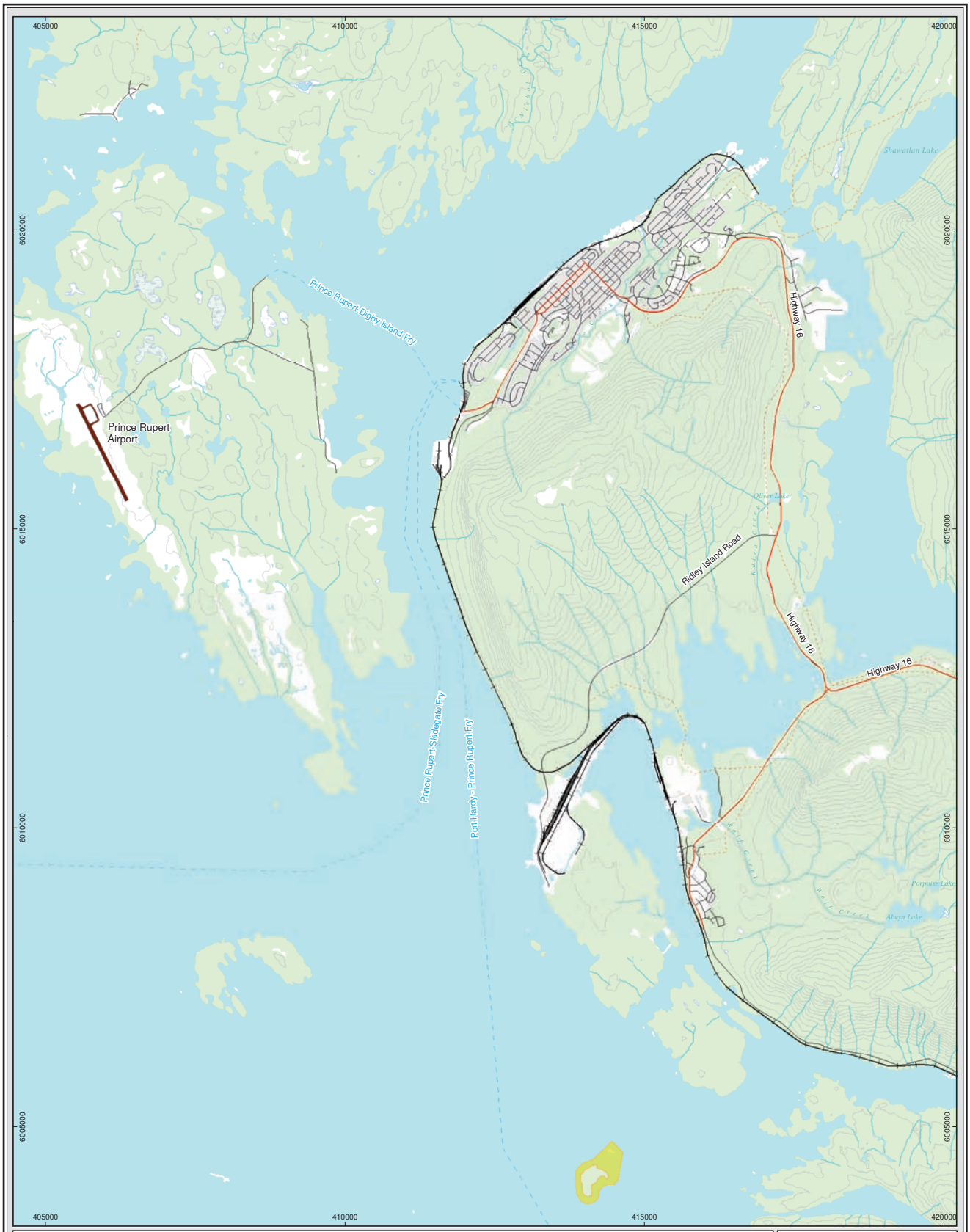
Three land use zones are applied by the LMRP (Integrated Land Management Bureau, 2009):

- Protected areas, which include newly established conservancies, as well as existing protected areas like parks
- Biodiversity, mining and tourism areas
- Ecosystem-based management (EBM) operating areas that is the most prevalent zone type, which applies to all areas not designated for protection and management applied by the other two zone types

Ridley Island and Kaien Island are covered by the EBM operating area zone (Integrated Land Management Bureau, 2009).

3.2.4.2 Conservation Areas

There are no designated protected areas at the Site or in the immediate vicinity. The closest protected area is the Kitson Island Marine Provincial Park, located approximately 2 km southwest and directly across from Lelu Island (Figure 3.4). There are no conservation areas or conservation plans applicable to the site and proposed camp location.



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3.2.5 Crown Tenures and Permits

CEAA Guide 3.1
CEAA Guide 3.2
CEAA Guide 4.2
CEAA Regs 12.0(c)
BCEAO Guide
Land use setting

Crown tenures and permits exist in the Project area (Table 3.1).

Table 3.1. Crown Tenures and Permits

Trapline Holders	Licenced trapline area TR0614T020 covers all of Ridley Island plus a significantly larger area of the mainland around and south of Port Edward.
Guide Outfitters	There are no designated guide outfitters licenced areas on Ridley Island.
Mineral and Placer Tenures	A line of mineral tenures stretch from the west to the east side of the north end of Ridley Island (75.6 ha). According to the Mineral Titles Online, these tenures are held by the same entity and expire May 2013. In addition, a mineral tenure (18.91 ha) also exists at the southern end of Ridley Island, which expires in September 2013.
Forest Harvest Authorizations/Forest Managed Licences	There are no active forest harvest authorizations on Ridley Island. One active Licence To Cut was identified on the north side of Ridley Island Road. Two retired forestry tenures were also identified along Ridley Island Road.
Active Land Act Leases, Licenses, Permissions and Permits	A Tenure and a Permit Application was identified off the south-west coast of Ridley Island for an electric power line. A Notation of Interest for heavy industry was identified off the north-west coast of Ridley Island and on either side of Ridley Island Road. A Licence of Occupation for quarrying was also identified along Ridley Island Road on the north side, west of Highway 16.

Source: (BC Government, 2012b) (data layers: Trapline, Guide Outfitter Areas, Land Act Leases, Land Act Licenses, Land Act Permissions, Land Act Permits).

3.2.5.1 Marine Users

Vessel Movements

Vessel traffic calling at the Port of Prince Rupert increased by over 44% between 2008 and 2011 (Table 3.2). This trend is expected to continue into 2013, when the number of vessel calls will be more than 75% higher than it was in 2008. Most of this change is driven by increases at the Fairview container terminal and the coal terminal on Ridley Island.

Table 3.2. Vessel Calls at the Port of Prince Rupert between 2006 and 2013 (forecasted)

	2006	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
RTI – Coal	58	70	68	61	107	103	140	150
PRG – Grain	93	112	65	84	87	107	105	105
Inner Anchorages – Logs	12	16	13	18	27	31	20	30
Wood Pellets	0	6	7	17	24	2	4	16
Fairview North - Liquid wax	4	4	2	4	4	3	4	4
Northland – Cruise	48	44	47	23	25	21	4	8
Fairview South - Container	0	9	79	104	106	139	160	180
Total	**215**	**261**	**281**	**311**	**380**	**406**	**437**	**493**

Source: Prince Rupert Port Authority, 2012

According to the Comprehensive Study for the Fairview Expansion Project, two vessels currently arrive per week (104 per year) at Fairview Terminal, but this number will increase to 10 per week (an increase of 416 vessels per year) when Stage 1 is complete in 2015 and up to 14 (an increase of 208 vessels per year over stage 1) per week when Stage 2 is complete between 2018 and 2019 (Fisheries and Oceans Canada, Environment Canada and Canadian Transportation Agency, 2012).

Vessel numbers for RTI will increase by 125 to 240 per year from 2011 to 2017, or 90 more vessels than is projected for 2013. Canpotex is expected to add 130 to 150 vessel calls per year beginning in 2017 (Fisheries and Oceans Canada, Environment Canada and Canadian Transportation Agency, 2012).

The combined total from all of these sources will result in a total increase of 864 vessels per year by 2018, for a total of 1,357 vessels per year (Table 3.3).

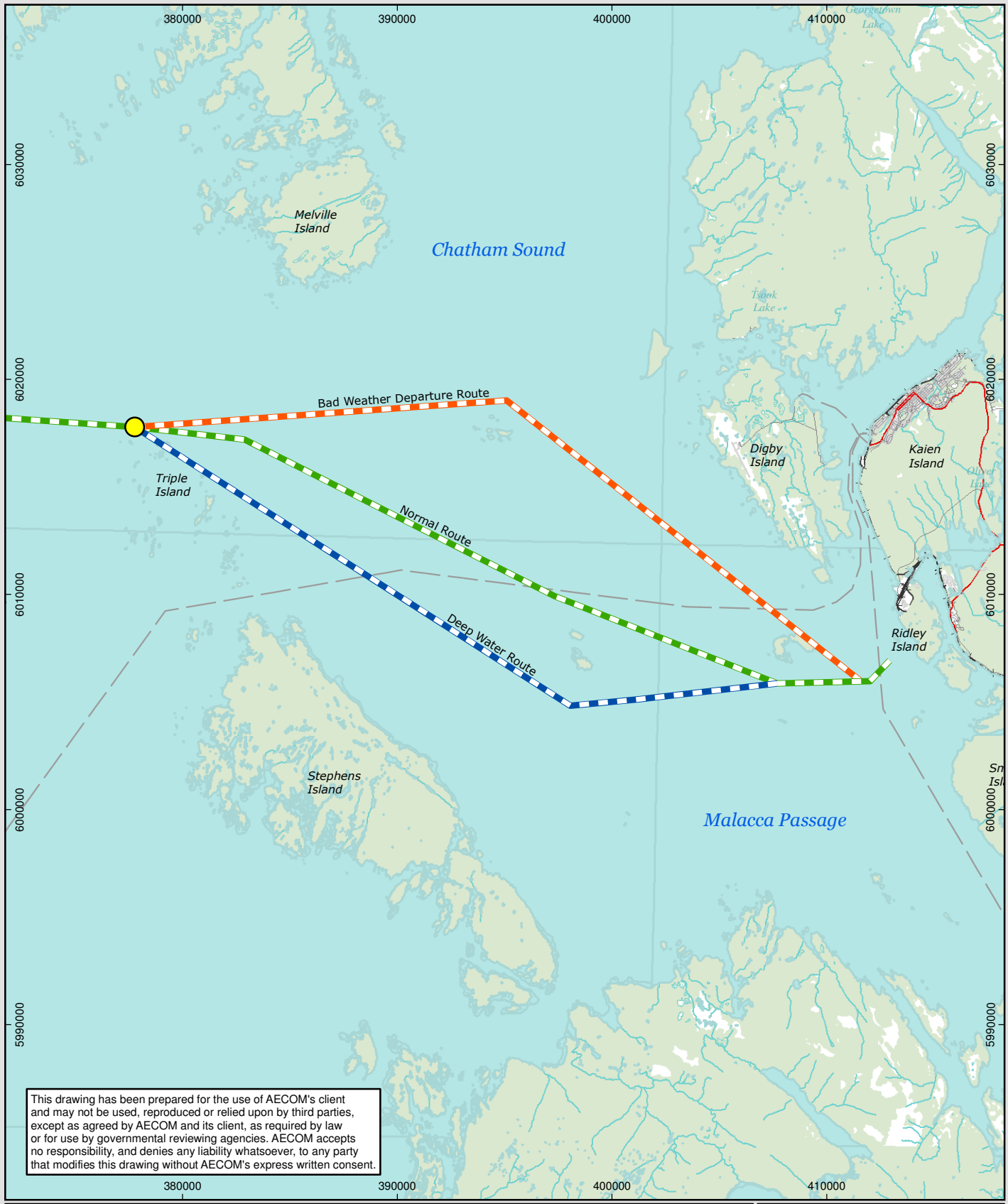
Table 3.3. Vessel Traffic Associated with Other Projects

	Additional Calls	Total	Cumulative Increase from 2013	Cumulative Percentage Increase from 2013
2013 - Projection	-	493	0	0%
2015 - Fairview Phase 1	416	909	416	84%
2017 - Canpotex and RTI	150 + 90	1,149	656	133%
2018 - Fairview Phase 2	208	1,357	864	175%

Source: Comprehensive Study Report for the Proposed Fairview Terminal Phase II Expansion Project, 2012

Vessel traffic coming in to and going out of the Fairview terminal is not expected to interfere with traffic in and out of Ridley Island (Canadian Environmental Assessment Agency, 2012); although there is a risk of incidents in the outer harbour (i.e., in the vicinity of Triple Island). This risk will be mitigated by the vessel traffic management systems that the PPRA will have in place. A study commissioned by the PRPA found that the Port of Prince Rupert is one of the lowest risk ports on the west coast (Fisheries and Oceans Canada, Environment Canada and Canadian Transportation Agency, 2012). The PRPA also has plans to adapt traffic management systems to ensure an acceptable level of navigation safety, such as adding pilots and pilot boats, and adding additional anchorages as needed (Fisheries and Oceans Canada, Environment Canada and Canadian Transportation Agency, 2012). The PRPA is also working with the Canadian Coast Guard to enhance and improve marine traffic control by implementing AIS and radar to the marine approaches.

Key shipping and ferry routes in and out of the Port of Prince Rupert are illustrated in Figure 3.5 and Figure 3.6.



Basemapping from Esri Online, Government of British Columbia, Natural Resources Canada and Stantec.

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Legend

- Pilotage Point
- Normal Route
- Deep Water Route
- Bad Weather Departure Route
- Ferry Route

Overview Map

BG Baseline Studies
Location: Ridley Island, BC

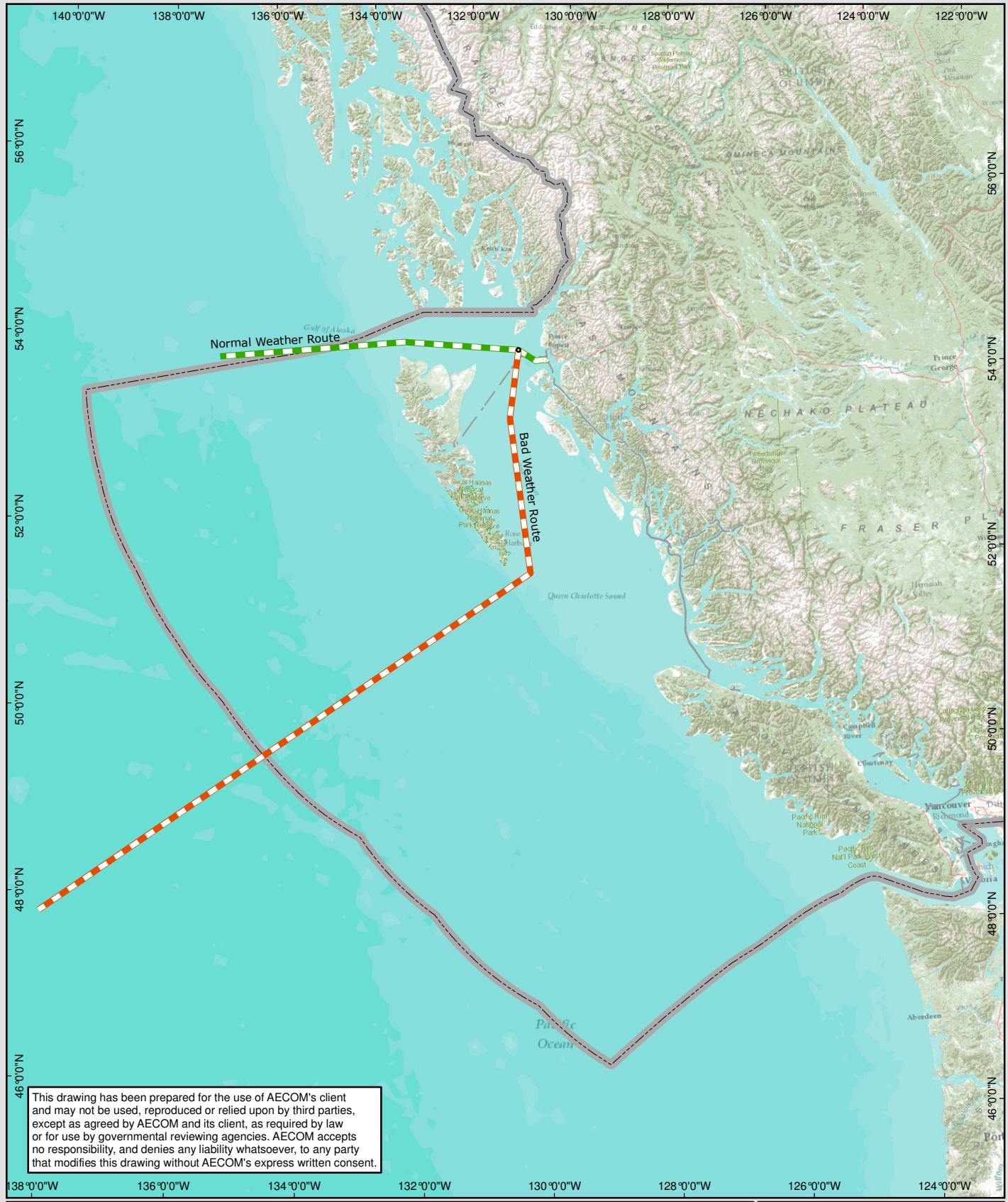
Shipping Routes

April 2013
Project: 60284368

AECOM

Figure 3-5

File Location: P:\60284368\000-CADD\050 GIS WIP\02 Maps\SOCIO ECONOMIC PROGRAM\2013-01-16-ProjectDescription\Fig3-5-2013-04-03-ShippingRoute-60284368.mxd Date Revised: April 05, 2013 Prepared by: DL Project: 60284368



Basemapping from Esri Online, Government of British Columbia, Natural Resources Canada and Stantec.

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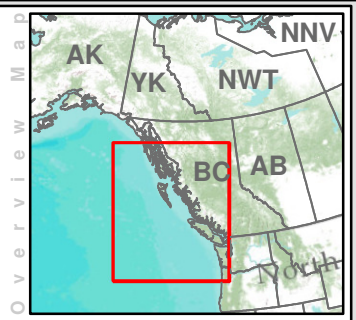
Legend

- Pilotage Point
- Normal Weather Route
- Bad Weather Route
- International Water Boundary



BG Baseline Studies
Location: Ridley Island, BC

Shipping Routes to International Waters

April 2013
Project: 60284368

AECOM

Figure 3-6

File Location: P:\60284368\000-CADD\050 GIS WIP\02 Maps\SOCIO ECONOMIC PROGRAM\2013-01-16-ProjectDescription\Fig3-6-2013-04-03-ShippingRouteInternationalWater-60284368.mxd Date Revised: April 03, 2013 Prepared by: DL Project: 60284368

Port Edward Harbour Authority

The Port Edward Harbour Authority maintains four marinas: Porpoise Harbour (Port Edward), Cow Bay, Rushbrook Marina, and Fairview Marina (Figure 5.15). The marina closest to Ridley Island is the Porpoise Harbour Marina Complex, located in Porpoise Harbour on the western side of Port Edward. The Porpoise Harbour Marina Complex can accommodate approximately 350 vessels (Port Edward Harbour Authority, 2012).

3.2.5.2 Communities and Residents

CEAA Guide 3.1
CEAA Regs 12.0(d)
BCEAO Guide General Background Information

Location

The community of Port Edward is located on the opposite (east) side of Porpoise Harbour from Ridley Island, within 0.5 km of the easternmost shore of the Island. Port Edward is the community closest to the Project, with the nearest residences approximately 850 m from the nearest edge of the project footprint. Prince Rupert is located north of Ridley Island and is over 10 km from the Site.

Demographics

The information presented in this section is from the most recent census data available. The population of the region where the Project is proposed has been in decline for more than a decade. Since 2001, Prince Rupert, Port Edward and the Skeena-Queen Charlotte Regional District have undergone consistent population decline, particularly between 2001 and 2011. Between 2006 and 2011, Lax Kwa'alaams and Metlakatla faced population stagnation and population decline respectively. In 2011, the populations of Prince Rupert and Port Edward were 12,508 and 544, respectively. The on-reserve populations of Lax Kwa'alaams and Metlakatla were 667 and 118, respectively (Statistics Canada, 2006a) (Statistics Canada, 2011).

While the proportion of the population aged between 20 and 64 in the Prince Rupert, Port Edward and the Skeena-Queen Charlotte Regional District is close to the provincial average, the proportion of those aged 0 to 19 is larger than the provincial average, and the proportion of those aged 65 and older is smaller (Statistics Canada, 2011). Prince Rupert had a higher proportion of women to men in 2006, but there were more men than women in Port Edward and the Skeena-Queen Charlotte Regional District (Statistics Canada, 2006a).

The proportion of Aboriginal people in the Skeena-Queen Charlotte Regional District was over 40% in 2006, almost nine times the proportion in BC. The proportion of Aboriginal people in Prince Rupert and Port Edward were also above the BC average at over 30%. As a percentage of the Aboriginal population, the proportion of Métis in Prince Rupert, Port Edward and the Skeena-Queen Charlotte Regional District is lower than the BC average (Statistics Canada, 2006a).

3.2.6 Marine Terminal Aspects

CEAA Guide 2.3
CEAA Guide 3.2
BCEAO Guide Project Overview

The Project will include a marine terminal for loading LNG onto carriers. The types of facilities and activities associated with the construction and operation of the marine terminal are described in Section 2. There is no existing marine terminal at the Site, but there are other marine terminals on Ridley Island.

3.2.7 Port Aspects

The Site is located in the Port of Prince Rupert on Federal Crown Land, under the administration of the PRRA. The land falls within the PRPA's land-use plan and has been zoned for Industrial development.

3.2.8 Aboriginal Lands / Resource Involvement

CEAA Guide 3.1
CEAA Guide 3.2
CEAA Regs 12.0(e)

The Tsimshian, or "People of the Skeena," are a group of linguistically and culturally related First Nations that occupy the northwest coast of BC and the southern tip of the Alaska Panhandle. The Tsimshian have close cultural and linguistic ties to the Gitxsan, who occupy the Upper Skeena River valley and the Nisga'a (Nishga) along the Nass River valley. The "Coast Tsimshian", a group that includes the Lax Kw'alaams and Metlakatla First Nations, have occupied the area along both the lower parts of the Skeena River and the nearby coast, and assert traditional territories in the Prince Rupert area that include the Site on Ridley Island and areas along related shipping routes. The "Southern Tsimshian", a group that includes the Gitxaala First Nation, also assert traditional use and territory that includes the Site. The "Canyon Tsimshian" includes the Kitselas and Kitsumkalum First Nations, occupying the upper Skeena River valley and having current and historic traditional use and territories that extend to the coast and to the Prince Rupert area and coastal waters. The Tsimshian peoples share many aspects of their culture, social organization and history (Halpin & Seguin, 1990).

Information on the geographic extent of traditional territories was gathered from:

- Land Use Planning Agreements.
- Forest and Range Consultation and Revenue Sharing Agreements.
- Statements of Intent.

The Land Use Planning and Forest and Range Consultation and Revenue Sharing agreements were signed between First Nations and the Province to create greater certainty and control over resource use and development within the traditional territories of First Nations. Each of these agreements includes a map showing the asserted Traditional Territory of the First Nation. The Statement of Intent is the first stage of the BC Treaty Commission Agreement Six-Stage Treaty Process, and includes a map showing the geographic area of the First Nation's traditional territory.

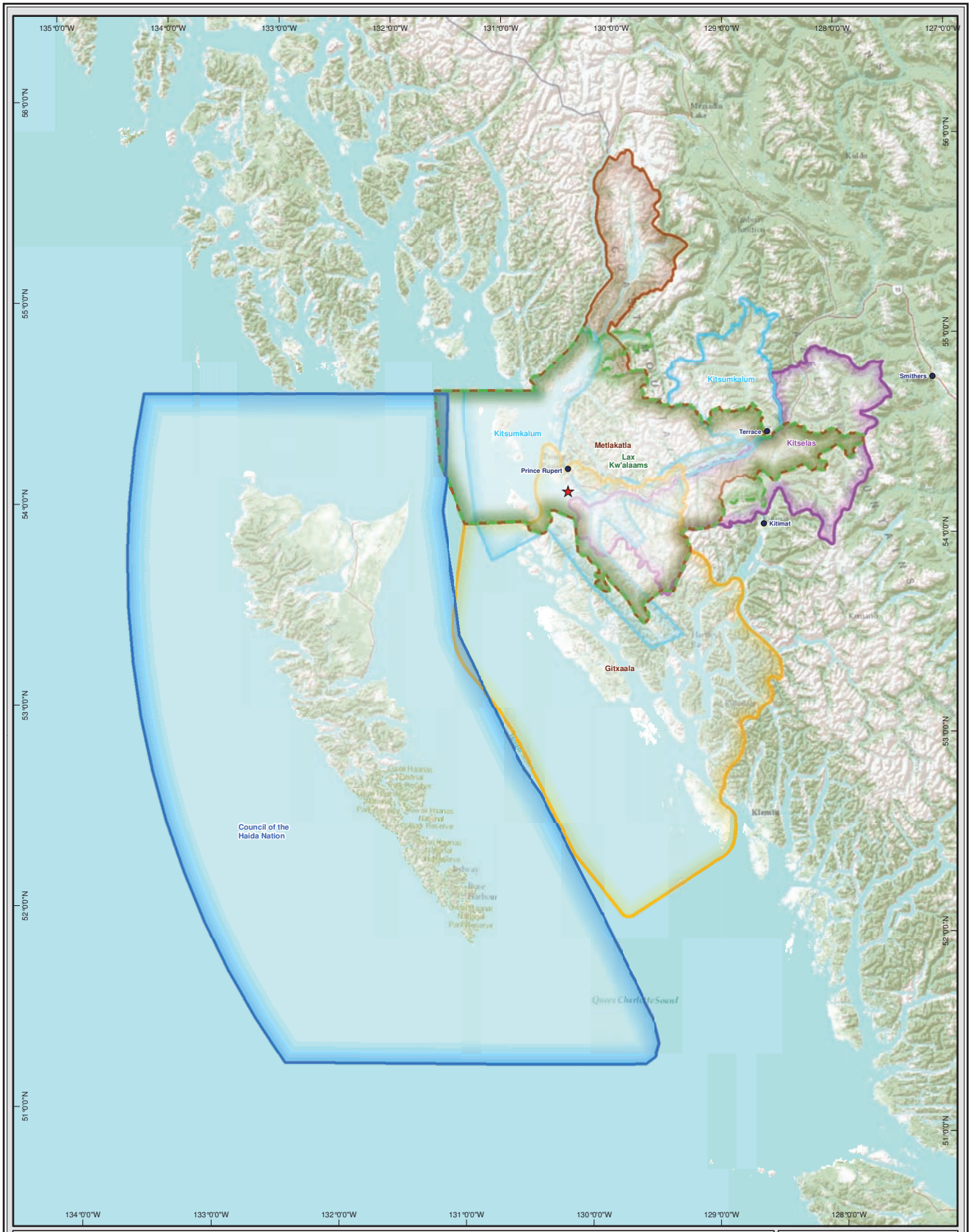
A consolidated map of the approximate location of the Traditional Territories shown in these maps was developed for illustrative purposes only (Figure 3.7). These maps have been used as a means of identifying First Nations with an interest in the Project.

Additional information on traditional use of lands and resources by Aboriginal groups is described in Section 6.2.

3.2.9 Reserve Lands

The communities of Metlakatla and Port Simpson (Lax Kw'alaams) are the nearest First Nations communities to the Site. Both of these communities are located north of Prince Rupert. The Metlakatla reserve, S 1/2 Tsimpsean 2, is the closest to the Project at approximately 12 km away.

The Lax Kw'alaams reserve, Lax Kw'alaams 1, is approximately 22 km away from the Project (Figure 3.8).



Basemapping from Department of Natural Resources Canada and ESRI Basedata.

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NAD 1983 UTM Zone 9N

Legend

- Kitselas
- Kitsumkalum
- Gitxaala (Kitkatla)
- Metlakatla
- Lax Kw'alaams
- Council of the Haida Nation
- Major Communities
- Ridley Island

Overview Map

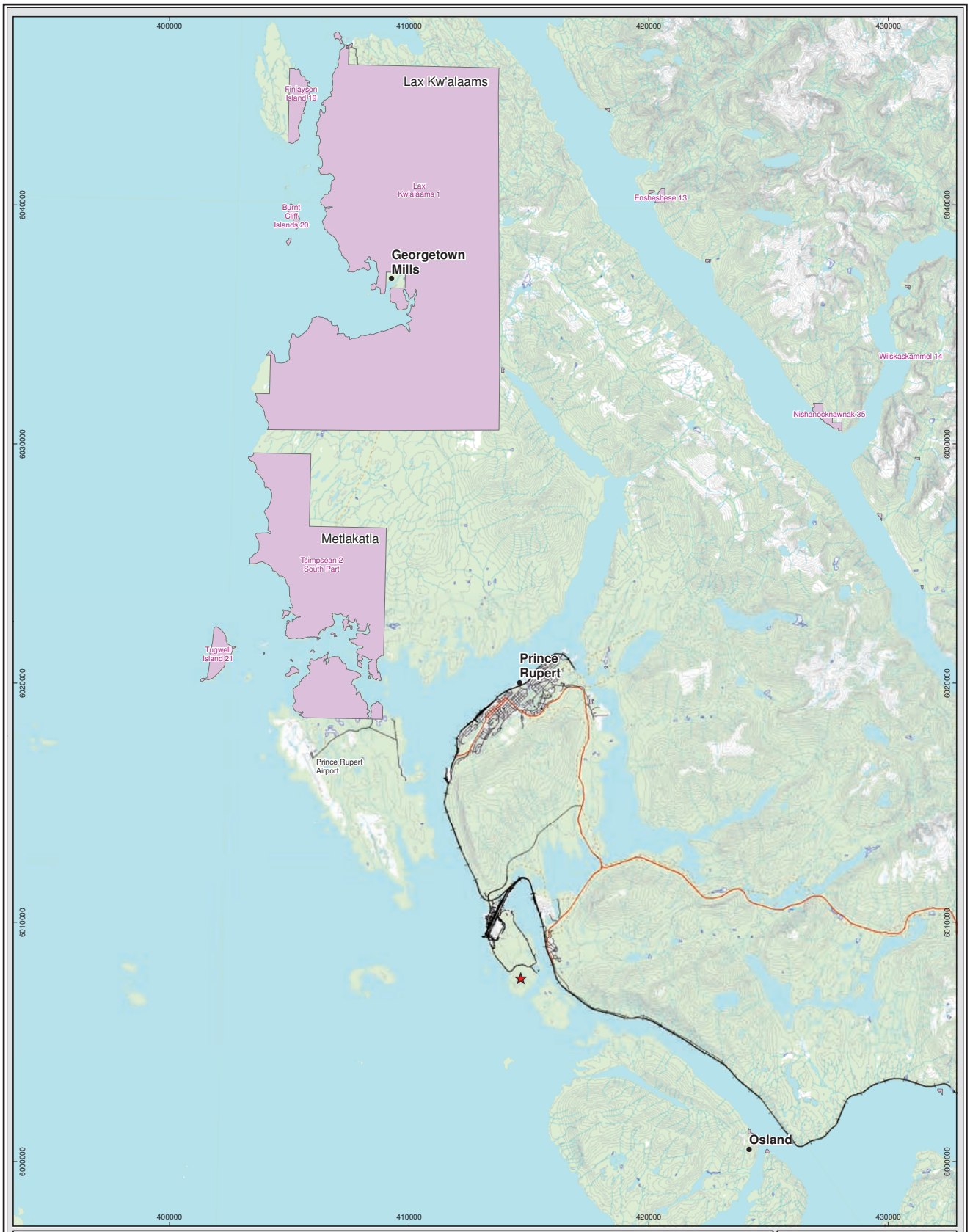
BG Baseline Studies
Location: Ridley Island, BC

First Nations Traditional Territories Covering Ridley Island

April 2013
Project: 60284368

AECOM

Figure 3-7



Basemapping from Department of Natural Resources Canada and ESRI Basedata.

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Legend

- ★ Ridley Island
- First Nation Reserves

Overview Map

BG Baseline Studies
Location: Ridley Island, BC

First Nation Reserve Lands

April 2013
Project: 60284368

AECOM

Figure 3-8

File Location: P:\60284368\000-CADD\050 GIS WIP\02_Maps\SOCIO_ECONOMIC_PROGRAM\2013-01-16-ProjectDescription\Fig3-8-2013-04-03-ProjectDescription_ReserveLands-60284368.mxd Date Revised: April 01, 2013 Prepared by: DL Project: 60284368

4. Federal and Provincial Involvement and Regulatory Requirements

CEAA Guide 4.0

4.1 Federal Financial Support

CEAA Guide 4.1
CEAA Regs 13.0

There is no proposed or anticipated federal financial support associated with the Project.

4.2 Federal Lands Requirements

CEAA Guide 4.2
CEAA Regs 14.0

The Project will be located on Federal Crown Land under the administration of the PRPA. The land will be leased from the PRPA.

Some facilities, such as the construction camp, contractor storage areas, borrow areas, and warehouses, will be located offsite on Provincial Crown Land or Prince Rupert municipal lands.

4.3 Federal Legislative Requirements

CEAA Guide 4.3
CEAA Regs 15.0
BCEAO Guide
Required Permits

Section 1.4 discussed the legislative provisions that identify the Project as a project requiring an EA under both the CEAA and the BCEAA.

PRLNG has identified federal permits, licences approvals and authorizations that may be required for the Project (Table 4.1), including the name of the approval, the activity it covers, applicable legislation and the granting agency.

Table 4.1. Federal Permits, Licences, Approvals and Agencies

Responsible Agency	Description of Federal Permits, Licences and Approvals	Activity
Environment Canada (EC)	Disposal at Sea Permit *Canadian Environmental Protection Act s. 125(1) (b)*	Disposal of marine sediments at an off shore disposal site. Dredging is required around the MOF and LNG jetty to achieve a safe navigation depth.
National Energy Board (NEB)	Export Licence *National Energy Board Act* s. 117	Exporting LNG outside of Canada to international markets.
Canadian Transportation Agency (CTA)	Approval *Canada Transportation Act* s.101	Crossing railway lines for infrastructure on Ridley.
Transport Canada (TC)	Approval *Navigable Waters Protection Act*	Construction of temporary and permanent off-loading docks and the LNG berth.
	Certificates of Compliance *Marine Transport Security Act* *Marine Transportation Security Regulations*	Operation of the Facility, port and carrier.
Fisheries and Oceans Canada (DFO)	Authorization to create harmful alteration, disruption or destruction of fish habitat (HADD) *Fisheries Act* s. 35.2	Activities that may result in a HADD include construction of: • facilities on the foreshore of Ridley Island. • temporary and permanent docks and the LNG berth. • temporary and permanent infrastructure in and around streams.

Responsible Agency	Description of Federal Permits, Licences and Approvals	Activity
Natural Resources Canada (NRC)	Licences/permits for explosives *Explosives Act* s. 7(1) *Explosives Regulations*	Explosives will be used during construction. Activities that may require licences and permits related to the use of explosives include: • transportation. • storage. • blend or manufacture for use.

During the review process and the exchanges with federal authorities more specific requirements will be refined.

4.4 Provincial Regulatory Requirements

BCEAO Guide
Required Permits

PRLNG has identified provincial permits, licences and approvals that may be required for the Project (Table 4.2), including the name of the approval, the activity it covers, applicable legislation and the granting agency.

Table 4.2. BC Permits, Licences, Approvals and Agencies

Responsible Agency	Authorization or Requirement and Applicable Statute	Activity
BC Oil and Gas Commission (BCOGC)	Facility Permit *Oil and Gas Activities Act* s. 21	Construction and operation of the Facility.
	Licence to Cut *Forest Act s. 47*	Removal of timber from Provincial Crown Land to clear sites for the construction camp and ancillary construction facilities (e.g., contractor lay down areas, warehouses etc.).
	Tenure on Provincial Crown Land *Land Act* ss. 39 and 40	Use of Provincial Crown Land for the construction camp and ancillary construction facilities.
	Waste Discharge Permit *Environmental Management Act* s. 6(5)	Facility air emissions, effluent discharges, and waste disposal. Waste incinerator for the construction camp.
BC Ministry of Environment (BCMOE), Water Stewardship Branch	Short Term Use of Water *Water Act* s. 8	Water may be needed for temporary construction facilities on Provincial Crown lands that may require diverting and using surface water for a period of <12 months.
	Long Term Water Licence *Water Act* s. 7	Water may be needed for construction facilities on Provincial Crown lands that may require diverting and using surface water for a period of >12 months.
BC Ministry Lands and Natural Resource, Archaeology Branch	Heritage Inspection Permit Heritage Investigation Permits *Heritage Conservation Act* s. 14	Archaeological surveys to support the environmental impact assessment on Provincial Crown Lands.
	Site alteration permit *Heritage Conservation Act s. 12*	Alteration of archaeological values (if any are found) that may be disrupted by construction of facilities on Provincial Crown Land.

Responsible Agency	Authorization or Requirement and Applicable Statute	Activity
BC Ministry of Environment (BCMOE), Environmental Protection Division	Authorization for Sewage facilities *Environmental Management Act* *Municipal Sewage Regulation* *Sewerage System Regulation*	Sewage facilities for the construction camp > 100 persons and registered with the Ministry of Environment at least 90 days prior to constructing the Facility.
BC Interior Health Authority (BCIHA)	Permit *Public Health Act s. 19* *Industrial Camp Regulation*	Construction and operation of the construction camp.

As the Facility will not be providing utility service, accordingly no approvals will be sought from the BC Utilities Commission (BCUC). It is planned that during the review process and the exchanges with BC authorities, additional approvals may be identified and specific requirements for approvals will be refined.

5. Project Setting and Potential Effects

CEAA Guide 5.0

CEAA Guide 5.1
CEAA Regs 16.0
BCEAO Guide
Project Overview

Information for the Project setting has been collected from desktop studies conducted between 2011 and 2012 and fieldwork conducted in 2012. These studies were conducted as part of PRLNG's due diligence for the Project to determine project feasibility and assess project risks. However, these studies were also designed to be used to support the EA. Fieldwork and studies in support of the environmental impact statement (EIS) will continue through 2013. In the coming months, PRLNG in conjunction with BG Canada will continue consultation with Aboriginal Groups and key stakeholders to review the work conducted to date and determine additional work that may be required in support of the EIS.

The preliminary findings from the studies conducted to date are described in the following sections. Possible mitigation measures are discussed where potential effects have been identified. As part of the ongoing environmental and socio-economic studies and engineering design work to be conducted throughout 2013, an area of priority will be identifying mitigation strategies to address any effects identified. This preliminary assessment of potential effects and mitigation measures is designed to facilitate discussion with provincial and federal agencies, Aboriginal Groups, and the public in the following months.

A detailed examination of the potential environmental effects of the Project and the possible mitigation measures will be provided as part of the EIS. The EIS will also assess any potential residual effects and cumulative effects.

5.1 Environment

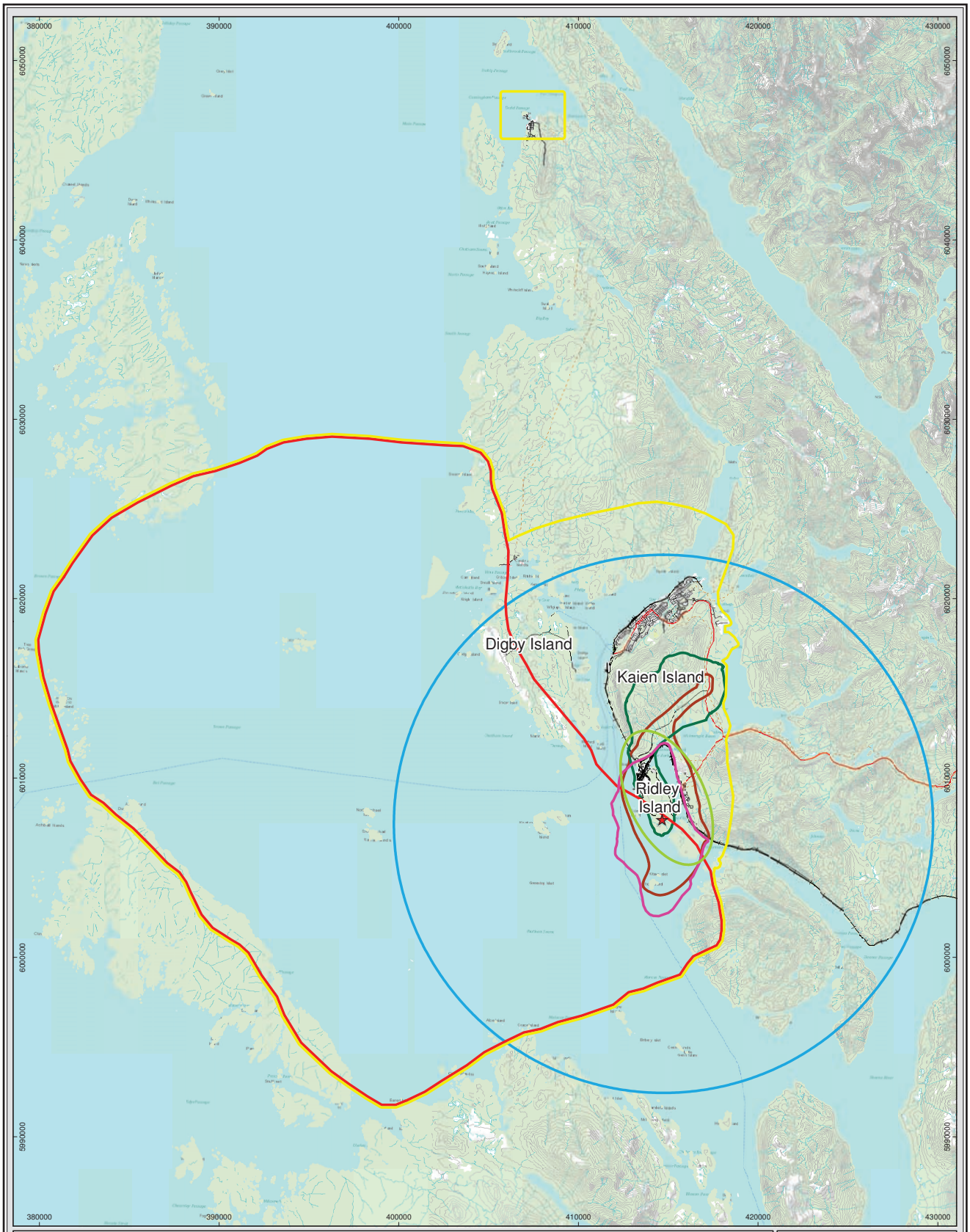
The geographical scope for studies varies across the different environment disciplines (Figure 5.1). For climate, the international nature of the GHGs and climate change issue dictates that the scope of study extend to include the Province of BC and Canada.

5.1.1 Climate

CEAA Guide 5.1
CEAA Regs 16.0
BCEAO Guide
Project Overview

5.1.1.1 Setting - Climate

A baseline technical analysis of climate was conducted for the region. The baseline data for meteorology will focus on information for the City of Prince Rupert, and the District of Port Edward and regional factors influencing local weather. The Prince Rupert Airport meteorological station is the closest reliable long-term EC weather station. Historical regional climate and wind data were obtained from meteorological monitoring conducted by EC. In October, 2012, AECOM installed a dedicated climate station in Port Edward. This station measures temperature, wind speed and direction, barometric pressure and solar radiation.



Basemapping from Department of Natural Resources Canada and ESRI Basedata.

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Legend

★ Project Site

Discipline

- Socio Economic
- Marine Mammal
- Marine Fish
- Freshwater Aquatic
- Air Quality
- Terrestrial
- Noise

Overview Map

BG Baseline Studies
Location: Ridley Island, BC

Geographical Scope of Studies

April 2013
Project: 60284368

AECOM

Figure 5-1

File Location: P:\60284368\000-CADD\050 GIS WIP\02_Maps\SOCIO_ECONOMIC_PROGRAM\2013-01-16-ProjectDescription\Fig5-1-2013-04-03-ScopeOfStudy-60284368.mxd Date Revised: April 01, 2013 Prepared by: DL Project: 60284368

Ridley Island lies within the Pacific climatic region of Canada that extends less than 150 km inland. Because of the prevailing westerly circulation of mild, moist air off the Pacific, this climatic region is characterized by cool summers and mild winters.

The prevailing wind in the area is from the south east, and the average wind speeds range from 2.07 m/s to 4.08 m/s. Prince Rupert is Canada's wettest city, with average annual precipitation of 2,594 mm of rainfall and 126 cm of snowfall. Mean monthly precipitation ranges between 114 mm and 379 mm with the greatest monthly precipitation falling in October and the least falling in July (Environment Canada, 2012).

5.1.1.2 Potential Effects and Mitigation Measures – Climate

CEAA Guide 5.3
CEAA Regs 18.0
BCEAO Guide
Project Overview

The emission of GHGs is one factor that has the potential to effect climate change. The GHG effect is caused by absorbing gases that trap solar radiation within the atmosphere. These absorbing gases include CO_2, methane (CH_4), and nitrous oxide (N_2O).

For the Project, there are expected to be emission sources and activities that have potential to lead to alterations of the GHG baseline levels. In the construction phase, road traffic emissions, site clearing and grubbing, and operation of construction equipment may have an effect on GHGs. In the operational phase, the following sources may alter existing GHG levels: power generation; marine vessel operations including carriers and tugs (i.e., emissions from fuel combustion for main/auxiliary engines and auxiliary/steam boilers); road traffic emissions; tank storage emissions; facility operations; loading of carriers; upset flaring emissions; and fugitive emission leaks from fittings.

Mitigation measures that may be appropriate include:

- minimization of vehicle idling and turning off equipment when not in use.
- use of electric driven accelerated processing units (APUs) where appropriate.
- ensuring ground service vehicles are properly tuned and maintained.
- implementation of onsite speed limits.
- proper route selection to reduce travel distances for the delivery of construction and operational materials.
- development and implementation of a balanced earthwork management plan and keeping as much excavated earth onsite as possible to reduce offsite hauling and loss of natural GHG sinks.
- application of adaptive management to reduce air emissions.
- use of grid power during construction.
- use of high efficiency gas turbine driven compressors.
- use of air coolers instead of a cooling water/sea water cooling system.
- provision on annual reports on GHG emissions after the operation commences.
- controlling of fugitive emissions, spills and unintentional releases of both LNG and natural gas.
- during operations, implementation of preventative maintenance program that includes a leak detection and repair (LDAR) program to control and prevent emission leaks within the Facility's infrastructure.

5.1.1.3 Further Study and Assessment - Climate

The science of climate change has not advanced to the point where a clear and direct relationship can be determined for specific (or even regional) GHG emissions and global climate change. It is not possible to conclude with certainty that a given source of GHGs has a measurable effect on local, regional, or global climate. As such, the work will focus on determining Project effects on GHG emissions, rather than Project effects on climate change. This method meets the guidelines outlined in CEAA. The Project effects on climate will be based on the level of GHG emissions in relation to existing provincial and national GHG emissions. A GHG emission inventory will be developed to assess the potential Project effects. Emission inventories will be calculated based on peak operation and production levels. The emissions will be quantified based on information regarding the type, quantity, and maximum operating time of the equipment. The total Project GHG emissions will be compared to the provincial and national emission levels to assess the significance of the potential effect of the Project on climate.

5.1.2 Air Quality

CEAA Guide 5.1
CEAA Regs 16.0
BCEAO Guide
Project Overview

5.1.2.1 Setting – Air Quality

PRLNG established an air quality monitoring station in the community of Port Edward at 800 Alder Avenue in August of 2012 to acquire current data for CO, NO_2, SO_2, PM_{10}, and $PM_{2.5}$. These parameters are continuously monitored and logged on an hourly basis and are being monitored for a six month period. The hourly average and daily average concentrations for CO, NO_2, SO_2, PM_{10}, and $PM_{2.5}$ are measured and recorded on a continuous basis.

The publicly available data for the study area does not cover all the criteria air contaminants (CACs) and is not current. BCMOE air monitoring data for Prince Rupert and Port Edward is only available for SO_2 and PM_{10}. Monitoring conducted by the BCMOE in Port Edward for PM_{10} was last completed in 2005; and monitoring for SO_2 in Port Edward occurred from 1998 to 2002. However, the total port traffic in the area has almost doubled since 2005. The increase in port traffic has resulted in an increase in fuel combustion emissions. Therefore, the publicly available data are not considered representative of existing baseline conditions in the area.

The nearest community to the Project site is Port Edward. The District of Port Edward contains sensitive receptors and is predicted to have the highest potential to be impacted by Project activities. Sensitive receptors include residential dwellings, health care facilities, senior citizens' residence, long term care facilities, child care facilities and educational facilities.

The monitoring site was chosen to be representative of the general group of sensitive receptors (Figure 5.2). Monitors are not required at all sensitive receptors to adequately characterize the ambient air quality as dispersion modelling will be used to assess air quality at all locations within the study area. The following factors were considered to choose the most appropriate air monitoring site:

- Location of Project activities and sensitive receptors such as residential dwellings and education facilities
- Local wind patterns based on meteorological data available at the time of implementation from the Prince Rupert Airport meteorological station
- Location of topographic features that affect the dispersion of emissions

- Wind flow obstructions caused by nearby buildings, trees, hills or other obstacles
- Accessibility of electrical power
- Station security
- Proximity to high traffic roads or other emission sources

Since neither BC nor Canada currently has a detailed air monitoring protocol that outlines the Quality Assurance and Quality Control (QA/QC) for all parameters being monitored, the Alberta Environment Air Monitoring Directive was chosen as the next closest jurisdiction with an appropriate protocol. The following QA/QC measures have been established to provide confidence that baseline air monitoring is reliable, representative and complete:

- Daily quality assurance (such as calibrations that include spans, zeros and precisions) was performed to ensure proper operational performance of the analyzers.
- Data is downloaded daily to minimize the risk of data loss.
- Monthly calibrations were performed as per the Alberta Environment Air Monitoring Directive, 1989 (Alberta Environment, 2006), in the absence of any ambient air monitoring calibration standards in the BC Field Sampling Manual.
- Standardized operating procedures for the daily operating requirements were carried out and proper documentation is applied as stipulated in Alberta Environment Air Monitoring Directive, 1989 (Alberta Environment, 2006).
- All data was traceable to a primary standard. All calibration standards (including zero and spans) used were certified traceable to primary standards of the US Environmental Protection Agency, Canada's Institute for National Measurement Standards (INMS), and the Alberta Environment Air Monitoring Directive, 1989 (Alberta Environment, 2006).

The monitoring data collected from this station between September and November 2012 serves as the current reference of existing air quality setting in the area. Monitoring data for CO (Table 5.1), NO_2 (Table 5.2), $PM_{2.5}$ (Table 5.3), PM_{10} (Table 5.3), SO_2 (Table 5.4) are all well below British Columbia Air Quality Objectives and Standards (BCAQOS), and the National Ambient Air Quality Objectives (NAAQO).

Table 5.1. Ambient Air Quality Monitoring Data for CO

Parameter	Averaging Period	NAAQO[(a)1] ($\mu g/m^3$)	Avg Conc ($\mu g/m^3$)	Max Conc ($\mu g/m^3$)	Min Conc ($\mu g/m^3$)	80th Percentile ($\mu g/m^3$)	90th Percentile ($\mu g/m^3$)	Frequency of Exceedence
CO	1 hour	35,000	128.2	2,986.2	0.0	205.1	226.7	0.00%
	8 hour	15,000	130.9	1,289.6	0.0	204.3	226.9	0.00%

Notes: (a) Maximum acceptable NAAQO

Source: [1]Government of Canada (2004), National Ambient Air Quality Objectives

Table 5.2. Ambient Air Quality Monitoring Data for NO_2

Parameter	Averaging Period	NAAQO[(a)1] (µg/m³)	Avg Conc (µg/m³)	Max Conc (µg/m³)	Min Conc (µg/m³)	80th Percentile (µg/m³)	90th Percentile (µg/m³)	Frequency of Exceedence
NO_2	1 hour	400	1.4	5.9	0.0	2.0	4.0	0.00%
	24 hour	200	1.4	5.9	0.0	2.0	4.0	0.00%

Notes: (a) Maximum acceptable NAAQO

*Source: [1]*Government of Canada (2004), National Ambient Air Quality Objectives

Table 5.3. Ambient Air Quality Monitoring Data for PM

Parameter	Averaging Period	Standard (µg/m³)	Average (µg/m³)	Maximum (µg/m³)	Minimum (µg/m³)	80th Percentile (µg/m³)	90th Percentile (µg/m³)	Frequency of Exceedence
$PM_{2.5}$	24-hour	30[1]	5.9	10.9	0.0	7.7	8.6	0.00%
PM_{10}	24-hour	50[2]	6.0	25.8	0	8.7	11.9	0.00%

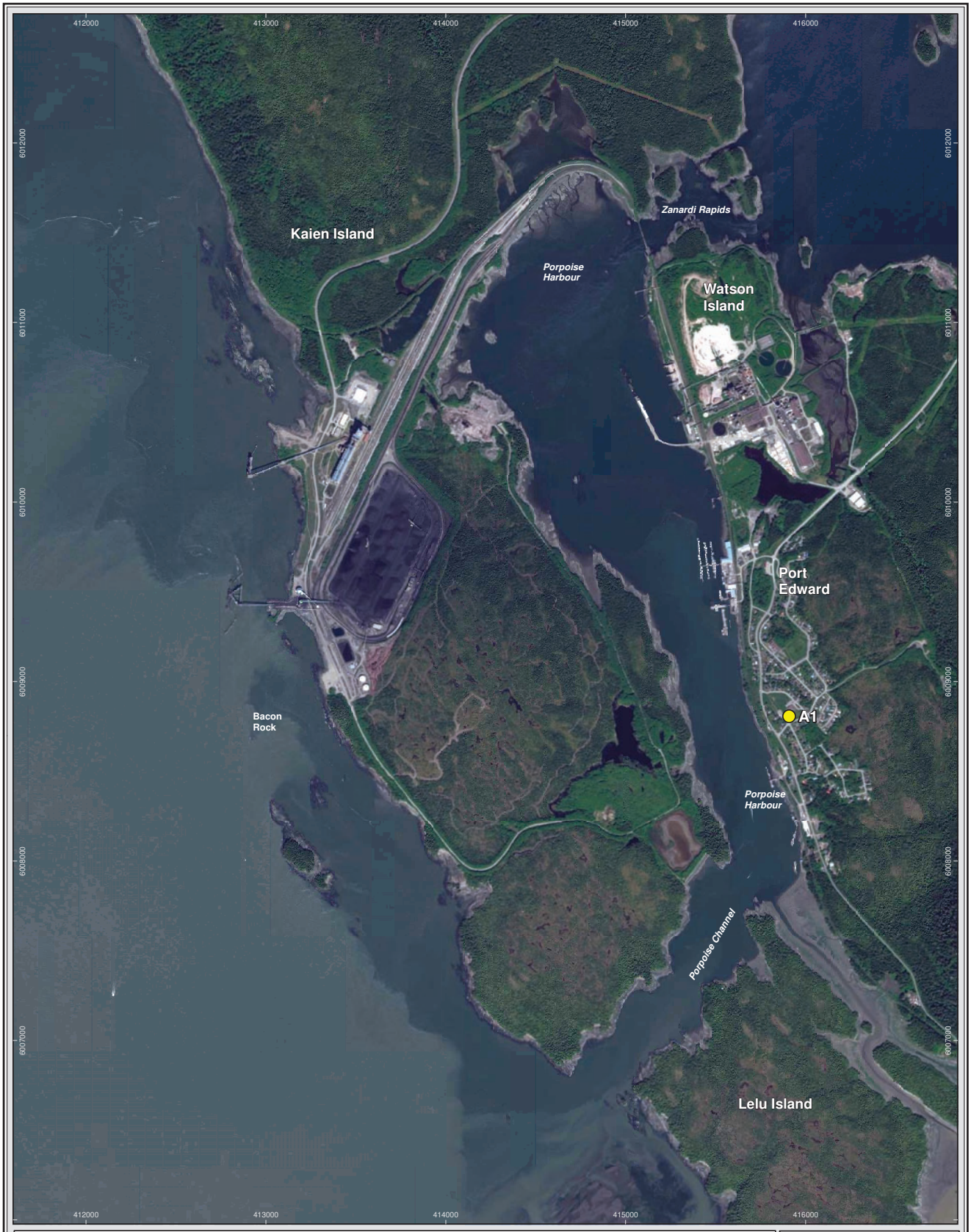
Sources: [1]Canada Wide Standards, [2]BCAQOS

Table 5.4. Ambient Air Quality Monitoring Data for SO_2

Parameter	Averaging Period	NAAQO[(a)1] (µg/m³)	Avg Conc (µg/m³)	Max Conc (µg/m³)	Min Conc (µg/m³)	80th Percentile (µg/m³)	90th Percentile (µg/m³)	Frequency of Exceedence
SO_2	1 hour	900	0.3	58.3	0.0	0.0	0.0	0.00%
	24 hour	300	0.3	3.3	0.0	0.5	1.1	0.00%

Notes: (a) Maximum acceptable NAAQO

*Source: [1]*Government of Canada (2004), National Ambient Air Quality Objectives



Basemapping from Department of Natural Resources Canada and ESRI Basedata.

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- Air Quality Monitoring Location

BG Baseline Studies
Location: Ridley Island, BC

Air Monitoring Station

April 2013
Project: 60284368

AECOM

Figure 5-2

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5.1.2.2 Potential Effects and Mitigation Measures – Air Quality

CEAA Guide 5.3
CEAA Regs 18.0
BCEAO Guide
Project Overview

The Facility has the potential to affect existing air quality during the construction and operation of the Project. The potential effects to air quality will be from the following CACs:

- **Carbon Monoxide (CO)** – A colourless, odourless, tasteless gas produced by the incomplete burning of fossil fuels.
- **Nitrous Oxides (NO_x, NO, NO_2)** – Most NO_2 in the atmosphere is formed by the oxidation of NO, which is emitted directly by combustion processes, particularly those at high temperature and pressure, such as combustion engines used for power generation. The levels of NO and NO_2, and the ratio of the two gases, together with the presence of hydrocarbons and sunlight are the most important factors in the formation of ground-level ozone and other oxidants. NO_x and SO_2 react with other substances in the air to form acidic precipitation. The largest human health concern associated with oxides of nitrogen is their effects on the respiratory system.
- **PM Less Than Ten Microns (PM_{10}) and PM Less Than 2.5 Microns ($PM_{2.5}$)** – PM is the general term used for a mixture of solid particles and liquid droplets in the air. It includes aerosols, smoke, fumes, dust, ash, and pollen. The types of particulate matter related to the Project are total suspended particulate (TSP), PM_{10}, and $PM_{2.5}$. There are both natural and human sources of PM. Combustion sources are the largest anthropogenic source of PM. Examples include the burning of fuels in combustion engines, power plants, and windblown dust from construction sites and other land areas where the water or vegetation have been removed.
- **Sulphur Dioxide (SO_2)** – A colourless gas with a distinctive odour similar to that of burnt matches. It is produced in combustion processes by the oxidation of sulphur in fuel. It has also been known to damage trees and crops. SO_2, along with nitrogen oxides, is the main cause of acid rain.

These air contaminants are considered the CACs for determining the effects of the Project on air quality.

During construction emissions of CACs (SO_2, NO_2, CO, and PM_{10} and $PM_{2.5}$) will come from road traffic, construction equipment, staging and storage areas, and tugs and barges. PM is the key CAC of concern for staging and storage areas. Wind erosion from stockpiles and staging areas will emit PM.

During operations, emissions of CACs will include sources such as: power generation, road traffic, LNG production, flaring, and fugitive emissions from potential fitting leaks and loading of LNG carriers and shipping.

Project-related CAC emissions will be released through the combustion of fuels, construction activities associated with the development of the Facility and terminal, and supporting infrastructure such as roads and power generation facilities.

Mitigation measures to limit the emissions of CACs that may be appropriate include:

- minimization of vehicle idling and turning off equipment when not in use.
- use of electric driven APUs where appropriate.
- low NOx burners and selective catalytic reduction (SCR) where appropriate.
- ensuring ground service vehicles are properly tuned and maintained.
- implementation of onsite speed limits.
- proper route selection to reduce travel distances for the delivery of construction and operational materials.
- performance of regular road sweeping during construction.
- watering down loose materials and exposed earth during construction.
- prevention of erosion to control the extent and duration of bare ground surface exposure.
- development and implementation of a balanced earthwork management plan and keeping as much excavated earth onsite as possible to reduce offsite hauling.
- application of adaptive management to reduce air emissions.
- use of grid power during construction.
- use of high efficiency gas turbine driven compressors.
- use of air coolers instead of a cooling water/sea water cooling system.
- provision on annual reports on air emissions after the operation commences.
- control of fugitive emissions, spills and unintentional releases of both LNG and natural gas.
- during operations, implementation of preventative maintenance program that includes a LDAR program to control and prevent emission leaks within the Facility's infrastructure.

5.1.2.3 Further Study and Assessment – Air Quality

The planned work program for climate and air quality includes continued ambient monitoring, development of emissions inventories and air dispersion modelling.

Construction and operational Project impacts to the atmospheric environment will be estimated through emissions estimation, meteorological modelling, and air dispersion modelling.

For air quality, emissions calculations for the various Project sources will be based on several sources of data. Several emissions estimation techniques will be considered for the study: literature based emission factors such as USEPA AP-42; mass balance calculations; and manufacturer's performance guarantees. Engineering calculations may also be used, as relevant, for assessing the site specific emissions rates for sources such as fuel combustion. In some cases manufacturer's performance guarantees will also be used to estimate emissions. In all cases, actual maximum operations will be considered in developing the emissions estimates for the assessment in order to accurately represent the operations on an hourly basis and daily basis for peak operations.

An advanced air dispersion model is required to translate estimated emissions of air contaminants into ground-level concentration contours at various receptor points in the Project's area of influence. Once contaminants are emitted from a source, like a plant's stack or a diesel engine, they are affected by processes of atmospheric dispersion and possible reaction with other compounds. These include effects such as building downwash and terrain influence on wind patterns. Advanced air dispersion modelling software has been developed to calculate these dispersion effects and will be used to predict impacts at receptors. The dispersion model chosen for this system is the CALMET/CALPUFF model, originally developed by AECOM and now owned by TRC. This model system is selected specifically for the Project due to advantages in calculating terrain-induced spatial variability, long-range transport, chemical transformation and deposition. In particular, the complex terrain of the Project area requires a model capable of calculating terrain-induced effects. The dispersion model will be developed so as to include all significant sources of air emissions, which will be represented as line, area or point sources within each respective model. The calculated emissions inventory will be used as a set of inputs into the dispersion model. Additionally, terrain, land-use, site details, and meteorological data files will also be collected and pre-processed for input into the dispersion model.

Outputs from the model will be in the form of pollutant concentrations at specific sensitive receptors, as well as, pollutant concentration plots. Any proposed mitigating strategies will be used to revise the air quality assessment to account for the proposed changes. The significance of the residual effect on air quality, after taking account of all proposed mitigation measures, will be determined.

5.1.3 Sound

CEAA Guide 5.1
CEAA Regs 16.0
BCEAO Guide
Project Overview

5.1.3.1 Setting - Sound

Sensitive areas for the acoustic environment include residential dwellings and public areas such as schools, campgrounds, marinas, parks and other public areas.

The nearest receptors to the Project are located across Porpoise Harbour in Port Edward. There are residential areas in Port Edward that are approximately 850 m from the nearest edge of the project footprint. The sound levels at these receptors are currently affected by existing rail, road and industrial sources. Industrial sources of sound include the grain and coal terminals on Ridley Island, as well as the fish manufacturing plant and associated coolers in Port Edward.

A seasonal baseline sound monitoring program has been initiated at Port Edward. The sound monitoring program commenced in August, 2012 and will continue each quarter through to summer 2013.

Only summer and fall data have been collected to date. Sound monitoring was conducted during one week periods in August and October 2012 using sound level meters (SLM) with microphones mounted on tripods. The SLMs were installed at five locations within the community of Port Edward, with the nearest located approximately 800 m east of the project footprint (Figure 5.3).

Sound readings were logged every hour. The metrics used to describe sound levels were the day night average sound level (L_{dn}) and the equivalent sound level (L_{eq}). L_{dn} represents the weighted day night average sound level over a 24 hour period. The L_{dn} is important because it considers daytime and night-time, but adds 10 dBA for sound levels occurring during night-time, when

residential receptor sensitivity to sound is heightened. L_{eq} is the time averaged sound level over a period of time or, in this case, the measurement period.

The 2012 summer and fall sound monitoring data indicates that existing sound levels in Port Edward are higher than expected for a rural area and are representative of an urban area (Table 5.5). This monitoring data provides an indication of the existing sound levels in the study area for 2012. However, the following future changes to the study area will increase the existing sound pressure levels:

- Increased rail use due to future potential projects such as the Fairview Terminal Expansion, the Canpotex Project and the RTI Expansion
- Increased rail use due to increased number of vessels projected for the Prince Rupert Port
- Increased industrial operational noise from the RTI expansion and the Canpotex Project
- Increased industrial operational noise from the Pacific Northwest LNG facility

The projected increase due to future changes in transportation and industrial sources, as identified above, will be added to the existing baseline as part of a cumulative effects assessment for the acoustic environment. It is important to identify an appropriate future baseline condition that includes future projections of industrial and transportation sound emissions. This baseline will be important to gauge and assess potential effects of the Project on the acoustic environment.

Table 5.5. Ambient Sound Levels in Port Edward

Site	Average L_{eq}[a] (dBA)	Average L_{day} (dBA)	Average L_{night} (dBA)	Average L_{dn} (dBA)	L_{10}[b]	L_{90}[c]	L_{max}[d]
Port Edward Average	60	61	60	67	55	44	75

Notes:

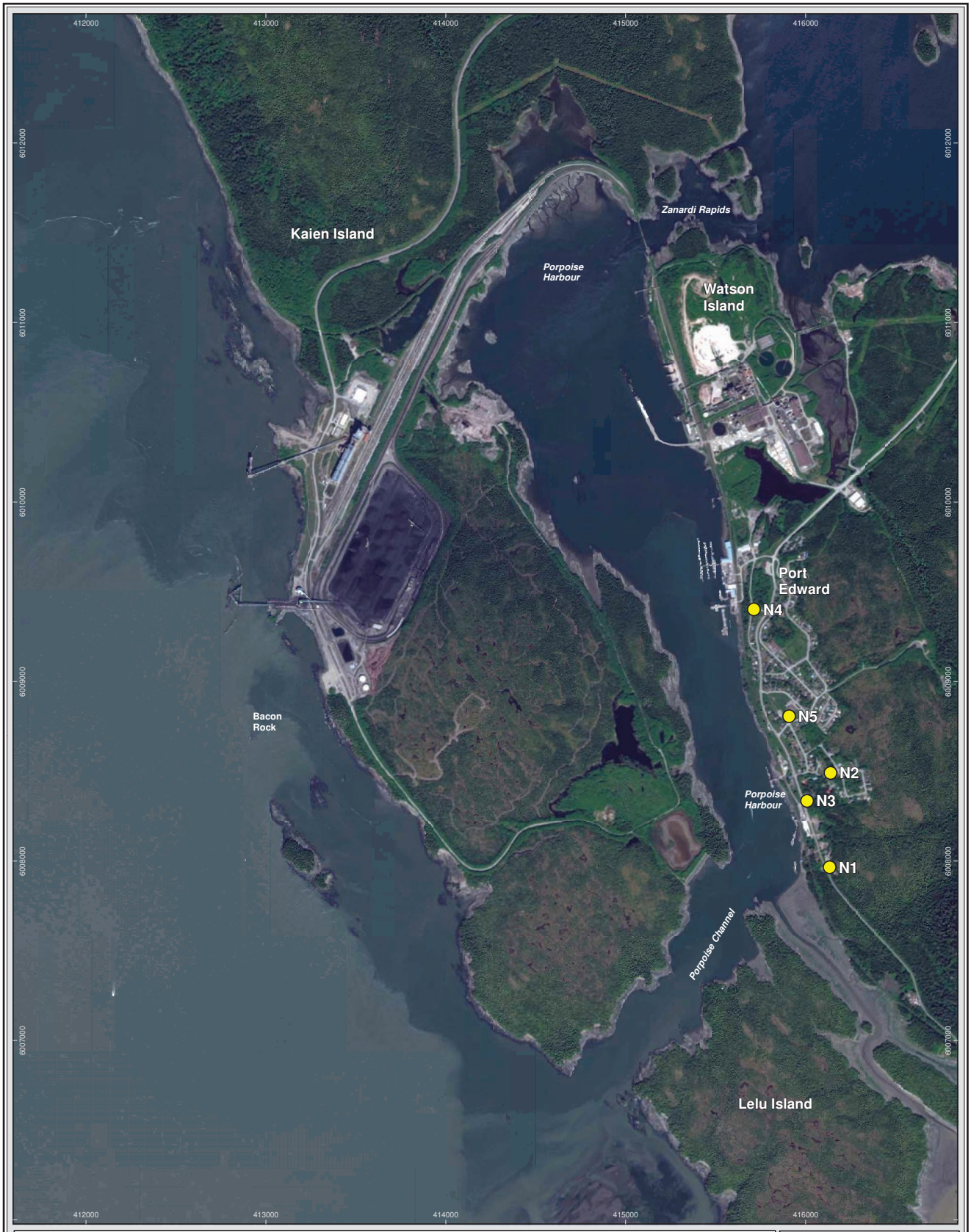
[a] *L_{eq} – logarithmic average of all of the hourly data measured*

[b] *L_{10} – average of all of the hourly L 10 data measured*

[c] *L_{90} – average of all of the hourly L 90 data measured*

[d] *L_{max} – the maximum hourly sound level measured during the Day (0700-2200) and Night (2200-0700) hours*

[e] *S1 statistics were included in this table but not included in the Port Edward averages because this site was not considered representative of the local study area.*



Basemapping from Department of Natural Resources Canada and ESRI Basedata.

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- Noise Monitoring Location

BG Baseline Studies
Location: Ridley Island, BC

Noise Monitoring Locations

April 2013
Project: 60284368

AECOM

Figure 5-3

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5.1.3.2 Potential Effects and Mitigation Measures - Sound

CEAA Guide 5.3
CEAA Regs 18.0
BCEAO Guide
Project Overview

Sound levels at receptor locations will be affected by construction and operational activities. During construction, the following are potential sound emission sources:

- Blasting
- Pile installation
- Road traffic
- Earthmoving works such as site clearing, rock blasting and grubbing
- Facility assembly
- Concrete batching plant operation
- Bolt tightening
- Pneumatic testing
- Line cleaning
- Pressure testing or pipework and pressure vessels onsite
- Operation of construction equipment

Mitigation measures that may be appropriate include:

- notifying the residents of Port Edward of significant sound-causing activities and scheduling these activities to create the least disruption to receptors.
- fitting internal combustion engines with appropriate muffler systems.
- using acoustical screening from existing onsite buildings to shield residential locations from construction equipment sound emissions.
- limiting the operation of louder activities associated with construction (i.e., impact pile driving) to daytime hours.

Wherever possible, noisy construction activities will be limited to the hours of 07:00 and 22:00 to reduce the potential impacts of construction sound emissions on receptors. However, some construction activities will still need to occur outside of this period, as required by the Project schedule and subject to permit stipulations.

During operations, the following are potential sound emissions sources:

- Facility - refrigeration; flaring; air coolers; compressors; pumps; power generation and standby generators
- Road traffic
- Marine vessel operations including carriers and tugs (i.e., emissions from fuel combustion for main/auxiliary engines and auxiliary/steam boilers)
- Loading of LNG carriers

Potential sound emissions mitigation measures that may be appropriate include planting of vegetation to provide increased foliage along the fence line, which would function as a sound barrier and containing major sound emission generating equipment within shelters, where practical. In addition, buildings that house equipment that generate substantial sound (e.g., boil

off gas compressor) may utilize the following mitigation measures as appropriate from the modelling assessment:

- Sound transmission class (STC) of at least 50
- Limiting the number of windows
- Non-operable windows
- Perimeter seals on the exterior doors
- Metal insulated exterior doors for higher STC values
- Adequate building ventilation such that doors and windows do not need to be opened
- Silencing elements on building ventilation equipment

5.1.3.3 Further Study and Assessment - Sound

The future planned work for the acoustic program includes continuation of seasonal sound monitoring for one week in the winter and one week in the spring and assessment of the Project effects through noise modelling.

Existing sound pressure levels may be affected by temporal variations in transportation, industrial activities, meteorology and ground cover. To account for potential temporal variations between day and night time hours, a week long monitoring program was implemented. In addition, to account for varying meteorological and ground cover effects, a seasonal monitoring program has been implemented.

The assessment of the potential project effects relating to sound pressure levels will include the following: identification of sound sources from the Project; characterization of the sound sources in terms of acoustical power and sound dispersion modelling for downwind propagation of the sound emissions; and assessment of the dispersion modelling results. The noise modelling will be in accordance with methods appropriate under the CEAA, the BCOGC Noise Best Practices Guideline, and the International Organization for Standardization (ISO) Standard 9613 (ISO 9613).

The acoustic assessment of the potential project effects will be based on noise modelling results. A noise model of the Project will be prepared using the acoustic modelling software (CADNA/A). CADNA/A uses ISO 9631 as the basis of prediction, which is in accordance with recommendations in BC's Noise Control Best Practices Guideline. The predicted sound pressure levels (SPL) will be compared to the existing background level and the noise level limits outlined in the guideline. The noise modelling assessment will be based on the predictable "worst-case" scenario, which is the peak operating conditions of the Facility under normal operations.

5.1.4 Groundwater

CEAA Guide 5.1
CEAA Regs 16.0
BCEAO Guide
Project Overview

5.1.4.1 Setting – Groundwater

The groundwater setting was determined by reviewing existing geotechnical and environmental reports for Ridley Island as well as conducting a data base search for water wells and reviewing local geology, topography and drainage mapping. Baseline field activities for groundwater,

including groundwater monitoring well installation with subsequent flow and quality measurements are planned for 2013.

The upper one metre of soil on Ridley Island is primarily an organic veneer of peat that takes the form of the underlying surface. There are also smaller areas of glacial marine silt and clay deposits and even smaller areas of bedrock outcrop. The organic peat materials that are common throughout the southern portion of Ridley Island are mainly associated with bog wetland ecosystems (Clague, 1984).

Based on test pits and borings completed for other studies conducted just north of the Site, (Golder Associates Ltd, 2008) perched groundwater levels and seepage zones occur within the lower portions of the peat or in the underlying sand layers. Below these relatively shallow unconsolidated deposits is grey, foliated, metamorphic bedrock (biotite-hornblende schist). The strike (i.e., the direction of the bedrock ridges along a horizontal plane) of this foliated rock is northwest-southeast, parallel to the topographic ridges on Ridley Island that tend to control local drainage patterns. The bedrock surface typically dips (slopes) to the northeast at an angle of 10 to 35 degrees. The bedrock is weathered at the surface but typically is slowly permeable and does not form a productive aquifer.

Groundwater flow from the Site is inferred to be outward towards the ocean based on the Premier Environmental Service Hydrogeology Investigation for the area immediately north of the Site (Premier Environmental Services Inc, 2011). There are no groundwater supply wells onsite or within a 500 m radius of the Site. There is no potential to develop groundwater supply wells due to the low permeability of the bedrock and the proximity to saline marine waters. Groundwater flow in the bedrock will likely contribute relatively small amounts of base flow to the local streams. Baseline groundwater quality will be determined during the 2013 field investigations.

Geologic conditions for potential camp sites along Ridley Island Road are generally similar to Ridley Island with a thin veneer of glaciomarine silt and clay over metamorphic bedrock. However, the surface grades on these areas are generally steeper and they are generally better drained. Peat and organic areas are less common but do occur in low wet areas. Aquifers suitable for water supply are not likely to be present. There is a low-yield bedrock well at the City of Prince Rupert municipal landfill located southwest of the intersection of Ridley Island Road with Highway 16, which is used for washrooms but not drinking water.

5.1.4.2 Potential Effects and Mitigation – Groundwater

CEAA Guide 5.3
CEAA Regs 18.0
BCEAO Guide
Project Overview

Clearing the Site of the shallow organic soils and wetlands to allow industrial development will tend to lower groundwater levels locally. This is unlikely to affect any aquatic receptors as groundwater base flow volumes discharging to local creeks are expected to be less than 10% of average flows.

There is no potential for high yield water supply wells on Ridley Island due to the relatively low permeability bedrock and saline marine waters that surround the island and that are likely present at depth below the island. Therefore there will be no impacts on water wells.

During construction and operation, groundwater quality could be affected by spills of chemicals or fuels from mobile and stationary equipment and storage tanks onsite that, if allowed to seep into the soils, could enter the groundwater system. During construction, best management practices

for fuel and chemical storage and handling will be used. All fuel and chemical storage areas will be provided with secondary containment.

Proper emergency response plans and rapid cleanup of any spills that do occur will reduce any potential impacts on groundwater quality. These procedures will be part of the Stormwater and the Emergency Response construction management plans for the Project. Prompt response to spills will also reduce the potential for groundwater to form a pathway for subsurface migration of contaminants to groundwater discharge locations along streams or the ocean near aquatic receptor habitat. Stormwater drains will be installed early in the Site construction sequence and oil water separators will be installed where appropriate.

During operations, the Site will be paved with stormwater infrastructure including collection drains. Surface runoff will go directly to the stormwater system. Any potential spill of chemicals or fuels and will go directly to the facility drainage system and be cut off from entering the groundwater system. In the event of a spill, operational emergency response plans and quick cleanup will still apply to mitigate effects of discharge to downstream surface water. Fuel and chemical storage facilities will be designed to prevent spills into the environment by using the following mitigation strategies:

- **Ensuring Containment Integrity** – All process piping will be welded where possible, with an emphasis on minimizing flanged connections, and screwed piping will not be used in any hydrocarbon services.
- **Secondary Containment** – For storage areas, Canadian standard or where applicable 110% secondary containment.
- **Drainage and Collection** – Flammable liquid-hydrocarbons process and storage areas will be provided with a drainage system designed to remove a spill as quickly as possible and to control heat flux damage to equipment if ignition occurs.

5.1.4.3 Further Study and Assessment - Groundwater

The baseline field activities for groundwater assessment, including groundwater monitoring well installation with subsequent flow and quality measurements, will be conducted in the latter half of 2013 and will allow a more detailed assessment of potential effects.

5.1.5 Hydrology and Surface Water Quality

5.1.5.1 Setting – Hydrology and Surface Water Quality

CEAA Guide 5.1
CEAA Regs 16.0
BCEAO Guide
Project Overview

The surface water at the Site is associated with sphagnum bogs, and small streams draining into the foreshore. The water in most areas is acidic due to the sphagnum bogs that they drain. One stream on the northwest corner of the Site has more neutral pH. The streams along Ridley Island Road also have more neutral pH.

PRLNG has established a sampling program of streams and wetlands in the Project area and at the three locations along Ridley Island Road to establish current water quality conditions (Figure 5.4). Preliminary results have confirmed the low pH of many of the small streams on the south end of Ridley Island.

Water quantity data is being collected at the same time and in the same locations as water quality data. Water quantity sampling includes collecting flow measurements that will be used to determine if there is a correlation between flow and water chemistry. The hydrology data will also be used to correlate site-specific observations with the regional data collected from the Kloiya River, the nearest station operated by Water Survey of Canada (WSC). The Kloiya River watershed is located approximately 8.5 km northeast of the Project area (Ministry of Environment, 2010).

5.1.5.2 Potential Effects and Mitigation Measures – Hydrology and Surface Water Quality

CEAA Guide 5.3
CEAA Regs 18.0
BCEAO Guide
Project Overview

Water quality and quantity can be affected during both construction and operation.

In the construction phase, run-off will have to be managed to control the release of sediment laden water outside the construction site of either the Facility or construction camp. A construction Stormwater Management Plan will be developed to include best management practices for protecting the quality of runoff including directing clean water away from construction areas, the installation of containment to hold contaminated water, onsite as necessary, proper storage of substances that can impact water quality, and emergency procedures in the event of spills. The stormwater systems will be designed to accommodate the anticipated rain events in the area.

The stormwater system designed for facility operation will be similar to the construction phase in that clean water will be diverted around the Facility and rain water landing onsite will be directed into the stormwater collection system, which will include features such as oil/water separators and other appropriate contain and treat systems to ensure that stormwater discharged into the receiving water meets all applicable water quality criteria. Spill containment equipment and emergency response plans will be in place to deal with accidents and malfunctions.

5.1.5.3 Further Study and Assessment – Hydrology and Surface Water Quality

Water quality and quantity sampling will continue until June 2013 in order to collect 12 months of data characterizing site conditions. The data will be summarized to characterize the baseline conditions at the Facility and camp site.

5.1.6 Fresh Water Fish and Fish Habitat

5.1.6.1 Setting – Fish and Fish Habitat

CEAA Guide 5.1
CEAA Regs 16.0
BCEAO Guide
Project Overview

The geographical scope of the studies for fish and fish habitat encompasses the Site and along the Ridley Island Road. A number of existing reports (Stantec, 2011a) (Stantec, 2011b) (Jacques Whitford AXYS Ltd, 2006) (Jacques Whitford AXYS Ltd, 2008) (City of Prince Rupert, 1995) associated with EAs for previous projects were found that provide information on fish and fish habitat in this area. The existing information was reviewed and two

Photograph 5.1. Typical Wetland on Ridley Island

field studies were conducted. The first field study in July 2012 was to confirm information reported in previous studies. The second field survey in September 2012 focused on one of the larger streams on Ridley Island that flows west along the north end of the Site (Site 9, Figure 5.4) as there was no fish information for this stream and it appeared to be capable of supporting fish.

There are numerous small streams draining the Site and along Ridley Island Road. The coastal areas adjacent the Site on Ridley Island also provide fish habitat. Previous studies indicated that most of the streams within the Site were non-fish bearing. The streams drain several sphagnum bogs in the center of the property (Photograph 5.1) and the water has a very low pH, and is unsuitable for fish. There is one unnamed tributary, identified as Site 9, which drains the northwest corner of the property and has more neutral pH. The survey of Site 9 in September 2012 revealed the presence of sculpins (*Cottus* sp.) and threespine sticklebacks (*Gasterosteus aculeatus*) (Photograph 5.2 and Photograph 5.3).

Photograph 5.2. Threespine Stickleback

Streams along the western half of Ridley Island Road have continuous water flow and suitable water quality and are known to support Dolly Varden (*Salvelinus malma*) and Cutthroat trout (*Oncorhynchus clarkii*). A small stream labelled Site 11 (Figure 5.4) has low pH and marginal fish habitat (i.e., almost no flow at time of survey).

The habitat values of the shoreline of the PRPA area has been classified into high, medium and low value habitat in a 2011 World Wildlife Fund study (WWF Canada, 2011). This study classed much of the western shore of the Site as moderate value habitat. The small bay that is fed by the small fish-bearing creek at the northwest corner (Figure 5.4) of the property has been rated as high value habitat due to the diversity of the shoreline (mix of bedrock, gravel and sand) and the presence of small pockets of eel grass. The southern shore of Ridley Island is also rated as high value habitat due to the diversity of habitat types and extensive marine plants (algae and grasses) present.

Photograph 5.3. Sculpin

5.1.6.2 Potential Effects and Mitigation Measures – Fish and Fish Habitat

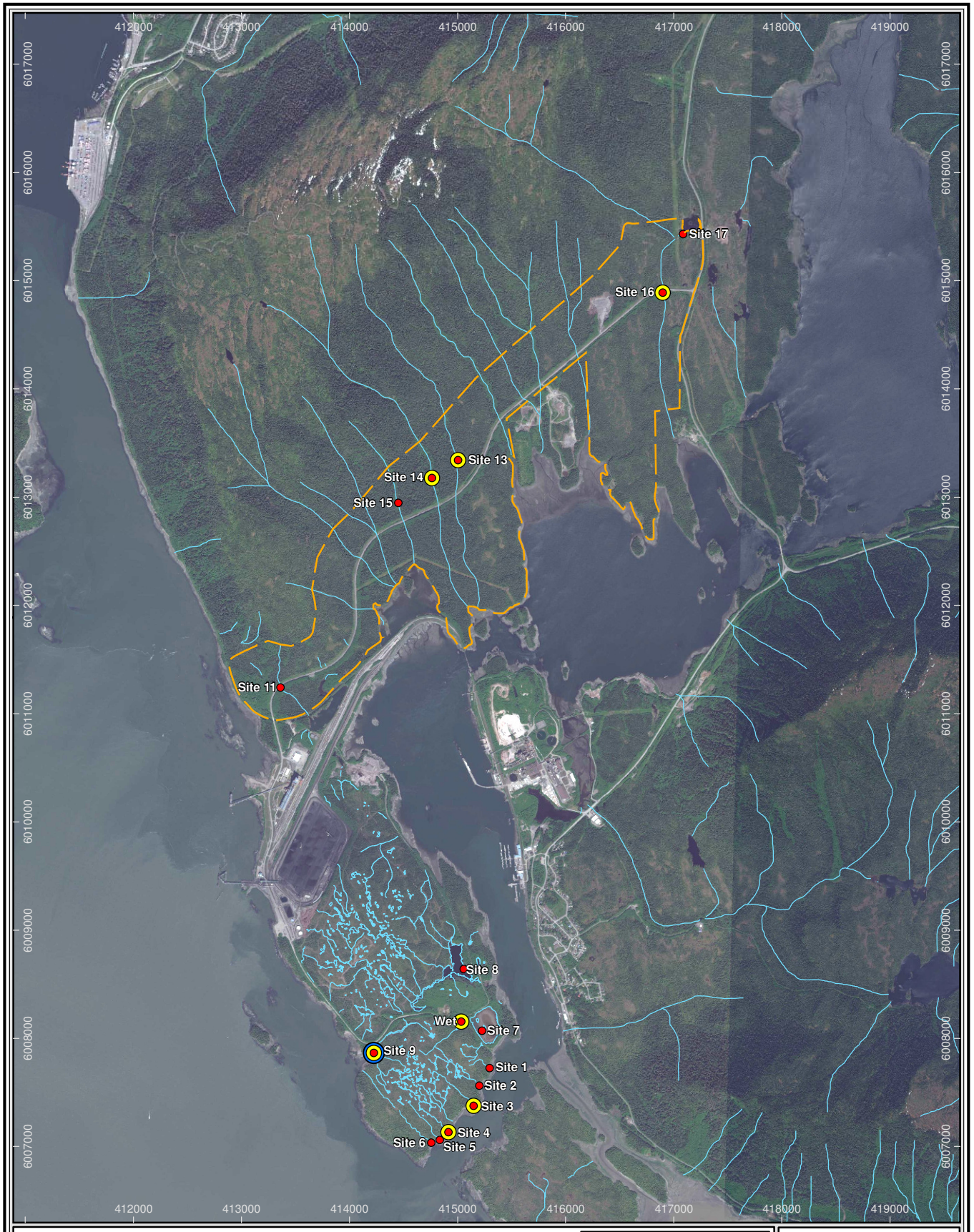
CEAA Guide 5.2(a)
CEAA Guide 5.3
CEAA Regs 17.0(a)
CEAA Regs 18.0
BCEAO Guide Project Overview

To accommodate the Facility, almost the entire Site on Ridley Island will have to be modified. This process will involve covering the fish bearing stream (known to support populations of sculpin and stickleback) in the northwest corner of the property and the foreshore areas on the west and south sides of the property. A fish habitat compensation plan will be developed.

The construction camp search area includes a number of small, fish bearing streams that could be affected by camp construction (Figure 5.4). The camp design will take into account appropriate setbacks to fish bearing creeks. Other measures to mitigate any habitat effects could be accomplished through identifying opportunities for habitat improvement or enhancement at other sites in the vicinity of Ridley Island. As described in the water quality section, best management practices applied (i.e., appropriate set back from fish bearing streams, no in-stream works, effective erosion and sediment control to protect water quality, etc.) during construction will control impacts to fish and fish habitat outside the project footprint.

5.1.6.3 Further Study and Assessment – Fish and Fish Habitat

Future fisheries work includes a spring 2013 field visit to determine if the streams in the vicinity of the Project support spring spawning, as there is no available information on spawning habitat use of the Site 9 creek or the creeks along Ridley Island Road. The current plan for the Site suggests that there will be a project footprint in the intertidal area and on the Site 9 Creek; additional work will be required to identify potential fish habitat compensation options.



Basemapping from ESRI (World Topology).
All other data from AECOM, 2012.

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Legend

- Fish Sampling Sites
- Water Quality and Hydrology Sites
- Fish Habitat Reconnaissance Sites
- Construction Camp Search Area

Overview Map

BG Baseline Studies
Location: Ridley Island (Prince Rupert), BC

Freshwater Sample Locations

March 2013
Project: 60284368

AECOM

Figure 5-4

File Location: P:\60284368\000-CADD\050 GIS WIP\02_Maps\SOCIO_ECONOMIC_PROGRAM\2013-01-16-ProjectDescription\Fig5-4-2013-04-03-Freshwater Sample Sites-60284368.mxd Date Revised: March 28, 2013 Prepared by: DL Project: 60284368

5.1.7 Marine Ecosystems

5.1.7.1 Setting – Marine Ecosystems

CEAA Guide 5.1
CEAA Regs 16.0
BCEAO Guide
Project Overview

The Site includes both intertidal and subtidal areas (Figure 5.5 to Figure 5.8) (Photograph 5.4). The intertidal has rocky areas covered by algae, isolated open spots with cobble and sand, larger pocket beaches, and eelgrass patches. There is distinct zonation correlated to tidal heights. Based on the presence of potentially suitable habitat in the lower intertidal and shallow subtidal, areas may support the special-status northern abalone (*Haliotis kamtschatkana*), although none were observed during surveys. In addition, these areas support isolated pockets of eelgrass (*Zostera marina*) communities. The subtidal environment includes both soft (sandy, muddy) substrates and hard, rocky substrates. In areas of soft sediment, most of the animals present live within the substrate.

Photograph 5.4. Marine Intertidal Survey

<u>*Marine Mammals*</u>

Surveys for marine mammals using both vessels and passive listening devices (hydrophones) have been conducted. The surveys were designed to observe marine mammals while the hydrophones recorded ambient sounds, both natural and anthropogenic. Over ten days between 24 September and 3 October 2012, vessel surveys covered roughly 1,000 km^2 of Chatham Sound from the Site out to Stevens Island, Brown Passage, and as far north as the Tsimshian Peninsula (Figure 5.9). Direct sightings were supplemented by discussions with local mariners actively working in the Chatham Sound to collect their local knowledge of the use of the area by marine mammals. To provide a long-term record of marine mammal activity in the area, three hydrophones have been deployed to record both low and high frequency sounds at three locations, near the Site, in the middle of Chatham Sound, and near Brown Passage (Figure 5.10). The fall 2012 surveys identified harbour porpoise (*Phocoena phocoena*), Dall's porpoise (*Phocoenoides dalli*), harbour seals (*Phoca vitulina*), Steller's sea lions (*Eumetopias jubatus*), humpback whales (*Megaptera novaeangliae*) (Photograph 5.5), and transient killer whales (*Orcinus orca*). Additional surveys are planned for winter, spring and summer of 2013. Timing of surveys is highly weather dependent. The hydrophones will be collected and redeployed in late spring and collected in September to secure a full year of acoustic data.

Photograph 5.5. Humpack Whale Flukes

Basemapping from Department of Natural Resources Canada, Map data from: Archipelago Marine Research LTD.

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Legend

- Streams
- Surveyed Transect
- Zone Break
- Eelgrass
- Mud/Sand (Field)
- Mud/Sand (Ortho)
- Sand/Gravel (Ortho)
- Salt Marsh

BG Baseline Studies
Location: Ridley Island, BC

Intertidal Features Surveyed in the Porpoise Channel Section

April 2013
Project: 60284368

AECOM

Figure 5-5

File Location: P:\60284368\000-CADD\050 GIS WIP\02_Maps\SOCIO_ECONOMIC_PROGRAM\2013-01-16-ProjectDescription\Fig5-5-2013-04-03-IntertidalSubtidalZone1-60284368.mxd Date Revised: April 01, 2013 Prepared by: DL Project: 60284368

Basemapping from Department of Natural Resources Canada,
Map data from: Archipelago Marine Research LTD.

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NAD 1983 UTM Zone 9N

Legend

- Streams
- Surveyed Transect
- Zone Break
- Eelgrass
- Mud/Sand (Field)
- Mud/Sand (Ortho)
- Sand/Gravel (Ortho)
- Salt Marsh

BG Baseline Studies
Location: Ridley Island, BC

Intertidal Features Surveyed in the Southwest Ridley Island Section

April 2013
Project: 60284368

AECOM

Figure 5-6

Basemapping from Department of Natural Resources Canada, Map data from: Archipelago Marine Research LTD.

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NAD 1983 UTM Zone 9N

Legend

- Streams
- Surveyed Transect
- Zone Break
- Eelgrass
- Sand/Gravel (Ortho)
- Mud/Sand (Field)
- Rip / Rap
- Salt Marsh

BG Baseline Studies
Location: Ridley Island, BC

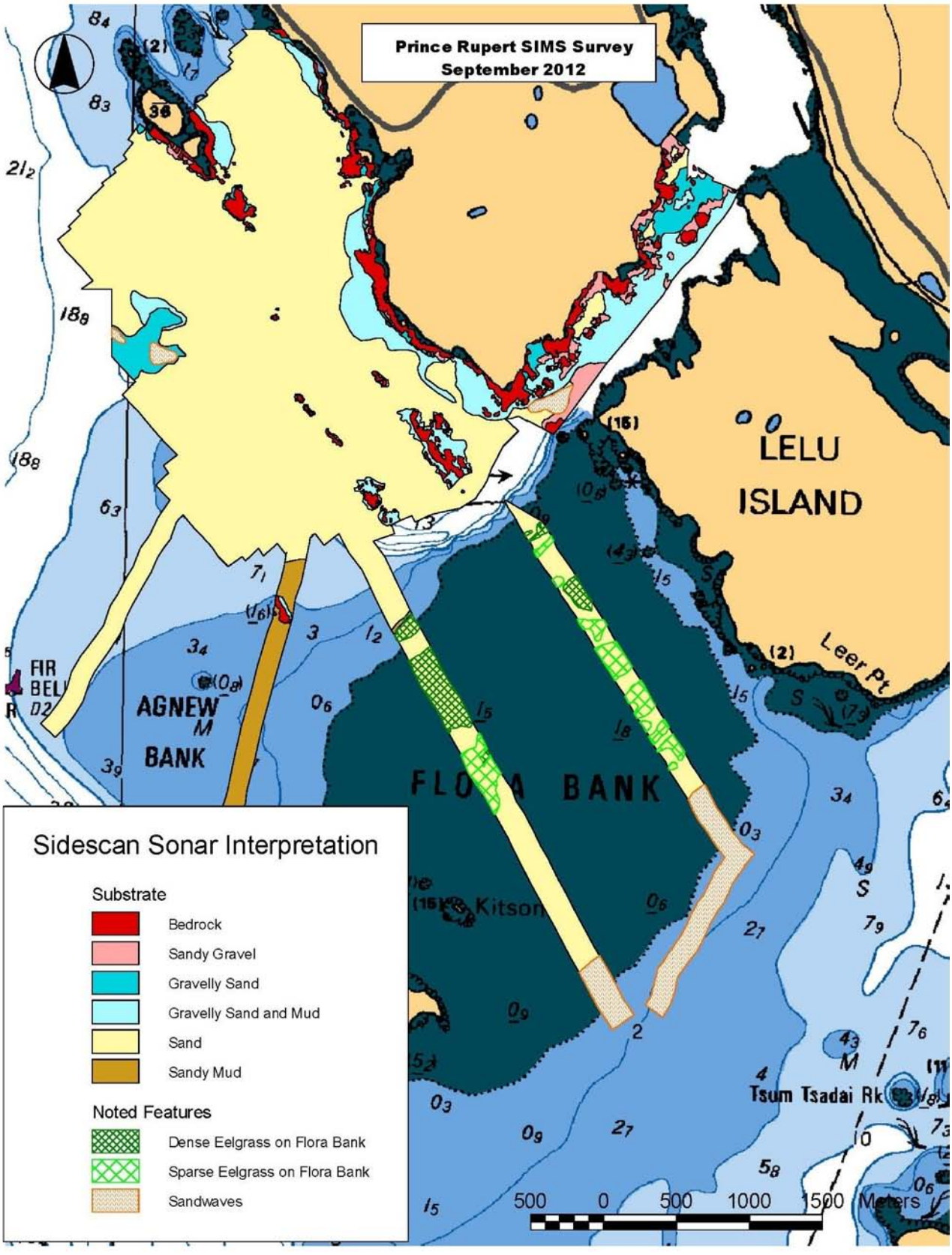
Intertidal Features Surveyed in Northern Islet / Embayment Area

April 2013
Project: 60284368

AECOM

Figure 5-7

File Location: P:\60284368\000-CADD\050 GIS WIP\02_Maps\SOCIO_ECONOMIC_PROGRAM\2013-01-16-ProjectDescription\Fig5-7-2013-04-03-IntertidalSubtidalZone3-60284368.mxd Date Revised: April 01, 2013 Prepared by: DL Project: 60284368



Map data: Coastal and Ocean Resources Inc.
Basemapping from ESRI (World Topology), Gov't of BC (GeoBC).
All other data AECOM, 2013.

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Overview Map

BG Baseline Studies
Location: Ridley Island (Prince Rupert), BC

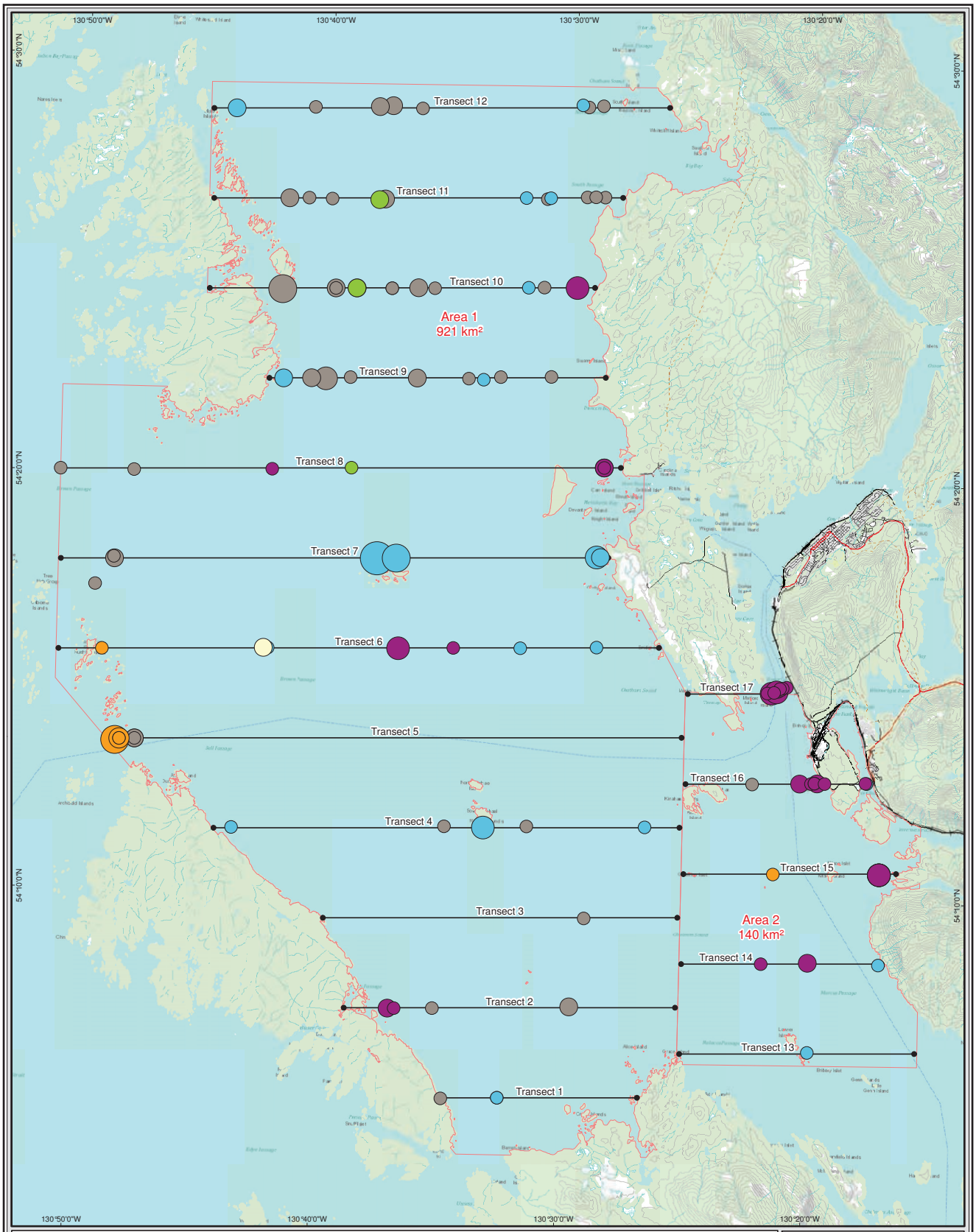
Subtidal Sidescane Sonar Interpretation

March 2013
Project: 60284368

AECOM

Figure 5-8

File Location: P:\60284368\000-CADD\050 GIS WIP\02_Maps\SOCIO_ECONOMIC_PROGRAM\2013-01-16-ProjectDescription\Fig5-8-2013-04-03-SubtidalSonarInterpretation-60284368.mxd Date Revised: March 28, 2013 Prepared by: DL Project: 60284368



Basemapping from ESRI (World Topographic Base).
All other data from AECOM, 2012.

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Kilometers

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NAD 1983 UTM Zone 9N

Legend

Marine Mammal Transect

Marine Survey Area

Humpback Whale
11-20
1

Harbour Porpoise
3-4
1

Harbour Seal
11-20
1

Dall's Porpoise
2-3
1

Steller Sea Lion
9-18
1

Killer Whale
2

BG Baseline Studies
Location: Ridley Island, BC

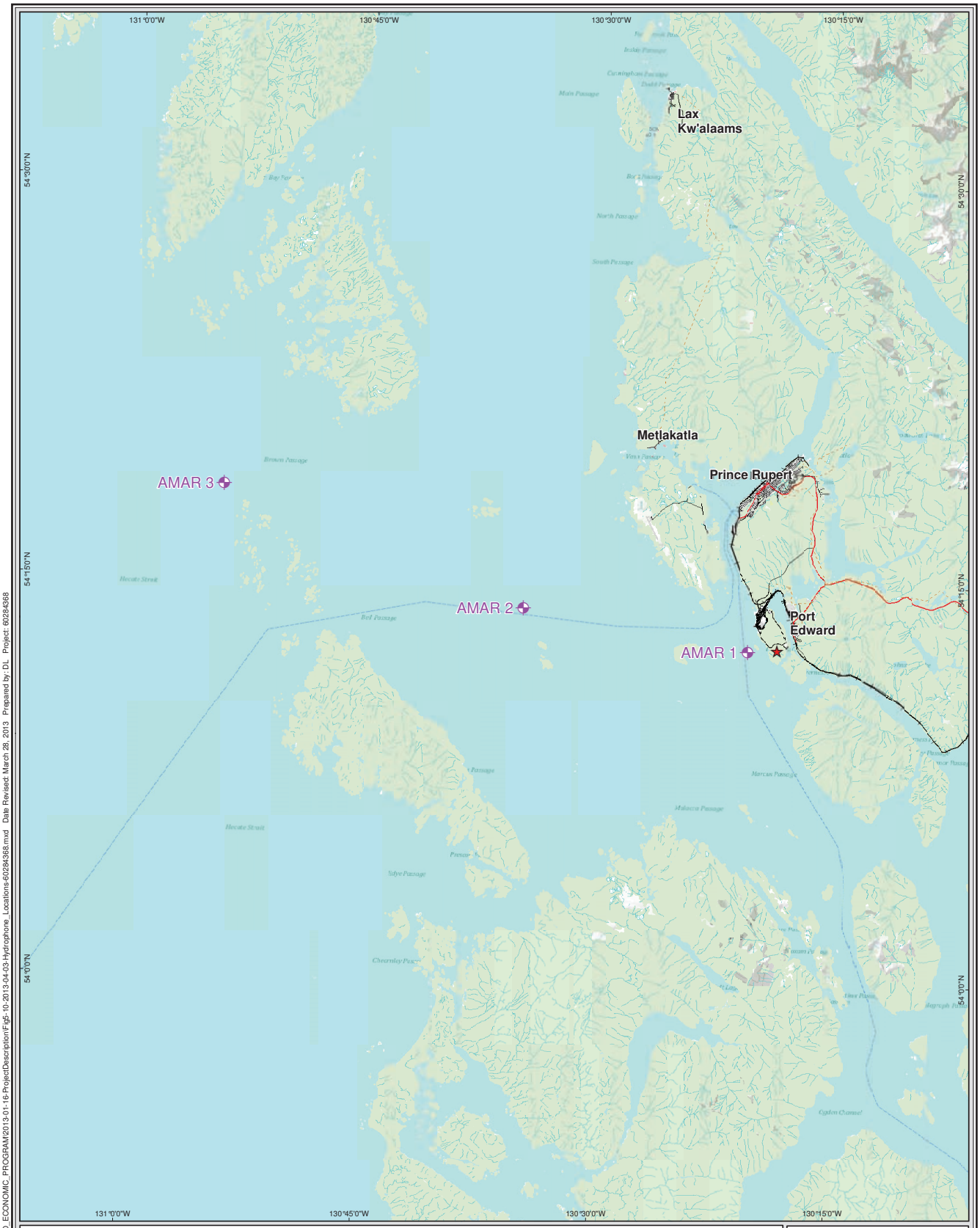
Marine Mammal Survey Results by Species and Group Size

April 2013
Project: 60284368

AECOM

Figure 5-9

File Location: P:\60284368\000-CADD\050 GIS WIP\02_Maps\SOCIO_ECONOMIC_PROGRAM\2013-01-16-ProjectDescription\Fig5-9-2013-04-03-Marine_Mammal_Survey_Results-60284368.mxd Date Revised: April 04, 2013 Prepared by: DL Project: 60284368



Basemapping from ESRI (World Topology), Gov't of BC (GeoBC).
All other data AECOM, 2012.

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Kilometers

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NAD 1983 UTM Zone 9N

Legend

- Acoustic Monitor Location
- Plant Site (Ridley Island)

Overview Map

BG Baseline Studies
Location: Ridley Island, BC

Acoustic Monitoring Locations

March 2013
Project: 60284368

AECOM

Figure 5-10

File Location: P:\60284368\6000-CADD\050 GIS WIP\02_Maps\SOCIO_ECONOMIC_PROGRAM\2013-01-16 ProjectDescription\Fig5-10-2013-04-03-Hydrophone_Locations-60284368.mxd Date Revised: March 28, 2013 Prepared by: DL Project: 60284368

Marine Birds

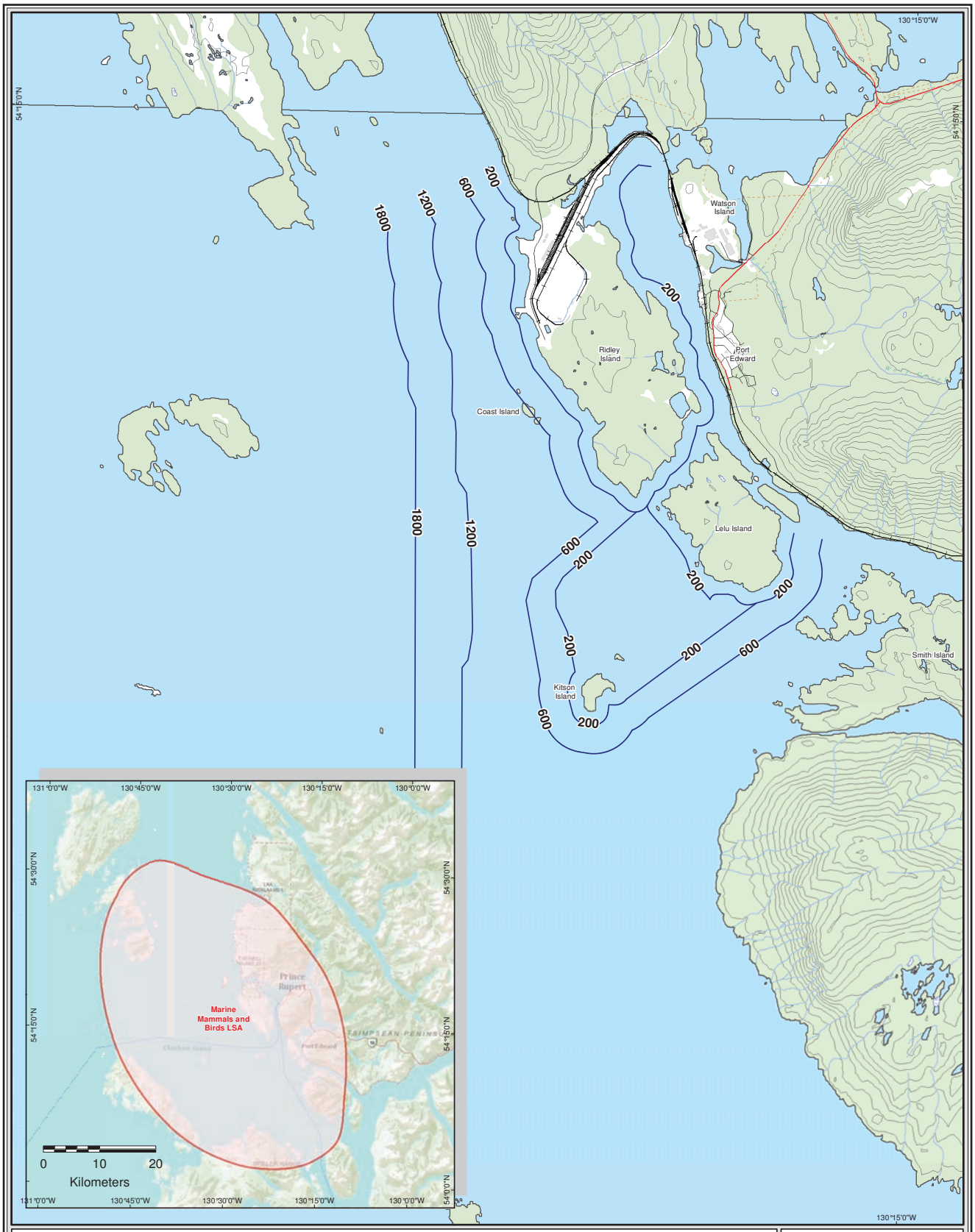
Photograph 5.6. Marbled Murrelet

The use of the area by marine birds was determined using vessel-based transect surveys designed to identify species in the marine portion of the Project area including Chatham Sound (Figure 5.11). Over 40 species were identified, including Alcid species such as Marbled Murrelets (*Brachyramphus marmoratus*) (Photograph 5.6), numerous species of gulls (family *Laridae*) and waterfowl (Family *Anatidae*). Raptors (Family *Accipitridae*) such as Bald Eagles (*Haliaeetus leucocephalus*) and Peregrine Falcons (*Falco peregrinus*) were also documented, along with the southernmost colony of Black-legged Kittiwakes (*Rissa tridactyla*) reported in the scientific literature. Three surveys were completed in 2012 representing summer residents, fall migrants, and winter overwintering birds. One additional survey will be completed to assess spring migratory birds in 2013.

Marine Fishes

Photograph 5.7. Marine Fish

Use of the Site by marine fish species is being determined by a combination of local sampling of non-commercial fish supplemented by analysis of commercial and recreational catch data for the area. Fish sampling methods included using a modified otter trawl, beach seine, and varying sizes of small meshed gillnets. Prawn/shrimp and crab traps were also used. Beach seining collected various fish species with northern sculpin (*Icelinus borealis*) being the most abundant species caught. Small meshed gillnets set parallel and perpendicular to the shoreline also collected various fish species with surf smelt (*Hypomesus pretiosus*) being the most abundant. In the crab pots, mostly undersized female Dungeness crabs (*Metacarcinus magister*) were caught as well as sunflower starfish (*Pycnopodia helianthoides*). On a few occasions, fish were caught in the crab pots – halibut (*Hippoglossus stenolepsis*), starry flounder (*Platichthys stellatus*) and rock sole (*Lepidopsetta bilineata*). In the prawn/shrimp pots, coonstripe shrimp (*Pandalus danea*), spiny pink shrimp (*Pandalus borealis*) and spot prawns (*Pandalus platyceros*) were caught along with a few fish (Photograph 5.7). Generally the otter trawl yielded little usable fish data, which reflects the absence of smaller fish in the nearshore area. The fish survey was completed in late summer of 2012. It will be repeated in early spring 2013 to assess migratory species and again in early summer to assess resident fish.



Basemapping from ESRI (World Topographic Base).
All other data from AECOM, 2012.

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NAD 1983 UTM Zone 9N

Legend

Marine Birds Survey Transects

BG Baseline Studies
Location: Ridley Island, BC

Marine Birds Survey Transects

March 2013
Project: 60284368

AECOM

Figure 5-11

File Location: P:\60284368\000-CADD\050 GIS WIP\02_Maps\SOCIO_ECONOMIC_PROGRAM\2013-01-16-ProjectDescription\Fig5-11-2013-04-03-BG_Marine_Birds_Transects-60284368.mxd Date Revised: March 28, 2013 Prepared by: DL Project: 60284368

Marine Habitats

Assessment of the marine habitats at the Site included direct and indirect observations. Intertidal habitats were surveyed by a team of biologists on a series of low, low tides. Habitats included protected sandy beaches and eelgrass beds as well as high-energy bedrock shoreline covered by kelp and red algae (Photograph 5.8 and Photograph 5.9). The diversity of habitats related to the amount of exposure or protection.

Photograph 5.8. Salt Marsh Intertidal Habitat

Photograph 5.9. Rocky Bench Intertidal Habitat

Submerged habitats consisted of isolated rock outcroppings within sandy or muddy flat areas. Due to high turbidity, the submerged habitat was defined using high resolution bathymetry and side-scan sonar, which yielded high resolution composite renderings of the substrate. In areas where there were features suggesting eel grass or other transition zones, towed video transects recorded the bottom, and the results were used to ground truth the benthic habitat characterization. The physical observations were supplemented by grab samples of soft sediments to assess infauna living within the substrate.

5.1.7.2 Potential Effects and Mitigation Measures – Marine Ecosystems

CEAA Guide 5.2(a)
CEAA Guide 5.2(b)
CEAA Guide 5.3
CEAA Regs 17.0(a)
CEAA Regs 17.0(b)
CEAA Regs 17.0(c)
CEAA Regs 18.0
BCEAO Guide Project Overview

The Project may result in potential effects to the marine environment during both construction and operation. To accommodate the Facility and maintain the appropriate set back from the community at Port Edward, the project footprint will extend into the marine intertidal area. Based on a preliminary site layout (Figure 2.1) this encroachment below the high water mark totals approximately 10 ha and will affect both high and medium value habitat along the foreshore. During the design of the Facility efforts will be made to minimise the footprint.

A fish habitat compensation plan will be developed. PRLNG will work with First Nations and key stakeholders to identify areas that are suitable candidate sites for habitat compensation and develop collaborative programs to restore or enhance the functions and values of those sites.

During construction, deposition of materials into the intertidal and subtidal areas may result in loss of habitat, increase in turbidity, changes in the types, intensities, and durations of sounds, and changes to local species behaviors and numbers. The construction of the trestles and dredging of the berthing areas and turning basins may have similar impacts, and the routine and regular presence of large vessels in the Project area may also result in impacts.

During operation the Project will have waste water discharges, the presence of large and small vessels, a periodic disturbance to the benthos from propeller wash and maintenance dredging, new lighting sources, and a variety of other effects.

The Project will increase sound in the marine environment during both construction and operation of the Facility and as a result of increased marine traffic. This may affect the ability of marine mammals to communicate, forage, and orient themselves spatially. These changes could result in disruptions in behavior and could lead to reduction of use of the area by some individuals.

An increase in the number of vessels in the area could also result in an increased potential for vessel strikes. Phase 1 of the Project will add another 186 vessel calls per year at the Port of Prince Rupert, representing a 14% increase over forecasted 2018 levels. In Phase 2, the number of vessel calls will increase to 260 per year, representing a 21% increase over forecasted 2018 levels.

The construction of the project has the potential to affect marine birds that may use the project site for resting or nesting. However, based on the existing surveys, few marine birds use the project site so any impacts are expected to be minimal. During operation, marine birds could be affected by being attracted to the new light sources on the facilities and vessels both while at the dock and in transit. This impact is already occurring due to the existing vessel traffic and adjacent industrial activities, but the effect would be increased.

To deal with these sorts of potential impacts a number of mitigation measures can be incorporated into the project design. Best Management Practices for runoff of stormwater as well as the management of noise, air emissions, and lighting will all be incorporated into the project design.

Mitigation measures that may be appropriate include:

- minimizing the footprint of the Project thereby limiting the loss of native habitat along the coast.
- incorporating rugosity and refuge areas into the design of the shoreline to allow fish and other organisms protection from predators.
- controlling the lights shining into the water.
- controlling the amount of water withdrawn from, and discharged back into, the ocean and placing the intake and discharge points in areas of maximum flow to yield maximum mixing with the ambient water.
- collecting stormwater runoff and allowing it to return to the ocean after verification that it is free of contaminants.
- avoiding blasting or other noisy construction activities when marine mammals are in the area.
- limiting the speed of vessels in transit to/from the project to reduce noise and limit the potential for vessel strikes.
- employing effective measures during dredging to limit turbidity and localized sedimentation.

5.1.7.3 Further Study and Assessment – Marine Ecosystems

Additional field studies are planned for 2013 to complete seasonal data for marine mammals, marine birds, and marine fish. In addition, the set of three hydrophones have been redeployed to collect the balance of a full year's worth of ambient data that will be analyzed to determine anthropogenic and naturally occurring sounds. Data on marine mammals, marine birds, and marine fish will be evaluated to look at seasonal patterns of use of the area. The full data set will be reviewed to identify the magnitude of use of the area by each species or species group.

Samples will also be collected to more fully characterize sediments at depth within the proposed dredge footprint. These samples will be reviewed for horizons that could indicate changes in depositional characteristics. The samples will be analyzed for grain size, organic content, and other physical parameters. If they appear to have distinct layers suggesting different deposition, samples will be evaluated for other chemicals such as dioxins or furans.

The potential for water quality impacts from dredging will be defined by modelling of the dredge operation in context of the ambient water currents. Similar modelling will be conducted to consider the effects of maintenance dredging and routine operation from activities such as prop wash that could disturb sediments.

Dredgeate may be disposed at sea. Potentially suitable sites will be identified and reviewed with other interested parties, after which the habitats of the primary candidate site will be more fully characterized through a combination of direct sampling of the benthic community and video transects of the surface dwelling community.

5.1.8 Terrestrial Ecosystems

5.1.8.1 Setting – Terrestrial Ecosystems

The terrestrial ecosystem includes landforms and soils, vegetation and wildlife. An integrated approach has been used to characterize baseline conditions enabling a holistic approach for understanding complex ecological processes. Baseline studies for the Terrestrial Ecosystems Program are habitat-based, and derived from air photo interpretation.

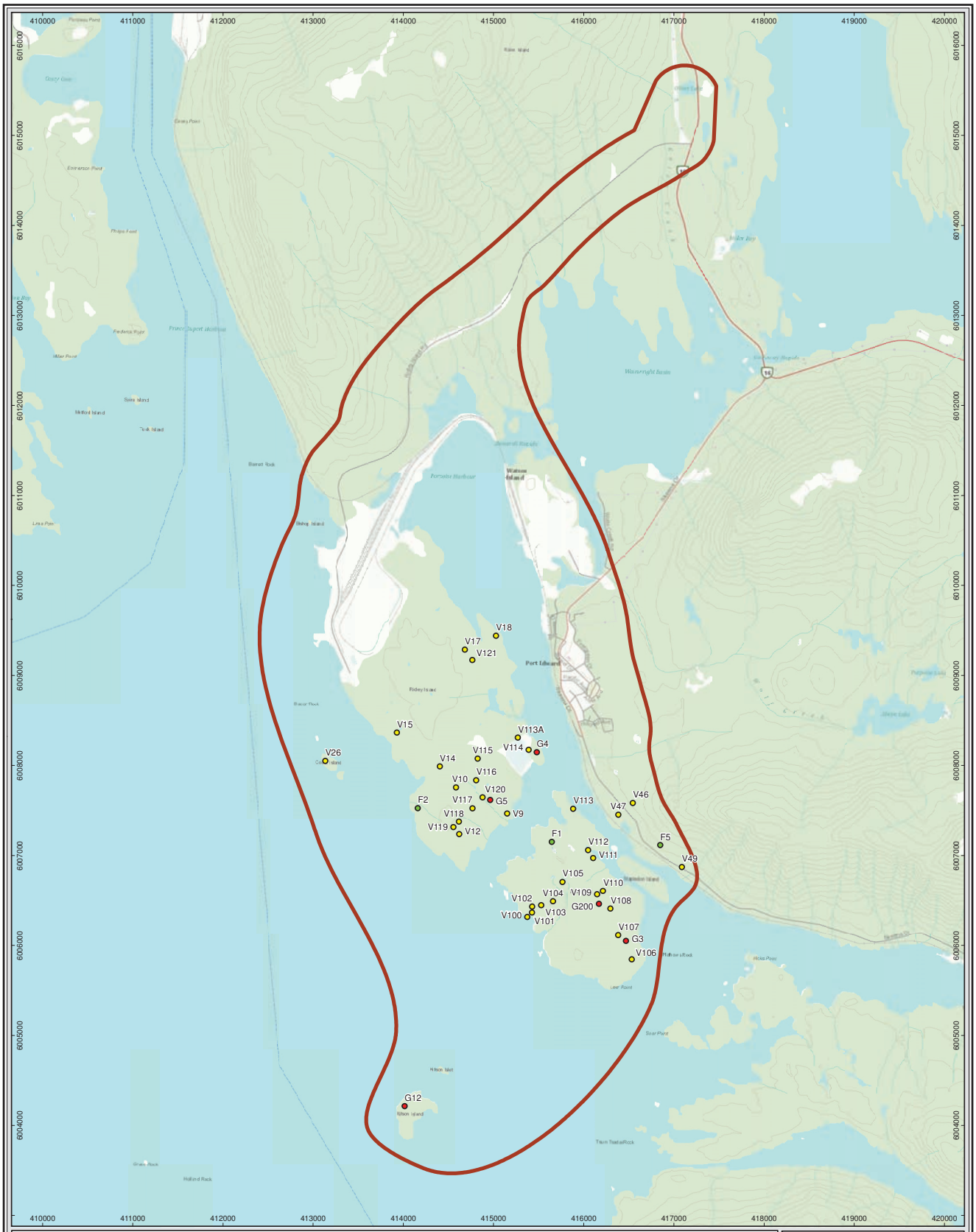
Habitats in the study area will be classified with Terrestrial Ecosystem Mapping (TEM) with reference to guidelines from the BC Resource Inventory Standards Committee. This TEM mapping will occur in the context of the Biogeoclimatic Ecosystem Classification System for BC, which lists the habitats in this part of the North Coast Forest District as the Coastal Western Hemlock - Very Wet Hypermaritime Subzone - Central Variant (CWHvh2). Forests in this subzone are dominated by Western hemlock (*Tsuga heterophylla*), Western red cedar (*Thuja plicata*), Sitka spruce (*Picea sitchensis*) and shore pine (*Pinus contorta* var. *contorta*). Wetland vegetation is mainly dominated by low-growing shore pine, yellow cedar (*Chamaecyparis nootkatensis*), common juniper (*Juniperus communis*) and peat mosses (*Sphagnum* spp.).
The field surveys for the Terrestrial Ecosystems Program fall into the following categories:

CEAA Guide 5.1
CEAA Regs 16.0
BCEAO Guide
Project Overview

- **Landforms and Soils** – These surveys are part of the TEM surveys to ground-truth air photo interpretation.
- **Vegetation** – TEM surveys to ground-truth air photo interpretation as well as rare plant surveys and surveys of rare ecological communities (Figure 5.12). Initial TEM

surveys for landforms and soils and vegetation were completed from July 17 to July 23, 2012.

- **Wildlife** – Surveys of wildlife and wildlife habitat including: breeding bird surveys (Figure 5.13), raptor surveys, bat surveys, amphibian surveys and wetland surveys were conducted during the summer of 2012. Further surveys are planned in 2013.



Basemapping from ESRI (World Topology).
All other data from AECOM, 2012.

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Legend

Terrestrial Local Study Area

TEM Plot Locations and Type

- Full
- Ground
- Visual

BG Baseline Studies
Location: Ridley Island, BC

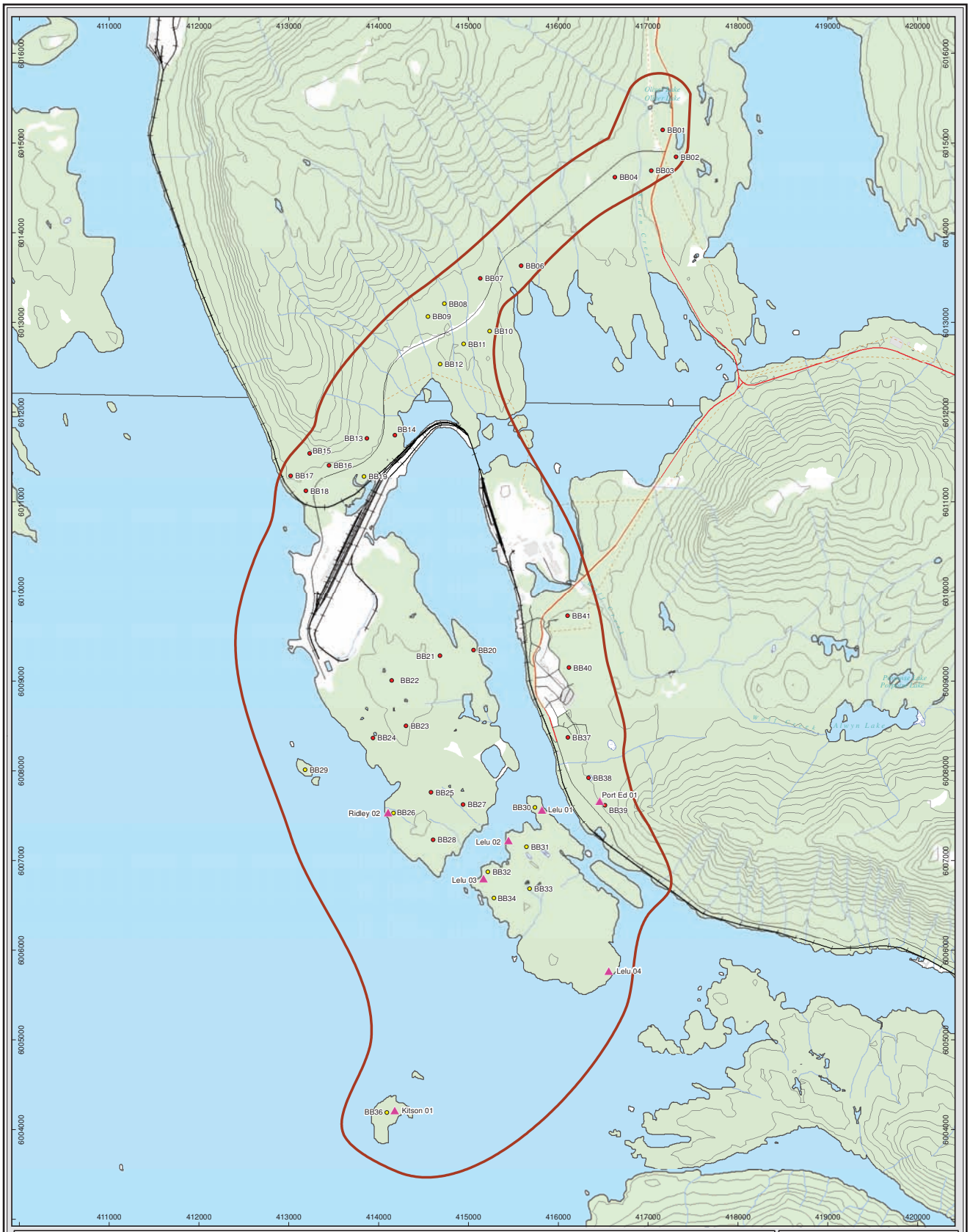
Terrestrial Ecosystem Mapping (TEM) Plot Locations

April 2013
Project: 60284368

AECOM

Figure 5-12

File Location: P:\60284368\000-CADD\050 GIS WIP\02_Maps\SOCIO_ECONOMIC_PROGRAM\2013-01-16-ProjectDescription\Fig5-12-2013-04-03-TEM-Plot-60284368.mxd Date Revised: April 04, 2013 Prepared by: DL Project: 60284368



Basemapping from Department of Natural Resources Canada, ESRI Basedata and AECOM 2012.

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Legend

- Northern Goshawk Call Station
- Breeding Bird Stations Surveyed in 2012
- Breeding Bird Stations Not Surveyed
- Terrestrial Local Study Area

Forest Stand Age

Relative Forest Stand Age

- Youngest <= 40 Years
- 3 = 41 - 60 years
- 4 = 61 - 80 years
- 5 = 81 - 100 years
- 6 = 101 - 120 years
- 7 = 121 - 140 years
- 8 = 141 - 250 years
- Oldest > 250 years

BG Baseline Studies
Location: Ridley Island, BC

Breeding Bird and Northern Goshawk Survey Locations

April 2013
Project: 60284368

AECOM

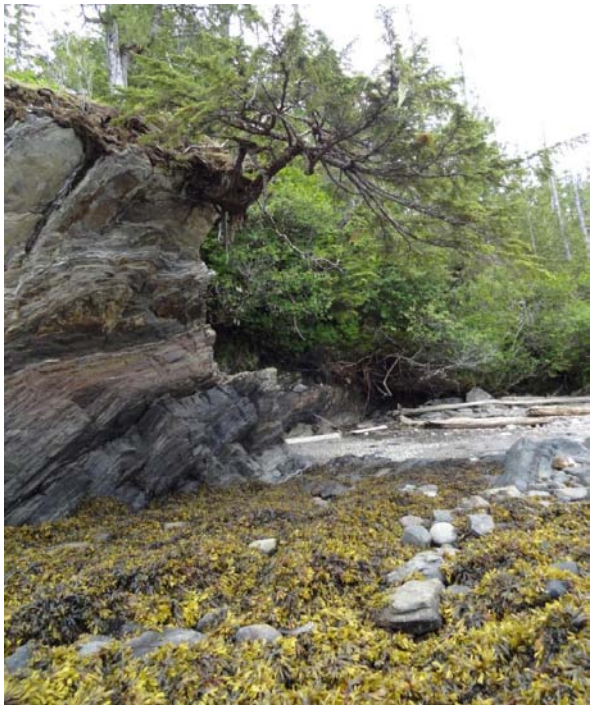
Figure 5-13

File Location: P:\60284368\000-CADD\050 GIS WIP\02_Maps\SOCIO_ECONOMIC_PROGRAM\2013-01-16-ProjectDescription\Fig5-13-2013-04-03-BreedingBirdStation-60284368.mxd Date Revised: April 04, 2013 Prepared by: DL Project: 60284368

This area of the northwest coast of BC is referred to as the Hecate Lowlands. The climate is hypermaritime, receiving more than 2,500 mm of precipitation each year (most of this falling as rain). The temperatures in the summer and winter are relatively cool due to the high latitude and moderating influence of the Pacific Ocean. The Site and construction camp locations are near current mean sea level with subdued relief. The area is dominated by temperate rainforests and bog wetlands.

Landforms and Soils

Nearly the entire area is underlain by metasedimentary and metamorphic bedrock from the Ordovician to Triassic period (Photograph 5.10). The City of Prince Rupert has identified the rock types on Kaien and Ridley Islands as mainly schist and gneiss consisting of relatively narrow alternating horizons of thinly fissile and more massive rocks. The majority of the area can be described as garnet-baring mica schists with well-developed foliation. The contemporary landscape reflects both the geological origins and the glacial and post-glacial history of the region. Bedrock along with Organic and Morainal deposits is expected to be the most common surficial material throughout the area due to its physiographic nature.



Photograph 5.10. Typical bedrock at Ridley Island

Vegetation

Photograph 5.11. CWHvh2 07 – Red cedar-Sitka spruce / Devil's club ecosystem in Study Area

Based on general range, more than thirty listed species of plants have the potential to occur in the study area. Among them, nine blue- and red-listed plant species, subspecies and varieties have been described within the study area (Klinkerberg, 2012) including eight blue-listed species, subspecies and varieties in BC: Lesser saltmarsh sedge (*Carex glareosa* var. *amphigena*); Gmelin's sedge (*Carex gmelinii*); Kamchatka spikerush (*Eleocharis kamtschatica*); Arctic rush (*Juncus arcticus* ssp. *alaskanus*); Bog-adder's mouth orchid (*Malaxis paludosa*); Alaska

holly fern (*Polystichum setigerum*); Menzies' burnet (*Sanguisorba menziesii*); Brown's four-toothed moss (*Tetrodontium brownianum*), and one red-list species in BC, Graceful arrow-grass (*Triglochin concinna*). The blue-listed, Alaska holly fern and Gmelin's sedge have been located on the western and southwestern shoreline of Ridley Island, and the latter is the only listed species that has been found in the project footprint.

Sixteen red and blue-listed ecological communities may be present in the study area, based on general range. Among them, one red-listed and four blue-listed ecological communities have been recorded in the study area (Stantec, 2011a). One blue-listed ecological community has been found within the project footprint, Western redcedar - Sitka spruce / Skunk cabbage (*Thuja plicata - Picea sitchensis / Lysichiton americanus*) - CWHvh2/13 (Ws54) (Photograph 5.11).

Wildlife

Wildlife species of federal concern that have been recorded or potentially occur in the study area include the western toad (*Bufo/Anaxyrus boreas*) and coastal tailed frog (*Ascaphus truei*), both of which are listed as Special Concern (SC) under the federal *Species at Risk Act* (SARA); the Queen Charlotte subspecies of the Northern Goshawk (aka. Queen Charlotte Goshawk)(*Accipiter gentilis laingi*), which is a SARA Threatened species; the Western Screech-owl (*Megascops kennicottii*) and the Pacific subspecies of the Great Blue Heron (Ar*dea herodias fannini*), both of which are SARA SC, and the little brown myotis (bat; *Myotis lucifugus*), which is recommended as SARA endangered by COSEWIC (2012). Keen's long-eared myotis (bat; *Myotis keenii*) and the northern tightcoil (snail; *Pristiloma arcticum*) are provincially red- and blue-listed respectively, but are not categorized under SARA.

The western toad (Photograph 5.12), Great Blue Heron, and little brown myotis were detected in the study area during the 2012 field surveys. The coastal tailed frog, Queen Charlotte Goshawk and Keen's long-eared myotis were not detected during the preliminary surveys conducted in 2012, although suitable habitat for these species exists in the study area and follow-up surveys will be undertaken in 2013. No surveys were conducted for the Western Screech-owl and northern tightcoil in 2012; surveys will be conducted in 2013.

Photograph 5.12. Western toad observed on Ridley Island

Larger terrestrial wildlife such as the black bear (*Ursus americanus*), grey wolf (*Canis lupus*), and Sitka black-tailed deer (*Odocoileus hemionus sitkensis*), occur in the area including on the Site. While the Site does not contain substantial foraging or wintering habitat critical for survival for any of these species, habitat alteration and loss will occur. Habitat suitability models are currently being developed to assess the extent of habitat change that will result from project activities and their potential effects on large wildlife.

Similarly the Site provides breeding, foraging and stopover habitat for migratory birds. Preliminary breeding bird surveys conducted in 2012 provided insight as to the diversity and abundance of breeding birds occurring on the Site with follow-up surveys planned for 2013 to help assess the extent of potential effect that habitat change may have on bird populations currently using the site. No direct impact on migratory birds is anticipated. To control the potential for incidental impact take of any nesting migratory birds, land clearing and other potentially disruptive work activities in migratory bird habitat will wherever possible be completed outside of the active breeding season. If work must be conducted in migratory bird habitat during the nesting season, a survey will be conducted by a qualified biologist immediately prior to commencement of work to identify and locate active nests of species covered protected under the *Migratory Birds Convention Act* and appropriate no disturbance buffers established until the nest has fledged.
For further details, see Section 5.6.3.

5.1.8.2 Potential Effects and Mitigation Measures – Terrestrial Ecosystems

CEAA Guide 5.3
CEAA Regs 18.0
BCEAO Guide
Project Overview

The Project and the associated temporary infrastructure will remove habitats on a portion of Ridley Island and in the area of the proposed construction camp. Potential effects of the Project on terrestrial ecosystems were examined with respect to landforms and soils, vegetation, wildlife and wildlife habitat. Considerations included effects on wetlands and old-growth forests.

The Project will permanently remove relatively small areas of the CWHvh2 subzone on this part of the coast of BC. This removal will result in the permanent loss of some occurrences of rare ecological communities and the potential loss of some rare plants. Consideration will be given to the relocation of rare or listed plants. PRLNG in accordance with its commitment to its Environmental Standard will work with First Nations and key stakeholders to identify opportunities to compensate for loss of biodiversity.

Potential effects of the Project on wildlife are being examined not only with respect to potential effects on wildlife habitat but also with respect to potential effects on movements and mortality.

Mitigation measures that may be appropriate include:

- relocating rare or listed plant species.
- limiting tree-clearing or habitat-altering activities to time periods outside of critical life stages (e.g., not during the breeding season for birds or amphibians).
- avoiding habitat features important to wildlife where possible (e.g., wetlands, streams, ponds, etc.).
- using existing roads, clearings and water course crossings whenever possible.
- confining all Project traffic to designated access roads and construction sites.
- limiting the size of the temporary workspace to the greatest extent possible.
- deactivating and removing unused roads and construction sites and revegetate with native vegetation; reductions in traffic may reduce direct mortality on wildlife and increase habitat use.
- maintaining habitat connectivity, wherever possible.
- zero tolerance on the feeding of wildlife.
- careful management of all garbage.

5.1.8.3 Further Study and Assessment – Terrestrial Ecosystems

The terrestrial program has planned future work for the Landforms and Soils, Vegetation and Wildlife disciplines. TEM field surveys for landforms and soils and vegetation will be conducted in 2013 to build on 2012 surveys. Field surveys for vegetation will also include a rare plant survey and a rare ecological community survey.

The Wildlife discipline has field surveys planned for bats, raptors and owls, breeding birds and wetlands in 2013. These surveys will be required for the baseline and to prepare and run models including Marbled Murrelet, Northern Goshawk and black bear that will assess habitat suitability.

5.2 Economic

BCEAO Guide
Project Overview

This section provides an overview of economic indicators for the main communities located close to the Project (Prince Rupert, Port Edward, Lax Kw'alaams, Metlakatla), as well as the regional area covered by the Skeena-Queen Charlotte Regional District. Data were unavailable for Lax Kw'alaams and Metlakatla, but data for the Skeena-Queen Charlotte Regional District includes these communities as part of the broader Regional District.

Prince Rupert is the largest city in the Skeena-Queen Charlotte Regional District and provides employment and commercial services for residents of the surrounding communities of Port Edward, Lax Kw'alaams, Metlakatla and beyond. Traditionally the economic drivers in these communities were the fishing and forestry industries, but these industries have faced significant economic challenges and have declined in importance (City of Prince Rupert, 2007). More recently, the Port of Prince Rupert has seen expansion and job creation and Port facilities are a key local employer. The Port of Prince Rupert has plans to continue expansion, including the Road Rail Utility Corridor and phase 2 of Fairview Container Terminal.

5.2.1 Employment

The Project will create local employment opportunities during the construction and operations phases. Employment will include those directly employed by PRLNG (or affiliates), those employed by contractors to the Project, and those employed by companies supplying goods and services to contracted companies. The Project will also create spin-off employment in other sectors as wages are spent purchasing local goods and services. The area currently has relatively high unemployment rates compared to the Province, with the North Coast / Nechako region having the highest reported unemployment in BC at 10.7% (BC Statistics, 2013). The most recent national Census data from 2006 shows the unemployment rate for Skeena-Queen Charlotte Regional District as being more than twice that of the BC average, at 15.0%. Unemployment in 2006 was particularly high in Port Edward, at 21.8% (Statistics Canada, 2006b).

5.2.2 Skills and Training

The Project will require a range of labour, from highly skilled specialists, through skilled trade occupations, to general labour. Stakeholders and Aboriginal Groups have identified skills and training as being a barrier in achieving higher local employment in major projects. In Prince Rupert and the Skeena-Queen Charlotte Regional District, the proportion of the labour force with no certificate, diploma or degree was close to twice as high as it was in the province, at 21.9%

and 24.3%, respectively. In Port Edward the proportion of the labour force with no certificate, diploma or degree was two percentage points higher above the BC average at 14.5%. The proportion of the labour force with a university certificate, diploma or degree at bachelor's level or above was close to nine percentage points lower in all three areas compared to BC, ranging between 12% and 14% (Statistics Canada, 2006b). Barriers to accessing employment opportunities and additional training included low high school graduation rates, poor math and reading skills among children and transportation barriers (Northwest Regional Workforce Table, 2013).

The Northwest Regional Workforce Table (NRWT) was created to identify how best to align existing training in the North Coast and Nechako region to meet local employment opportunities, and to improve access to training and job opportunities close to home (Ministry of Jobs, Tourism and Skills Training and Responsible for Labour, 2013). The NRWT identified 34 occupations that will be in particularly high demand over the next decade. Under the conservative scenario, trades make-up more than 40% of the high-demand occupations, followed by labourers (14%), semi-skilled workers (15%), truck drivers and heavy equipment operators (14%), and managers and supervisors (7%). Under the optimistic scenario, trades occupations are projected to increase to 50% of total demand and labourers increase to 26%, due to a higher level of construction activity (Northwest Regional Workforce Table, 2013).

5.2.3 Income

Workers taking employment at the Project will generally be doing so in order to receive higher wages or as an opportunity to move from unemployment or under-employment. This can be expected to lead to higher median wages in local communities. The high levels of capital expenditure and Project employment will also lead to higher levels of spend for local goods and services, which can lead to beneficial income effects in other sectors. The most recent national Census statistics for Prince Rupert, Port Edward and the Skeena-Queen Charlotte Regional District show median income in these areas as being broadly similar to BC (BC Statistics, 2006).

5.2.4 Commercial Resource Use

Harvest of marine resources by both the commercial and recreational fishery is recorded around Ridley Island and the surrounding area. While the commercial fishery has declined in output, it still remains important in the Prince Rupert area. Prince Rupert also has an established guided recreational fishing and wildlife viewing industry, and this is tied to the broader tourism industry. The locations for guided recreational fishing and marine-based wildlife viewing are wide ranging in the Hecate Strait region and are not centred on the area around Ridley Island. A registered trapline area covers the project footprint on Ridley Island as well as a significantly larger part of the mainland around and to the south and west of Port Edward. Public access is not currently permitted on Ridley Island.

5.2.5 Potential Economic Effects and Mitigation

BCEAO Guide
Project Overview

The Project will create employment opportunities for people in the local communities, the broader region, and beyond. The level of local employment uptake will be dependent on the availability of skilled labour. This has been identified as a current challenge, but there is effort through the NRWT's planning work to address this challenge for the future. Project demand for skilled labour

may lead to lower labour availability for other businesses and projects in the region; similarly, these projects will affect labour availability for the Project. Project expenditure and employment will generally lead to higher local incomes, and this will lead to higher spend for other goods and services.

The movement of LNG carriers will affect the free movement of marine traffic in the immediate vicinity of Ridley Island, and this may create some inconvenience for commercial fishing, guided recreational fishing and marine-based wildlife viewing (Figure 5.14). Biophysical effects to marine resources may occur from the Project. If such effects are anticipated, their implications for commercial use will be assessed. The Project is expected to increase vessel traffic to the Port of Prince Rupert between 14% and 21% over forecasted 2018 levels.

Basemapping from Department of Natural Resources Canada and ESRI Basedata.

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Kilometers

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NAD 1983 UTM Zone 9N

Legend

- Commercial Fishing Area
- Contour
- Wetland
- River
- Lake
- Rail
- Road
- Highway

Overview Map

BG Baseline Studies
Location: Ridley Island, BC

Commercial Fishing Areas

April 2013
Project: 60284368

AECOM

Figure 5-14

File Location: P:\60284368\000-CADD\050 GIS WIP\02_Maps\SOCIO_ECONOMIC_PROGRAM\2013-01-16-ProjectDescription\Fig5-14-2013-04-03-CommercialFishingArea-60284368.mxd Date Revised: April 04, 2013 Prepared by: DL Project: 60284368

There are a range of measures available to create economic opportunities and mitigate any negative economic effects. The key areas are:

- Support to local and regional skills, training and employment initiatives that aim to maximize opportunities for local people.
- Develop an employment and training strategy that aims to maximize employment opportunities for local and First Nations communities.
- Engagement with the local business community and First Nations to communicate Project opportunities for contractors and identify mutually beneficial business opportunities.
- Navigation aids and communication to control disruption to other marine users as a result of LNG carrier movement.

5.3 Social

BCEAO Guide
Project Overview

5.3.1 Infrastructure and Services

In general, labour demand for the Project will be firstly sourced from local communities and then from workers moving in from other areas. These workers may be previous residents of Prince Rupert and the surrounding communities, or may be new residents. Population increase created by in-migration of workers and their families can bring about positive effects as higher populations support higher levels of local services and community vitality. Negative effects may also occur as a result of higher demand for services, particularly in the short-term before service provision rises to meet demand.

5.3.1.1 Transportation

There are a number of different transportation options in Prince Rupert (Figure 5.15). Highway 16, (the “Yellowhead Highway”) is a major transport artery, connecting Prince Rupert and Port Edward to Terrace, and then continuing on eastward to Prince George and Edmonton. The Highway is two lanes with an 80 km per hour (kph) speed limit.

The only road access to Ridley Island is from the north. Approximately 9.0 km of two lane road with an 80 kph speed limit extends from a basic T-intersection at Highway 16 towards Ridley Island. The speed limit reduces to 50 kph approximately 6.3 km from the Highway. The access road is stop sign controlled at the intersection with Highway 16, yielding to traffic on the Highway. From the intersection on Highway 16, central Prince Rupert lies approximately 9.0 km (or eight minutes) to the north, the community of Port Edward lies approximately 6.5 km (or eight minutes) to the south and Terrace lies 130 km (or 1 hour 45 minutes) to the east.

Rail access to the Site is available through Canadian National Rail (CN Rail). CN Rail has a mainline that runs to Prince Rupert from Valemount, BC. At Valemount, the Prince Rupert mainline joins the CN Rail mainline from Vancouver. Freight traffic on the Prince Rupert mainline consists primarily of grain, coal, wood products, chemicals, and as of 2007, containers.

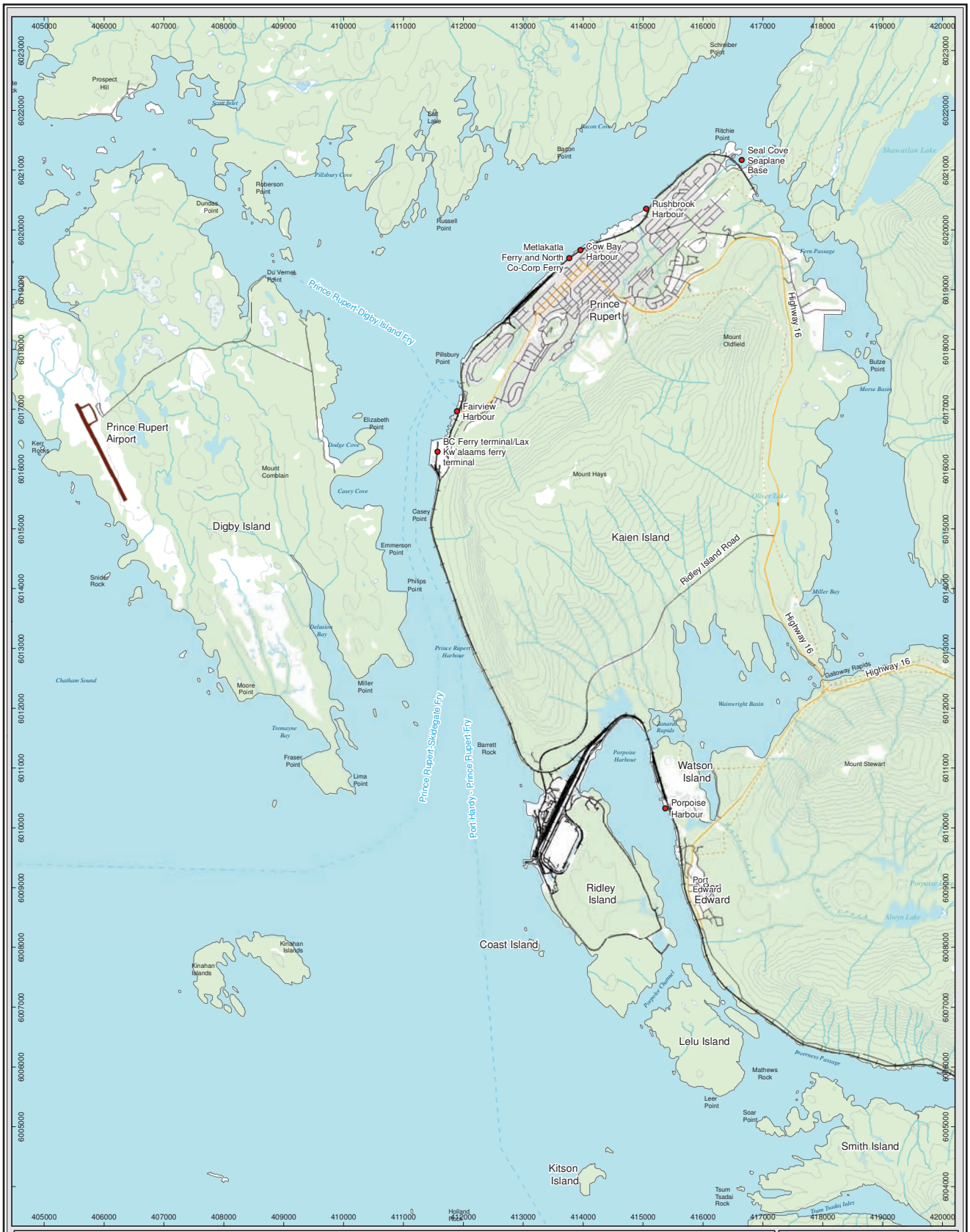
In addition, a passenger train operated by Via Rail connects Prince Rupert with Prince George and Jasper, operating three times per week. In Jasper, the route connects passengers with Via's “The Canadian” route, which runs between Toronto and Vancouver (Via Rail, 2012).

The Prince Rupert Airport is located on Digby Island, approximately 20 minutes by ferry from the City of Prince Rupert. The Prince Rupert Airport has one paved runway, 1,829 m in length, which is operational 24 hours per day year round. Air Canada Jazz and Hawkair provide daily flights between Vancouver and Prince Rupert Airport. As the airport is located on Digby Island, bus and ferry service is provided for regular scheduled flights. Travellers aboard scheduled airlines are transferred by bus and ferry to downtown Prince Rupert as part of their ticket (Prince Rupert Airport, 2012). While the airport is only approximately 5 km from Prince Rupert, travelling to the airport takes over an hour (Northern Development Initiative Trust, 2011). The Prince Rupert Airport saw 54,350 passengers in 2010. The volume of traffic through the Prince Rupert Airport has fallen since 2008, where it peaked at 63,660 passengers and 4,509 aircraft (Prince Rupert Airport, 2012).

Prince Rupert is connected to Skidegate on Haida Gwaii and Port Hardy on Vancouver Island (referred to as the 'Inside Passage') by BC Ferries. According to the BC Ferries website, the two ferries providing service to and from Prince Rupert are the Northern Expedition and Northern Adventure. The Northern Expedition was built in 2009 and has a passenger and crew capacity of 638 and 130 cars. The Northern Adventure was built in 2004 and has a passenger and crew capacity of 640 and 110 cars. From fall to spring, the ferry between Prince Rupert and Skidegate runs regular services once a day, three days a week, in both directions. In the summer, the ferry frequency peaks at once a day, six days out of the week in both directions. The Inside Passage ferry travels approximately once every week between fall and spring, increasing to once every other day during the summer.

There are several other smaller ferry services that run between Prince Rupert and the outlying communities. A small commuter ferry runs several times every weekday between the community of Metlakatla and Prince Rupert. The Metlakatla ferry can only carry passengers and does not provide service on weekends. Between the fall and spring, the Metlakatla ferry has additional runs that are specifically designated for students travelling to Prince Rupert for school. The community of Lax Kw'alaams also runs a ferry that can carry 16 vehicles from Aero Point, near Prince Rupert, up Tuck Inlet to the Northeast (Metlakatla First Nation, 2012).

The communities of Hartley Bay, Kitkatla and Metlakatla operate the North Co-Corp ferry service. The ferry leaves from Prince Rupert, arrives in the community, unloads passengers and loads new passengers, and returns immediately to Prince Rupert. The communities at which the ferry stops depend on the day of the week (Metlakatla First Nation, 2012).



Basemapping from Department of Natural Resources Canada and ESRI Basedata.

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Kilometers

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NAD 1983 UTM Zone 9N

Legend

- Contour
- Wetland
- River
- Lake
- Rail
- Road
- Highway
- Prince Rupert Airport

Overview Map

BG Baseline Studies
Location: Ridley Island, BC

Transportation Map

April 2013
Project: 60284368

AECOM

Figure 5-15

File Location: P:\60284368\000-CADD\050 GIS WIP\02_Maps\SOCIO_ECONOMIC_PROGRAM\2013-01-16-ProjectDescription\Fig5-15-2013-04-03-TransportationMap-60284368.mxd Date Revised: April 04, 2013 Prepared by: DL Project: 60284368

5.3.2 Housing

Prince Rupert experienced a decline in the number of dwellings between 2001 and 2006 (Table 5.6). The decline was particularly sharp for rented dwellings, with a decrease of 300 between 2001 and 2006, while it was under 100 for owned dwellings. Both gross rent and owners' payments dropped over the same time period, with renters paying $46 less a month and home owners $15 less a month. Despite this, the average value of owned dwellings increased by over $43,000 between 2001 and 2006, although this was a much more modest increase compared to the BC average of over $150,000 (BC Statistics, 2012a).

Table 5.6. Dwelling Cost and Value in 2006

	Prince Rupert		BC	
	2001	**2006**	**2001**	**2006**
Dwellings	5,460	5,070	1,534,335	1,643,150
Owned	3,215	3,130	1,017,485	1,145,045
Rented	2,240	1,940	512,360	493,995
Average gross rent	$600	$554	$750	$828
Average owners' payments	$900	$885	$904	$1,059
Average value of dwelling	$121,066	$164,644	$230,645	$418,703

Source: Community Facts, BC Statistics 2012a

More recently, the BC Northern Real Estate Board reported that, as of July 2012 in Prince Rupert, the average selling price declined from $193,534 last year to $193,223, but the 65 homes sold is the highest number sold in the first six months in the last four years (The Northern View, 2012). In the rental market, the Canadian Housing and Mortgage Company (CMHC) reported that the vacancy rate for "*Privately Initiated Rental Row and Apartment Structures of Three Units and Over*" in Prince Rupert fell from 12.7% in April 2011 to 12.0% in April 2012 (Canadian Housing and Mortgage Company, 2012). No housing statistics were available for Port Edward.

5.3.3 Health Services

The Prince Rupert Regional Hospital, serves Prince Rupert, Port Edward, Lax Kw'alaams and Metlakatla. The hospital has 24 beds, including 20 acute care beds, two maternity beds and two intensive care beds and is staffed by in-house surgeons for general surgery, obstetrics/gynecology and orthopedics, as well as a permanent specialist for pediatrics, internal medicine, psychiatrist and dentistry. Specialists that visit at least once a month include dermatology, plastic surgery, podiatry, geriatric, mental health, urology and cardiology (City of Prince Rupert, 2012b). Hospital services include diagnostics, ultrasound, CAT scan, surgery, emergency, day care, acute care and extended care with additional services such as diabetes education, healthy heart and rehabilitation programs. Other facilities include the Acropolis Manor, a modern residential care facility (Rural Coordination Centre of BC, 2012).

Occupancy at the hospital averages between 90 and 95%, but can fluctuate from 70% to overfull at times. The facility is short of beds on average one week per month, but it can use BC BEDLINE to both find and fill vacancies (City of Prince Rupert, 2012b).

A Report to Council found that the services provided by Prince Rupert Regional Hospital meet or exceed that provided by other communities. In particular, it was identified as a leader in the provision of cancer care. Much of the hospital's success is attributed to support provided by volunteers and outside community funding. Despite these successes, shortages in staffing, locums and nursing were identified (City of Prince Rupert, 2012b).

5.3.3.1 Accessibility

The Northwest HSDA compares well to the BC rate for physicians, with 88.4% having a regular medical doctor compared to the provincial average of 86.3%. The number of medical doctors per 100,000 population in the Northwest HSDA is 152 compared to the BC average of 119. However, a lower proportion of those in the Northwest HSDA had contact with a regular doctor in the past twelve months compared to BC, and there were only 263 specialists per 100,000 compared to 520 in BC (Statistics Canada, 2012).

5.3.4 Education

5.3.4.1 Primary and Secondary Education

School District 52 (Prince Rupert) serves Prince Rupert, Port Edward, Metlakatla, Gitxaala, Hartley Bay, Lax Kw'alaams, Dodge Cove, and Gingolx (Kincolith). There are nine schools located in Prince Rupert and Port Edward, seven of which are public (Table 5.7). An independent school is listed in Lax Kw'alaams, but no enrollment data are available from the BC Ministry of Education (Ministry of Education, 2012). Students from Metlakatla attend school in Prince Rupert.

Table 5.7. Primary and Secondary Schools in Prince Rupert

Schools	Address	Type	Grades	Enrollment (Sept 2012)
Annunciation School	627 5th Ave W, Prince Rupert	Independent School	K-8	227
Charles Hays Secondary	201 Prince Rupert Boulevard, Prince Rupert	Public School	9-12, GA	726
Conrad Elementary	825 Conrad St, Prince Rupert	Public School	K-5	197
Lax Kxeen Elementary	601 William Booth Way, Prince Rupert	Public School	K-5	181
Pacific Coast School	285 - 309 2nd Ave, Prince Rupert	Alternative Program Public School	9-12, GA	97
Pineridge Elementary	1700 Sloan Ave, Prince Rupert	Public School	K-5	197
Prince Rupert Middle	417 9th Ave W, Prince Rupert	Public School	6-8	453
Roosevelt Park Elementary	800 Summit Ave, Prince Rupert	Public School	K-5	239
Port Edward Elementary	633 Sunset Dr, Port Edward	Public School	K-5	30

Source: School Information, BC Ministry of Education

5.3.4.2 Post-Secondary Education

At the post-secondary level, the major education provider in Prince Rupert is the Northwest Community College (NWCC). The main campus of NWCC is based in Terrace, and this is where the majority of their training programs are offered. Other educational support, in the form of Grade 12 upgrade, essential skills, employment readiness, and employment services, is available in the area from the Hecate Strait Employment Development Society. Additionally, the Metlakatla Development Corporation (First Nations Training and Development Centre) and the Native Education College offer Grade 12 upgrade (Northwest Regional Workforce Table, 2013).

5.3.5 Emergency Services

The Prince Rupert Fire Rescue Department currently consists of a Fire Chief, Deputy Chief, four shift Captains and 13 career Fire Fighters. As a result of attrition reductions currently occurring within the career staff, an Auxiliary Department is being organized. The Fire Station is located downtown, and the department maintains a small fleet of firefighting apparatus, including one 75 foot Quint, two pumpers and one Fire/Rescue truck (City of Prince Rupert, 2012a).

The Prince Rupert RCMP has 28 regular members, including the General Investigation Section, a Police Service Dog and Dog Handler, a Forensic Identification Specialist, and a Crime Prevention/Media Relations Officer. The Rural Section of the Prince Rupert RCMP serves communities stretching from Port Simpson to Hartley Bay (City of Prince Rupert, 2012a).

Although the number of police has remained constant in the city of Prince Rupert since 2001, on a per capita basis the number of officers has increased due to the decline in population. The caseload peaked in 2007 at 96 cases per officer, but this has since declined to 87 in 2010. As for the RCMP policing the non-incorporated areas around Prince Rupert (provincial), the number of officers increased to seven in 2010, representing a 75% increase over the number of police between 2003 and 2009 (Ministry of Public Safety and Solicitor General, 2010).

5.3.6 Community Belonging and Crime

According to the 2012 Health Profile for the Northwest HSDA, the sense of community belonging was more than seven percentage points higher than the BC average, at 76.6% (Statistics Canada, 2012).

The Composite Index of Crime tracks the rate of violent crime and serious property crime, as well as the rate of motor vehicle theft and the number of serious crimes per police office. Out of 26 total Regional Districts in BC, the Skeena-Queen Charlotte Regional District ranked 6th highest in the province for the composite index, but 3rd highest for serious violent crime and 4th highest for serious crime overall between 2008 and 2010 (BC Statistics, 2012b).

The Crime Severity Index measures the incidence and severity of crime in Canada based on sentencing in courts. For overall crime severity, the Prince Rupert Municipal policing jurisdiction ranked 10th and Prince Rupert Provincial ranked 20th out of 170 jurisdictions in 2010 (Ministry of Public Safety and Solicitor General, 2011), indicating relatively high levels of crime.

5.3.7 Recreational

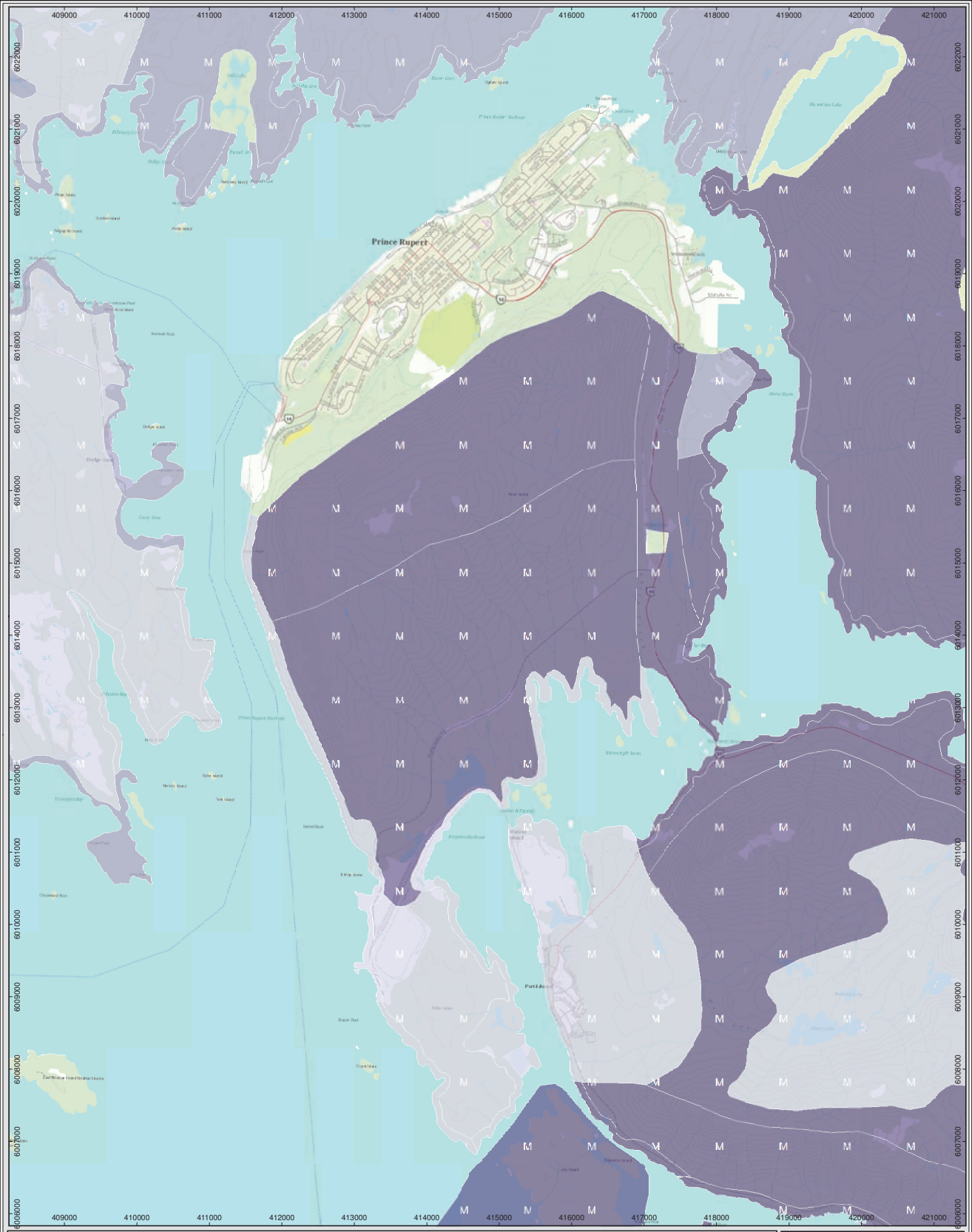
There is currently no public access to Ridley Island and so no effects to recreational use are anticipated. The areas on south Kaien Island that may be used for a construction camp have been identified as having recreational value, including walking for local residents. Changes in land use may affect the accessibility or amenity values of this area for recreation. The recreational features for most of Kaien Island is classed by the BC Government Recreation Features Inventory as “Very High” for significance, and ”Moderate” for sensitivity (Figure 5.16), (BC Government, 2012a) (data layers: Recreation Features Inventory – Significance and Sensitivity).

5.3.7.1 Visual

Port Edward is separated from Ridley Island by Porpoise Harbour. Ridley Island can be viewed from the residential areas of Port Edward, as well as by marine traffic to and from the Porpoise Harbour Marina Complex and around the Island. Development on Ridley Island will lead to a visual change for viewpoints from Port Edward and from the water surrounding Ridley Island.

The Visual Landscape Inventory classifies visual sensitive areas and corridors in BC, and determines or recommends a visual sensitivity class (VSC). The VSC rates the sensitivity of the landscape to visual alteration based on biophysical and viewing characteristics. The rating scale is 1 to 5, where Class 1 is defined as “Very high sensitivity to human-made visual alteration”, with the scale running to Class 5, which is defined as “Very low sensitivity to human-made visual alteration” (Ministry of Forests, 1997). The western and southern shoreline of Ridley Island has a Class 3 VSC. On the central and southern end of Kaien Island, the VSC is Class 2 (BC Government, 2012b) (data layers: Visual Sensitivity Class).

The province also has Established Visual Quality Objectives (EVQOs) that are used to express visual quality objectives for an area. They are generally used as a tool for management of forestry activity. On Ridley Island, the EVQO is “Retention” along western side of the island and unclassified for the rest (Figure 5.17). This provides direction for forestry management that forestry activities should not be visually evident. On the central and southern end of Kaien Island, the EVQO is either Retention or unclassified (BC Government, 2012b) (data layers: Established Visual Quality Objective).



Basemapping from ESRI (World Topology), Gov't of BC (GeoBC). All other data AECOM, 2013.

N
W
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0 0.5 1 1.5 2
Kilometers

1:50,000

NAD 1983 UTM Zone 9N

Legend

Recreational features inventory significance

- Low
- Medium
- High
- Very High

Recreational features inventory sensitivity

- Unclassified Area
- Low
- Moderate
- High

BG Baseline Studies
Location: Prince Rupert, BC

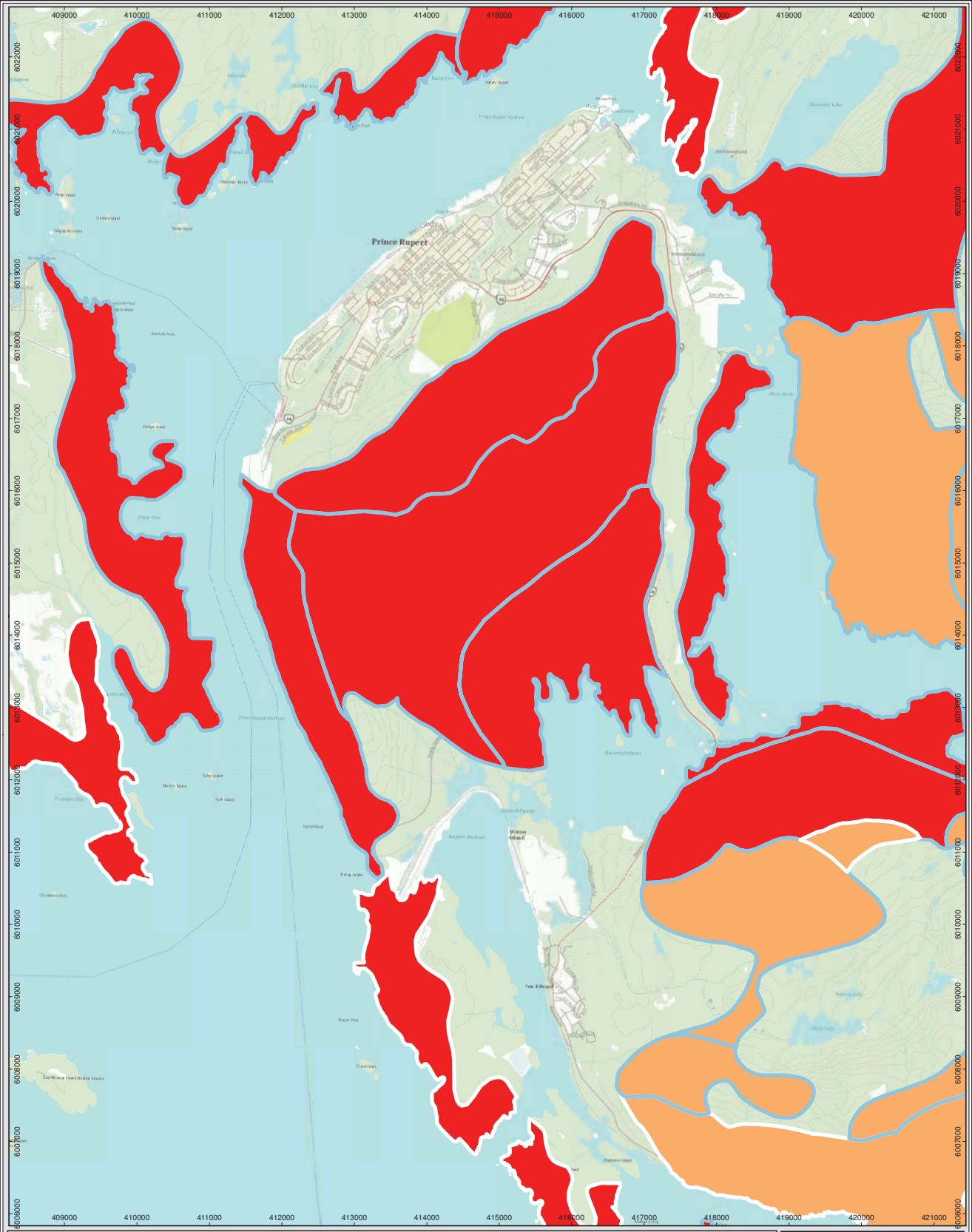
Reacreational Features Inventory Significance and Sensitivity

April 2013
Project: 60284368

AECOM

Figure 5-16

File Location: P:\60284368\6000-CADD\050 GIS WIP\02_Maps\SOCIO_ECONOMIC_PROGRAM\2013-01-16\ProjectDescription\Fig5-16-2013-04-03-PrinceRupertRFI-60284368.mxd Date Revised: April 04, 2013 Prepared by: DL Project: 60284368



Basemapping from ESRI (World Topology), Gov't of BC (GeoBC). All other data AECOM, 2012.

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Kilometers

1:50,000

NAD 1983 UTM Zone 9N

Legend

Established Visual Quality Objective

- Maximally Modified
- Modified
- Partially Retained
- Retain
- Preserve

Visual Sensitivity Classification

- 1 (High Sensitivity)
- 2
- 3 (Shown in white)
- 4
- 5 (Low Sensitivity)

BG Baseline Studies
Location: Prince Rupert, BC

Visual Quality Objective and Sensitivity

April 2013
Project: 60284368

AECOM

Figure 5-17

File Location: P:\60284369\000\CADD\050 GIS WIP\02_Maps\SOCIO_ECONOMIC_PROGRAM\2013-01-16-ProjectDescriptionFig5-17-2013-04-03-PrinceRupertVQO-60284368.mxd Date Revised: April 04, 2013 Prepared by: DL Project: 60284368

5.3.8 Potential Social Effects and Mitigation

BCEAO Guide Project Overview

To the extent practicable, preference will be given to hiring locally to fulfil Project labour requirements, taking into account the skills and needs of the applicable positions. However there will also be a need to hire from outside to meet Project needs, including for specialized skills. Due to relocation of new residents to the area, the potential social effects of the Project are likely to include demographic change and the resulting higher demand on local education, medical, social services, emergency services, housing, temporary accommodation and transportation infrastructure. Higher population levels will also lead to higher revenues from property taxes, permit fees and user-fees for services, and this will support the increased or improved provision of these services and infrastructure. During the construction there will be worker accommodation in a camp. This will lead to a relatively large increase in the number of people living in the area and lead to a short term requirement for local services, and a shift in local demographics to a higher population of young to middle-aged males.

Ridley Island is no longer open to public recreational use but there may be effects to recreational activities in the surrounding waters (recreational fishing and boating) from LNG carrier movement. Recreational activity also occurs in the south Kaien Island area, which may be affected by camp development. The Project development will affect the visual quality of viewpoints at Port Edward and from the waters surrounding Ridley Island.

Mitigation measures that may be appropriate include:

- development of a camp management plan that is sensitive to local needs around worker movement and use of services, while creating opportunities for positive economic and social effects for the local community.
- identification and making best use of temporary accommodation options, including hotel and rental capacity.
- development of transportation management plans to control disruption from the movement of workers and materials on local residents.
- mitigation of visual impact through layout of project components and screening where possible.

The project will conduct a Social Impact Assessment to better understand the potential impacts and appropriate mitigations.

5.4 Heritage

5.4.1 Potential Heritage Effects and Mitigation

CEAA Guide 5.4
CEAA Regs 19.0
BCEAO Guide Project Overview

The Archaeological Overview Assessment (AOA) identified that there was potential for archaeological sites to be found. Field study will be used to determine the precise location of previously recorded sites and to identify any unrecorded sites that may be present in the project footprint.

The development on Ridley Island will require the clearance of tree stands including culturally modified trees (CMTs), as well as any other archaeological sites identified during site fieldwork.

This clearance will be done after consultation with First Nations and as directed by regulatory agencies.

5.5 Health

BCEAO Guide
Project Overview

5.5.1 Physical and Mental Health

Baseline health data are available for the Northwest Health Service Delivery Area (HSDA), which includes Prince Rupert, Port Edward, Lax Kw'alaams and Metlakatla as well as other communities in the northwest region. For the Northwest HSDA, health indicators generally show poorer health outcomes when compared to the BC average.

The perceived physical and mental health in the Northwest HSDA is 6.5 and 7.6 percentage points lower than the BC average respectively though perceived life stress is slightly lower in the Northwest HSDA (Statistics Canada, 2012).

The level of functional health in the Northwest HSDA is lower on average than in BC, with the Northwest HSDA 7.0 percentage points below the provincial average of those reporting good to full functional health (Statistics Canada, 2012).

The rate of injury in the Northwest HSDA is higher on average than BC across all indicators. Death due to unintentional injury was significantly higher than in BC, with approximately 14 more deaths per 100,000 population, or over 50% higher than the BC average (Statistics Canada, 2012).

In the Northwest HSDA, the avoidable mortality rate was higher than the BC average for both avoidable mortality from preventable and treatable causes (Statistics Canada, 2012).

The Northwest HSDA scored less favourably for all indicators of chronic disease compared to the province. The percentage of those classed as overweight or obese was 62.1% for the Northwest HSDA compared to 44.7% for BC (Statistics Canada, 2012).

The Northwest HSDA has higher incidence than the BC average for mood disorder, hospitalizations and repeat hospitalizations for mental illness and mental illness patient days (Statistics Canada, 2012).

5.5.2 Potential Health Effects and Mitigation

CEAA Guide 5.4
CEAA Regs 19.0
BCEAO Guide
Project Overview

The Project has the potential to affect human health outcomes through the release of emissions (with pathways to human receptors through inhalation, dermal contact, and ingestion, including via the food chain), changes in the availability of local health services in light of increased demand, and changes in the harvest availability and consumption patterns of land, shoreline and marine country foods. Injury and accident rates may be affected by an increased level of road traffic, and participation in different occupation types.

A review of any potential risks to human health associated with the Project will be evaluated. An assessment will be conducted in the form of a quantitative human health risk assessment. Potential for health impacts will be considered for workers at the Facility and neighbouring

facilities, residents of Port Edward and Prince Rupert, residents of the Project construction camp and other people who may be exposed through their activities in the area.

Mitigation measures that may be appropriate include:

- safe work and occupational health plans and associated training during all Project phases.
- public access controls on the Site to control public safety risks.
- controlling and mitigating noise experienced from the Project by residents of Port Edward.
- provision of health services for workers during the construction phase, both in terms of emergency response and general health services.
- control technologies for reducing emissions and discharges.
- ongoing monitoring of emissions and discharges.
- controlling any disruption to areas used for the harvest of country foods or traditional medicines.

5.6 Potential Changes to the Environment – Related to Federal Legislation

5.6.1 Fish and Fish Habitat (*Fisheries Act, 1985*)

CEAA Guide 5.2(a)

CEAA Regs 17(a)

To accommodate the Facility, almost the entire Site on Ridley Island will have to be modified. This process will involve covering over the fish bearing stream in the northwest corner of the property. Current information suggests that the impact will be largely to fish habitats that support populations of sculpin and stickleback. In addition, to accommodate the Facility, the project footprint will extend into the marine intertidal area. Based on a preliminary site layout (Figure 2.1) this encroachment below the high-water mark totals approximately 10 ha and will affect both high and medium value habitat along the foreshore. Design of structures built into the intertidal area will take into consideration ways to limit the loss of fish habitat. An Authorization under the federal *Fisheries Act* will be required to allow for structures to be placed and construction activities in the intertidal and sub-tidal areas. As part of the Authorization a fish habitat compensation plan will be developed.

At this time PRLNG does not anticipate that the siting of the construction camp will affect fish habitat. Many of the streams along Ridley Island Road are fish bearing but final layout should be able to provide adequate setback to protect instream and riparian habitat values.

Construction activities could also affect fish depending on specific construction methods used for dredging and pile driving. The project design is not advanced enough at this stage to know what construction techniques will be most suitable for the Site and the design objectives. However, there are many methods available to mitigate construction activities including methods used for dredging, installing piles, timing windows, silt and bubble curtains, etc.

5.6.2 Aquatic Species (*Species at Risk Act, 2002*)

CEAA Guide 5.2 (b)
CEAA Regs 17(b)

Effects on aquatic species can occur as a result of the following activities:

- increase in vessel traffic that may result in altering underwater acoustics and increasing the potential for vessel collision with marine mammals.
- changes to the foreshore and near shore habitat as a result of the LNG facility and marine infrastructure such as the jetty and the MOF can result in effects to aquatic species including marine plants. Some examples include juvenile salmon, eulachon, Dungeness crab, eel grass and bull kelp.
- noise and sedimentation from construction of the jetty and the MOF and dredging for the marine basin can result in changes to aquatic species including marine plants for example eel grass and bull kelp.

These activities have the potential to effect aquatic species as defined in SARA. Some aquatic species are also listed as species at risk, and are confirmed to occur in the Project area. These are listed in Table 5.8.

Table 5.8. Marine Aquatic Species at Risk – Confirmed / Potential to Occur in Project Area

Species	SARA Status
Marine Mammals	
Northern Resident Killer Whale (*Orcinus orca*)	Threatened (Nov. 2008); Schedule 1
Transient Killer Whale (West Coast Transients) (*Orcinus orca*)	Threatened (Nov. 2008); Schedule 1
Fin Whale (*Balaenoptera physalus*)	Threatened (May 2005); Schedule 1
Humpback Whale (*Megaptera novaeangliae*)	Threatened (May 2011); Schedule 1
Harbour Porpoise (*Phocoena phocoena*)	Special Concern (Nov. 2003); Schedule 1
Grey Whale (*Eschrichtius robustus*)	Special Concern (May 2004); Schedule 1
Steller Sea Lion (*Eumetopias jubatus*)	Special Concern (Nov. 2003); Schedule 1
Offshore Killer Whale (*Orcinus orca*)	Threatened (Nov. 2008); Schedule 1
Blue Whale (*Balaenoptera musculus*)	Endangered (May 2012); Schedule 1
Sei Whale (*Balaenoptera borealis*)	Endangered (May 2003); Schedule 1
Fish	
Green Sturgeon (*Acipenser medirostris*)	Special Concern (Nov. 2004); Schedule 1
Invertebrates	
Northern Abalone (*Haliotis kamtschatkana*)	Endangered (April 2009); Schedule 1
Olympia Oyster (*Ostrea lurida* formerly *Ostrea conchaphila*)	Special Concern (May 2011); Schedule 1

CEAA Guide 5.2(c)
CEAA Regs 17(c)

5.6.3 Migratory Birds (*Migratory Birds Convention Act, 1994*)

Project activities that have the potential to affect migratory birds include:

- clearing potential resting or nesting habitat in the area of the Project footprint.
- operation of the flares may alter the migratory route near the Project site for birds such as Marbled Murrelet.
- noise from construction may result in avoiding use of nearby habitat for birds like the American Bittern.
- light sources at the Facility and on vessels both while at dock and in transit could attract birds with a potential to result in injury.

5.7 Potential Changes to the Environment That Would Occur on Federal Land

CEAA Guide 5.3
CEAA Regs 18.0
BCEAO Guide
Project Overview

The main footprint of the Project, with the exception of the proposed construction camp and some ancillary infrastructure, will be on Ridley Island, which is Federal Crown land. Therefore, any potential environmental effects associated with the construction and operation of the Project will occur on Federal Crown land. The potential environmental effects and mitigation measures that may be appropriate are summarized in Table 5.9.

Table 5.9. Summary of Potential Environment Project Interactions

Biophysical of Human Environment Component	Potential Environment-Project Interactions	Project Component			Project Phase			High-Level Mitigation & Compensation Considerations
		Onshore Facilities	Marine Facilities	Marine Vessel Operation	Site Preparation & Construction	Operations	Closure	
Environment								
Climate	Emissions of GHGs	x	x	x	x	x	x	• Minimization of vehicle idling and turning off equipment when not in use. • Use of electric driven APUs where appropriate. • Ensuring ground service vehicles are properly tuned and maintained. • Implementation of onsite speed limits. • Proper route selection to reduce travel distances for the delivery of construction and operational materials. • Development and implementation of a balanced earthwork management plan and keeping as much excavated earth onsite as possible to reduce offsite hauling and loss of natural GHG sinks. • Application of adaptive management to reduce air emissions. • Use of grid power during the construction phase. • Use of high efficiency gas turbine driven compressors. • Use of air coolers instead of a cooling water/sea water cooling system. • Provision on annual reports on GHG emissions after the operation commences. • Control of fugitive emissions, spills and unintentional releases of both LNG and natural gas. • During operations, implementation of preventative maintenance program that includes a leak LDAR program to control and prevent emission leaks within the facility's infrastructure.
Air Quality	Emissions of CACs (SO_2, NO_2, CO, PM_{10}, and $PM_{2.5}$)	x	x	x	x	x	x	• Minimization of vehicle idling and turning off equipment when not in use. • Use of electric driven APUs where appropriate. • Low NOx burners. • Ensuring ground service vehicles are properly tuned and maintained. • Implementation of onsite speed limits. • Proper route selection to reduce travel distances for the delivery of construction and operational materials. • Performance of regular road sweeping during construction. • Watering down loose materials and exposed earth during construction. • Prevention of erosion to control the extent and duration of bare ground surface exposure. • Development and implementation of a balanced earthwork management plan and keeping as much excavated earth onsite as possible to reduce offsite hauling. • Application of adaptive management to reduce air emissions. • Use of grid power during the construction phase. • Use of high efficiency gas turbine driven compressors. • Use of air coolers instead of a cooling water/sea water cooling system. • Provision on annual reports on air emissions after the operation commences. • Control of fugitive emissions, spills and unintentional releases of both LNG and natural gas. • During operations, implementation of preventative maintenance program that includes a LDAR program to control and prevent emission leaks within the facility's infrastructure.
Sound	Increase in ambient noise	x	x	x	x	x	x	• Construction of berms and the planting of vegetation to provide increased foliage along the fence line, both of which would function as sound barriers. • Containing major noise generating equipment within shelters where practical. • Controlling ship idling times during unloading and loading phases of the operation. • Buildings that house equipment that generate substantial noise (e.g., co-generator facility) will consider the following mitigation measures: o Implementing wall sound transmission class (STC) of at least 50 o Minimizing the amount of windows o Implementing non-operable windows o Implementing perimeter seals on the exterior doors o Using metal insulated exterior doors for higher STC values o Using adequate building ventilation such that doors and windows do not need to be opened o Silencing elements on building ventilation equipment
Groundwater	Alteration of groundwater quality	x			x	x	x	• Emergency response plans in place with spill containment equipment to rapidly deal with cleanup of any spills. • Fuel and chemical storage facilities will be designed to prevent spills into the environment by using the following mitigative strategies: ensuring containment integrity, secondary containment, drainage and collection. • Development of a construction and operations Stormwater Management Plan to include best management practices for protecting the quality of stormwater runoff.
Hydrology & Surface Water Quality	Alteration of surface water quantity and quality	x	x	x	x	x	x	• Emergency response plans in place with spill containment equipment to rapidly deal with cleanup of any spills. • Fuel and chemical storage facilities will be designed to prevent spills into the environment by using the following mitigative strategies: ensuring containment integrity, secondary containment, drainage and collection. • Development of a construction and operations Stormwater Management Plan to include best management practices for protecting the quality of stormwater runoff.
Fresh Water Fish and Fish Habitat	Loss of fish habitat within the project footprint							• Establishment of appropriate setback from fish bearing stream. • Effective sediment and erosion control plan. • Development of a fish habitat compensation plan.
Marine Ecosystems	Loss of marine habitat within the project footprint							• Minimizing the footprint of the project thereby limiting the loss of native habitat along the coast. • Incorporating rugosity and refuge areas into the design of the shoreline to allow fish and other organisms protection from predators. • Development of a fish habitat compensation plan to offset any unavoidable fish habitat effects.
	Alteration of marine water and sediment quality		x		x	x		• Employ effective measures during dredging to limit turbidity and localized sedimentation. • Controlling the amount of water withdrawn from and discharged back into the ocean and placing the intakes and discharge points in areas of maximum flow to yield maximum mixing with the ambient water. • Collecting stormwater runoff and allowing it to return to the ocean after verification that it is free of contaminants.
	Habitat alteration at dredge disposal sites		x		x			• Identify and use disposal sites with minimal habitat value; dispose of contaminated dredgeate at an approved land facility.
	Alteration of marine mammal behavior and potential for vessel strikes		x	x	x	x	x	• Avoiding blasting or other noisy construction activities when marine mammals are in the area. • Controlling the lights shining into the water. • Limiting the speed of vessels in transit to/from the project to reduce noise and limit the potential for vessel strikes.

Biophysical of Human Environment Component	Potential Environment-Project Interactions	Project Component			Project Phase			High-Level Mitigation & Compensation Considerations
		Onshore Facilities	Marine Facilities	Marine Vessel Operation	Site Preparation & Construction	Operations	Closure	
Terrestrial Ecosystems	Loss of vegetation within the project footprint	x			x			• Consider relocating rare or listed plant species. • Limit tree-clearing or habitat-altering activities to time periods outside of critical life stages (e.g., not during breeding season for birds or amphibians). • Avoid habitat features important to wildlife (e.g., wetlands, streams, ponds, etc.). • Use existing roads, clearings and water course crossings whenever possible. • Confine all project traffic to designated access roads and construction sites. • Limit the size of the temporary workspace to the greatest extent possible. • Deactivate and remove unused roads and construction sites and revegetate with native vegetation; reductions in traffic may reduce direct mortality on wildlife and increase habitat use. • Maintain habitat connectivity wherever possible. • Zero tolerance on the feeding of wildlife. • Careful management of all garbage.
	Loss of listed plant species and some occurrences of rare ecological communities	x			x			
	Loss of wildlife habitat within the project footprint	x			x			
	Alteration of wildlife movements and mortality	x			x	x		
	Loss of wildlife of listed species	x			x			
Economic	Economic opportunities	x	x	x	x	x	x	• Support to local and regional skills, training and employment initiatives that aim to maximize opportunities for local people. • Develop an employment and training strategy that aims to maximize employment opportunities for local people, including those from First Nation communities. • Engagement with the local business community to communicate Project opportunities for contractors and identify mutually beneficial business opportunities.
	Disruption to other marine users by LNG carrier movement			x		x		• Navigation aids and communication to control disruption to other marine users as a result of LNG carrier movement.
Social	Higher population levels							• Develop a camp management plan that is sensitive to local needs around worker movement and use of services, while creating opportunities for positive economic and social effects for the local community. • Identify and make best use of temporary accommodation options, including hotel and rental capacity. • Develop transportation management plans to control disruption from the movement of workers and materials on local residents.
	Changes to view points							• Mitigate visual impact through layout of project components and screening where possible.
Heritage	Potential for disturbance of archaeological sites within the project footprint	x			x			• Field study to determine the precise location of previously recorded sites and to identify any unrecorded sites that may be present in the project footprint. • Consultation with First Nations to determine methods for extracting maximum archeological value from any sites identified during field work, and ensuring appropriate documentation and storage of any artifacts.
Health	Potential effects on human health.	X	X	X	X	X	X	• Safe work and occupational health plans and associated training during all Project phases. • Public access controls on the project site to minimize public safety risks. • Controlling and mitigating noise experienced from the Project by residents of Port Edward. • Provision of health services for workers during the construction phase, both in terms of emergency response and general health services. • Control technologies for reducing emissions and discharges. • Ongoing monitoring of emissions and discharges. • Controlling any disruption to areas used for the harvest of country foods or traditional medicines.

5.8 Potential Changes to the Environment That Would Occur on Transboundary Lands

CEAA Guide 5.3

CEAA Regs 18.0

There are no potential changes to the environment expected that would occur in a province other than BC or outside of Canada.

5.9 Potential Effects on Aboriginal Peoples from Changes to the Environment

CEAA Guide 5.4

CEAA Regs 19.0

Section 6 provides a general description of the use of area around the Project site by First Nations for traditional activity and harvest. These activities include collection and use of land and marine resources for food, medicinal and ceremonial use.

Public access to Ridley Island is restricted by security gates and so existing land based activities by Aboriginal people on Ridley Island are limited. Therefore effects to Aboriginal land-based activities from changes in land use at the Facility are not expected. The proposed camp locations are adjacent to Highway 16 and/or the Ridley Island connector road, and in proximity to disturbed areas and existing industrial sites on Ridley Island and Watson Island. Marine harvest occurs in the area from Ridley Island out to Brown Passage, and shoreline harvest is also reported along the shorelines of this area.

Changes to the environment that may affect the traditional activities of Aboriginal people may include biophysical changes to marine and terrestrial resources. Marine resources may be affected due to altered marine habitat, dredging and dredge disposal. Vegetation resources may be affected due to deposition of contaminants from emissions, and this has the potential to affect mammals harvested as food. By 2018, it is forecasted the number of vessel calls at the Port of Prince Rupert will increase to 1,357 per year. Project related LNG carriers will increase this by another 14% to 21%, which may have a negative effect on traditional fishing activities around Ridley Island. Traditional activities may also be affected by reduced availability of lands used for hunting, trapping and gathering as a result of camp development. Aboriginal people involved in commercial fishing may also be affected by any decreased commercial fishing yield caused by biophysical changes to marine resources. The EIS will assess mitigation measures to reduce potential effects on Aboriginal peoples and evaluate any residual or cumulative effects.

An AOA has been used to compile records of archaeological sites within an area including all of Ridley Island and the southern part of Kaien Island as far as Highway 16. The AOA identified 46 previously recorded archaeological, cultural or heritage sites within 250 m of the area. The majority of these sites were CMTs, with other sites containing lithics, shell middens, a cabin, and one site of human remains. The sites recorded at or in close proximity to the development on Ridley Island are all CMT sites. The development on Ridley Island will require the clearance of tree stands including CMTs, as well as any other archaeological sites identified during site fieldwork. This clearance will be done after consultation with First Nations to determine methods for extracting maximum archaeological value from the sites, and ensuring appropriate documentation and storage of any artifacts.

The Project will provide employment, contracting and other economic opportunities to Aboriginal people. The socio-economic effects of these economic opportunities on Aboriginal communities will be assessed as part of the socio-economic effects assessment.

The EIS will examine effects on Aboriginal people from environmental changes, based on information to be gathered in Traditional Use Studies (TUS) that will be completed by First

Nations. These TUS will provide information about Aboriginal use of land and water, and will help determine potential site-specific effects. In relation to the specific rights and interests of Aboriginal peoples, the EIS will assess potential effects on:

- traditional fishing and marine harvest and access.
- harvest at traditional hunting, trapping and gathering grounds that may be affected by camp development or deposition of emissions.
- potential human health risks from consumption of country foods.
- sites of archaeological and cultural importance.

The EIS will also assess socio-economic and cumulative effects.

6. Engagement and Consultation with Aboriginal Groups

CEAA Guide 6.0

CEAA Guide 6.5

BCEAO Guide Land Use Setting

PRLNG has developed an Aboriginal and Public Engagement and Consultation (APEC) Plan that is aligned with BG Group Business Principles and Social Performance Standard. The BG Group Business Principles define how BG Group operates and expresses the core values and behaviours that govern all of its activities in all of its operations worldwide. Operating in accordance with the Business Principles is essential for sustainable performance and long-term value creation.

BG Group's Social Performance Standard commits PRLNG to follow an approach that recognizes and respects the rights of Indigenous People potentially affected by their activities. Therefore, a primary objective of the APEC Plan is to engage with community leaders and members of Aboriginal Groups with an interest in the Project.

The Aboriginal component of the APEC Plan focuses on working with Aboriginal Groups to:

- build constructive long-term relationships that facilitate meaningful dialogue and enable responses to issues, concerns and recommended mitigation measures in a timely manner.
- gather information to determine the effects of the project on aboriginal rights and activities.
- identify issues and concerns that are related to the effects of the project on the rights and interests of aboriginal groups.
- record issues and concerns raised, identify mitigation measures where appropriate and communicate how PRLNG will respond and address those issues.
- encourage aboriginal participation in project planning.
- promote sustainable local and regional opportunities and benefits, and in particular training, employment or contracting.
- provide appropriate capacity funding to facilitate meaningful participation in the engagement and consultation process.
- fulfill all federal and provincial regulatory requirements.

The main elements for active engagement and consultation with Aboriginal Groups will include:

- negotiating protocols and agreements for community benefits and participation in the Project.
- conducting community meetings, open houses and workshops to discuss specific issues of concern.
- regularly scheduled project updates, conference calls and meetings with First Nation administrative staff, consultants, Elders and other members of Aboriginal Groups.
- facilitating opportunities to participate in collecting baseline information, as well as review and input into the information.
- funding and support of the TUS.

- review of the EIS Terms of Reference and scope of environmental and socio-economic studies.

6.1 Potentially Affected and Interested Aboriginal Groups

CEAA Guide 6.1

PRLNG has identified Aboriginal Groups that that may have an interest in the Project and their key contacts (Table 6.1). Although PRLNG believes that they have identified the local Aboriginal Groups that have an interest in the Project, this list is not exhaustive.

Table 6.1. Aboriginal Contact Information

Aboriginal Group	Location	Contact
Lax Kw'alaams First Nation	The Lax Kw'alaams community's main reserve is located at Port Simpson, on the Tsimshian Peninsula. It is located in the Lax Kw'alaams 1 Indian reserve.	Wayne Drury, General Manager **Address**: 206 Shashaak Street, Lax Kw'alaams, BC V0V 1H0 **Ph**: (250) 625-3293 **Fax**: (250) 625-3246 **E-mail**: waynedrury48@hotmail.com
Metlakatla First Nation	The Metlakatla community and main reserve is located on Prospect Hill, within the S1/2 Tsimpsean 2 Indian Reserve, on the west coast of the Tsimshian Peninsula, the north end of Digby Island, and on the east shore of Chatman Sound.	Ryan Leighton, Director of Operations **Address**: PO Box 224, Prince Rupert, BC V8J 3P6 **Ph**: (250) 622 8067 **Fax**: (250) 628 9205 **E-mail**: northland@citytel.net
Gitxaala Nation	The Gitxaala's main reserve is located at Kitkatla, on Dolphin Island, a small island adjacent to Porcher Island off the coast of northern BC.	Mark Ignas, Manager Albert J. Hudec, Farris LLP **Address**: 2500 – 700 West Georgia Street, Vancouver, BC V7Y 1B3 **Ph**: (604) 661-9356 **Fax**: (604) 661-9349 **E-mail**: ahudec@farris.com
Kitselas Indian Band	Kitselas Band's main reserve (Kitselas Indian Reserve No. 1) is located at a constriction of the Skeena River slightly upriver from the confluence of Kleanza Creek.	Chief Judy Gerow **Address**: 2225 Gitaus Road, Terrace, BC V8G 0A9 **Ph**: (250) 635-8882 **Fax**: (250) 635-5335 **E-mail**: jgerow@kitselas.com
Kitsumkalum Band	The Kitsumkalum's main reserve is located just west of Terrace, where the Kitsumkalum River and Skeena River meet.	Chief Donald T. Roberts **Address**: PO Box 544, Terrace, BC V8J 4B5 **Ph**: (250) 635-6177 **Fax**: (250) 635-4622 **E-mail**: droberts@kitsumkalum.bc.ca
Council of the Haida Nation	The Haida Nation consists of two member bands: Old Masset Village Council or Haida Village, located 5 km NW of Masset; and Skidegate Mission, located on the SE corner of Graham Island on Haida Gwaii.	Secretariat of the Haida Nation **Address**: 504 Naanii Street Old Massett, PO Box 589 Masset, Haida Gwaii, BC V0T 1M0 **Ph**: (250) 626-5252 **Fax**: (250) 626-3404 **E-mail**: chn_hts@haidanation.ca

6.2 Aboriginal Traditional Use of Lands and Resources

6.2.1 Introduction

CEAA Guide 6.4

CEAA Regs 19.0

This section provides a high-level overview of traditional use in the project area from First Nations who have used the area, and is based on currently available information. Sources of published historical and traditional use information include the following:

- BC Hydro Northwest Transmission Line Environmental Assessment
- Pacific Trails Pipeline Environmental Assessment
- Naikun Wind Project Environmental Assessment
- Tsimsian peoples: Southern Tsimshian, Coast Tsimshian, Nishga and Gitksan by Dr. Marjorie Halpin and Dr. Margaret Seguin

PRLNG is committed to work with First Nations to gather more detailed traditional use information to inform project planning.

6.2.2 Tsimshian Traditional Use

The Tsimshian live along the Nass and Skeena rivers on the inlets and islands between their estuaries. Traditionally, most Tsimshian group used a single permanent winter village and would move in the spring to temporary fishing villages on the lower Nass and in the summer to fishing camps on other rivers (Halpin & Seguin, 1990).

The Southern Tsimshian, which includes the Gitxalaa, occupied the islands and the coastline south of the mouth of the Skeena River (Arrowstone Archaeological Research and Consulting Ltd., 2009). The Coast Tsimshian, which includes Lax Kw'alaams and Metlakatla, had winter villages on the lower Skeena River below its canyon (Halpin & Seguin, 1990). Permanent villages, mainly inhabited in the winter, were located in the Prince Rupert harbour area (Rescan Environmental Services Ltd., 2009), where there is evidence of 5,000 years of occupation (Halpin & Seguin, 1990). In 1831, the Hudson's Bay Company established a post at Fort Simpson, north of Prince Rupert, and the Coast Tsimshian moved their winter villages to remain close to the Fort while retaining access to traditional food supplies (Westland Resource Group Inc., 2007).

Between February and April, the primary harvesting activity was eulachon fishing on the Nass River. Fish were either dried or processed into an oil or grease, and the Tsimshian monopoly on the grease trade was particularly valuable (Halpin & Seguin, 1990).
In early summer, people moved to traditional fishing sites as salmon began to enter the rivers. Camps would support harvesting of salmon, halibut and herring spawn, as well as supplies for basket and artifact weaving, and seaweed for drying. Also during summer, women harvested berries, beginning with salmonberries and continuing with wild crabapples and high bush cranberries (Halpin & Seguin, 1990).

In fall, chum salmon were caught and hunting activities would begin (Halpin & Seguin, 1990). Hunted and trapped species included bear, beaver, deer, elk, fox, lynx, marmots, marten, mink, moose, mountain goats, otter, porcupines, raccoons, sea lions, seals, sheep, squirrel, waterfowl, weasel, and wolf (Rescan Environmental Services Ltd., 2009).

During the winter, hunting was sporadic and the Tsimshian would weave and carve, take part in ceremonial events, gamble, and listen to storytelling from elders (Rescan Environmental Services Ltd., 2009). Shellfish were gathered primarily during the winter (except abalone) and were important to the Tsimshian diet, including cockles, clams, and mussels (Halpin & Seguin, 1990).

Harvesting, managing, processing, consuming and trading fish and seafood was and remains an important part of Tsimshian life and culture (Rescan Environmental Services Ltd., 2009). However, in some instances, current hunting and trapping patterns differ from historical patterns due to limits implemented by the provincial government on hunting and trapping activities (Rescan Environmental Services Ltd., 2009).

6.2.3 Haida Traditional Use

The territory of the Haida Nation includes all of Haida Gwaii, the surrounding waters (Dixon Entrance and half of the Hecate Strait), sub-surface and the air space and the Kaigani Archipelago (Integrated Land Management Bureau, 2003). Haida Gwaii, or “Islands of the People,” (Council of the Haida Nation, 2011) consists of two main islands, with Graham Island north of Moresby Island in the south, and approximately 150 smaller islands.

The archaeological record in the Haida territory dates back over 10,500 years (Council of the Haida Nation, 2011). Between the early and late 1800s, much of the Haida Nation relocated from ancestral villages scattered throughout the islands to population centres at Skidegate and Old Massett, where they continue to exist today. Later, mining, logging, fishing and whaling encouraged further change. Salteries and crab and salmon canneries emerged in the late 1800s and many of the Haida found employment as fishermen and cannery workers. While fisheries have declined in importance, the Haida economy still largely relies on natural resources (Council of the Haida Nation, 2011).

The Haida maintain a connection to their land base and their traditional activities follow seasonal patterns. Marine resources were harvested throughout the year and included most intertidal shellfish, groundfish, herring roe-on-kelp, shrimp, prawn and Dungeness crab. In the spring, the Haida would traditionally move to outlying areas to harvest salmon, halibut, shellfish, seaweed and seagull eggs. In the summer, the harvest would focus on pink and coho salmon, snapper, lingcod, shrimp, prawns, urchins, chitons, sea cucumbers, Dungeness crab and octopus. In the fall, hunting would occur and the harvest of marine species included coho and chum salmon, trout, Dolly Varden char and steelhead. In the winter, the Haida would either return to the main villages or set up winter camps for trapping. Seal hunting became more prominent in the winter, with the harvest of groundfish and shellfish occurring during shorter trips from the villages (Council of the Haida Nation, 2011).

The Haida continue to live off the land, with fishing and gathering concentrated around Old Masset Village and Skidegate, but occurring throughout Haida Gwaii (Council of the Haida Nation, 2011).

6.3 Overview of Aboriginal Engagement or Consultation Activities to Date

CEAA Guide 6.2
CEAA Regs 3.0
BCEAO Guide Consultation Activities

BG Canada initiated engagement with Aboriginal Groups in the Prince Rupert area on behalf of PRLNG and the Project in October 2011 during the preliminary feasibility stage of the Project. Engagement with other First Nations was initiated in mid-2012 once the Project had moved

beyond the early preliminary feasibility stage. Engagement has included meetings with Aboriginal community leaders, participation and presentations at community meetings, telephone conversations, and written correspondence. Consultations were also held with staff representative of Coastal First Nations Great Bear Initiative. An overview of engagement with Aboriginal Groups from the start of the Project in 2011 until January 2013 is provided (Table 6.2).

It should be noted that the record of engagement includes meetings held in 2011 and 2012 with the leadership of Lax Kw'alaams and Metlakatla First Nations, who at that time had chosen to engage with the PRLNG jointly. During later discussions in March 2012 and by correspondence, the representatives and leadership of Lax Kw'alaams and Metlakatla conveyed their mutual decision to continue further discussions with PRLNG independently of one another. Subsequent records of engagement reflect independent discussions between BG Canada (on behalf of PRLNG and the Project) and Lax Kw'alaams and Metlakatla.

Table 6.2. Aboriginal Engagement Records

Date	Activity
Lax Kw'alaams and Metlakatla	
October 2011	Introductory meeting between BG Canada and Coast Tsimshian.
November 2011	Follow-up introductory meeting and correspondence to introduce and outline feasibility phase of the Project.
December 2011	Follow-up correspondence regarding the establishment of a communication process between BG Canada and Coast Tsimshian.
January-February 2012	Further discussions regarding engagement process between BG Canada and Coast Tsimshian.
March 2012	Update discussions regarding feasibility phase of the Project.
Lax Kw'alaams	
March 2012 – April 2012	Discussions and correspondence regarding potential Framework Agreement for engagement.
May 2012	Discussions regarding potential business opportunities related to the project and interests of Lax Kw'alaams.
June 2012	Continued discussions and correspondence regarding status of project, participation of Lax Kw'alaams in feasibility environmental field studies, and potential business and contracting opportunities.
July 2012	Discussions regarding participation of Lax Kw'alaams in environmental feasibility field studies.
August 2012	Discussions regarding feasibility work of the project – including preliminary archaeological work – and Lax Kw'alaams participation in that work; continued discussions regarding relationship issues.
September 2012	Discussions regarding engagement processes including capacity, and broad discussion on environmental issues including TUS.
October 2012	Updates regarding feasibility work, particularly planned archaeological studies and proposed TUS.
November 2012 – December 2012	Meetings and correspondence regarding engagement process and capacity requirements.
Metlakatla	
April – May 2012	Correspondence and meeting to provide update on the Project.

Date	Activity
June 2012	Detailed discussions regarding Metlakatla participation in feasibility environmental field studies.
July 2012 – August 2012	Discussions regarding feasibility work of the Project – including preliminary archaeological work – and Metlakatla participation in that work.
September 2012	Coordination of Metlakatla participation in environmental feasibility studies.
October 2012	Discussions regarding engagement process including capacity requirements and Metlakatla's interests in the project; broad discussion on environmental issues including TUS and planned archaeological studies.
November 2012	Presentation to Metlakatla Development Corporation and discussion of project opportunities.
December 2012	Discussions and coordination of Metlakatla participation in environmental feasibility studies.
January 2013	Discussions regarding TUS.
Gitxaala	
January 2012	Initial meeting to introduce BG Canada and the Project.
February 2012	Correspondence and discussions regarding engagement during feasibility phase of the Project.
June 2012	Meeting to provide update status of the Project.
August 2012 – October 2012	Correspondence providing update information on Project including archaeological work planned during feasibility phase and potential TUS.
January 2013	Correspondence to establish next steps in engagement process.
Kitselas	
August 2012	Correspondence to introduce BG Canada and Project to Kitselas and to provide information on archaeological work planned during feasibility phase.
November 2012 – December 2012	Correspondence to meet to discuss next steps in engagement process.
Kitsumkalum	
August 2012	Correspondence to introduce BG Canada and the Project to Kitsumkalum and to provide information on archaeological work planned during feasibility phase.
October 2012	Introductory meeting with Kitsumkalum.
November 2012	Discussions regarding archaeological feasibility field work and environmental studies.
Coastal First Nations Great Bear Initiative	
December 2011	Introductory meeting to discuss the Project and particular interests around shipping and energy.
May 2012	Update discussions on the Project.
June 2012	Meeting to discuss project update and interests on marine issues and shipping.
September 2012	Discussions regarding shipping and potential impacts from proposed LNG projects on the coast.
October 2012 – December 2012	Correspondence regarding interest in shipping and marine issues.
January 2013	Presentation on shipping and marine issues.

6.4 Key Comments and Concerns by Aboriginal Groups

CEAA Guide 6.3
CEAA Regs 3.0
BCEAO Guide Consultation Activities

PRLNG has maintained records from engagement with Aboriginal Groups in order to track the interests, issues, and concerns that have been raised to date regarding the Project. Table 6.3 summarizes the issues that have been heard to date during the engagement process. The

"response" column describes actions that PRLNG is proposing to take as a result of the feedback received. This list will likely evolve and change over time as discussions with First Nations and Aboriginal Groups continue over the life of the Project.

Table 6.3. Key Comments and Concerns by Aboriginal Groups

Issue	Actions Taken and Proposed
Requirement for habitat compensation if there were any effects on marine habitat.	Habitat compensation is an important and standard part of regulatory approvals. BG Group has a biodiversity policy that includes provision for habitat compensation, and this policy will be applied if any effects are expected to occur. Studies are being undertaken to assess the potential effects on marine habitat. PRLNG will work with First Nations to develop appropriate measures.
Development of marine infrastructure from Canpotex and PRLNG will affect the ability of small craft to navigate along the near shore around Ridley Island, making transit difficult, particularly in bad weather.	PRLNG will consult with First Nations, other developers at the Port, the PRPA and the Port Edward Harbour Authority to identify strategies to provide safe and effective navigation for small craft.
Importance of marine environment for First Nations on the coast.	PRLNG has Environmental Standards that require company operations to control and mitigate where possible effects to the marine environment. PRLNG is undertaking robust studies into marine mammals and fish and will work with First Nations to develop appropriate design and mitigation measures.
Importance of employment opportunities from the Project.	PRLNG will develop an employment and training strategy to maximize opportunities for local people and businesses, including those from First Nation communities. The development of this strategy will include consultation with First Nations and stakeholders.
Effect on salmon migration along the shoreline as a result of the development of marine infrastructure.	As part of the design of infrastructure in the marine environment and along the near shore and foreshore, PRLNG will review potential alternatives to control effects on salmon migration. Environmental studies and discussions with First Nations will help determine any potential effect on salmon migration.
The area offshore of Ridley Island is a ceremonial fishing area.	PRLNG will work with First Nations to understand traditional use of the water around Ridley Island, and will use this understanding to inform design and mitigation planning.
Potential effects on shellfish, salmon and oolichan from disposal at sea of dredge material.	PRLNG will undertake siting studies to identify the most appropriate option for dredge disposal and will work with First Nations and local communities to develop appropriate measures. A dredge disposal site has not been selected.
Effects of development on wildlife populations on Ridley Island. Identified presence of species including deer, wolf, frogs and toads on Ridley Island.	The Project, as well as other existing or proposed projects on Ridley Island, will have an impact on wildlife populations on Ridley Island. PRLNG had been made aware of the presence of species of frogs and toads through earlier EA work on Ridley Island and wildlife surveys are part of the field work that has been conducted to date. PRLNG will work with First Nations to identify viable mitigation measures.
Overlap in proposed construction periods between PRLNG and Canpotex. This may create implications for labour requirements and cumulative noise effects.	There is potentially some overlap between the construction periods of the two projects on Ridley Island. PRLNG's employment and training strategy for the Project will be based on an understanding of the other demands for labour within the region and beyond. If required, mitigation measures for managing noise effects will be designed with recognition of other noise sources from current and reasonably foreseeable activities within the local area.
Effects of anchorage on drift fisheries, and effect of light from anchored vessels on people using nearby islands to camp.	Anchorage of LNG carriers would not ordinarily occur. PRLNG will consult with the community of Port Edward and First Nations develop to mitigation measures that are appropriate and practicable to control lighting effects.
Issues arising from proximity of proposed Canpotex project and the Project.	PRLNG is aware of other proposed projects in proximity of the Project. PRLNG's Site design and management planning includes recognition of other projects that may be undertaken in the local area. Design and management plans will be based on a solid understanding of local projects, developed through discussion with First Nations, local communities, PRPA and individual proponents.

6.5 Proposed Aboriginal Engagement and Consultation

CEAA Guide 6.5

The Aboriginal component of the APEC Plan is founded on BG Group's commitments to their corporate global Business Practices and Social Performance Standard. Key activities for Aboriginal engagement and consultation that are anticipated going forward include:

- discussions regarding capacity requirements to participate in a review of the project and to begin discussions regarding potential impacts and benefits.
- continued discussions with First Nations and identification of issues to inform project development and EIS Terms of Reference.
- planning and implementation of TUS.
- participation in field studies and review of planned work.
- discussions about project benefits and opportunities for first nations.
- technical meetings on specific areas of interest – these may include issues such as shipping, marine use, dredging, employment and training, and business opportunities.

Throughout the engagement process, PRLNG will maintain a list of issues and areas of interest raised by First Nations and other Aboriginal Groups and will also ensure that a tracking mechanism is maintained to ensure appropriate follow-up for each issue and area of interest. Communication protocols and procedures will also be developed and implemented in collaboration with communities to ensure that Project information is provided in a timely and effective manner. PRLNG will work with First Nations and other Aboriginal Groups to identify capacity requirements to ensure meaningful participation in the Project.

7. Consultation with the Public and Other Parties

CEAA Guide 7.1
CEAA Regs 3.0
BCEAO Guide Consultation Activities

7.1 Stakeholders and Related Consultation Activities

The BG Group Business Principles and Social Performance Standard commit all BG Group operations to consult with identified interested and affected stakeholders throughout the life of their presence in a particular location. Consultation is to be transparent, inclusive, culturally appropriate and publicly defensible, with the intention of developing broad community support for BG Group's presence (BG Group, 2013a).

Stakeholders are defined by BG Group as interested and affected parties (organization/s, governmental entity/entities or individual/s), who have either real or perceived stakes (both financial and non-financial) in the Project. Stakeholders include those who are affected by the Project as well as those who can affect the Project (BG Group, 2013a).

Stakeholders involved to date in the Project include those with a direct interest in the Project and those who have been consulted for advice and information related to social, environmental and regulatory context of the Project. A preliminary list of Stakeholders has been developed (Table 7.1). The first column lists the name of the stakeholder, and the second column indicates whether the stakeholder has been contacted regarding the Project.

This list of stakeholders, their interests and the issues they may raise related to the Project is expected to evolve as the Project develops over time. PRLNG will continue to actively identify stakeholders and engage with them to understand their interests and issues.

Table 7.1. List of Stakeholders

Stakeholder	Consulted
Federal Government	
Aboriginal Affairs and Northern Development Canada (AANDC)	Yes
Canadian Environmental Assessment Agency (CEA Agency)	Yes
Environment Canada (EC)	Yes
Fisheries and Oceans Canada (DFO)	Yes
Health Canada (HC)	No
Major Projects Management Office	Yes
Natural Resources Canada (NRCan)	Yes
Transport Canada	Yes
PRPA	Yes
Provincial Government	
BC Ministry of Aboriginal Relations and Reconciliation (BC MARR)	Yes
BC Ministry of Energy, Mines and Natural Gas and Responsible for Housing (BC MEMNG)	Yes
BC Ministry of Environment (BC MOE)	Yes
BC Ministry of Forests, Lands and Natural Resource Operations (BC MFLNRO)	No
BC Ministry of Jobs, Tourism and Innovation (BC MJTI)	Yes

Stakeholder	Consulted
BC Ministry of Transportation and Infrastructure (BC MOTI)	No
British Columbia Environmental Assessment Office (BCEAO)	Yes
BC Oil and Gas Commission	Yes
Northern Health Authority	No
MLA North Coast	Yes
NDP Minister, Energy Critic	Yes
Local Government	
City of Prince Rupert (Mayor and Council)	Yes
City of Prince Rupert staff (planning public works, recreation and community services)	Yes
DFO Marine Communications and Traffic Services in Seal Cove	Yes
District of Port Edward (Mayor and Council)	Yes
Royal Canadian Mounted Police (RCMP)	No
School District 52	Yes
Skeena Queen Charlottes Regional District	Yes
Landowners and Land / Resource Users	
Prince Rupert Port Authority	Yes
Rikki Dickens (Trapline holder)	No
Other Stakeholder	
Local residents	Yes
Northern Health	Yes
Chatham Sound Charter Boat Association	No
Community Futures of Pacific Northwest	Yes
Hecate Strait Employment Development Society	Yes
North Coast Forest District	No
Northwest Community College	No
Port Edward Harbour Authority	Yes
Prince Rupert & Port Edward Economic Development Corporation	Yes
Prince Rupert Chamber of Commerce	Yes
School District	Yes
T Buck Suzuki	Yes
Tourism operators (various)	No
Tourism Prince Rupert	Yes
United Fisherman and Allied Workers Union	Yes

CEAA Guide 7.1
CEAA Regs 3.0
BCEAO Guide Consultation Activities

7.1.1 Overview of Stakeholder Consultation Activities to Date

Stakeholder and community engagement started in August of 2011 and is ongoing. Consultation records are provided through to the end of January 2013 (Table 7.2).

Table 7.2. Stakeholder Consultation Records

Date	Event	Description
Federal Government		
12/13/2011	Meeting with Kristine Burr (Assistant Deputy Minister TC)	Introduction to BG Group and Project. Federal transportation issues relevant to the Project.
01/17/2012	Meeting with Mike Henderson (TC)	Introduction to Project. Explore transportation issues and policy related to the Project.
05/31/2012	Meeting with Joy Hillier (DFO), Ian Bergsma (DFO), and Darren Chow (DFO)	Discuss marine issue areas to be surveyed, potential dredgate disposal areas and potential compensation areas.
06/14/2012	Meeting with Chris Barlow and Lisa Poier (CEA Agency)	Introduction to BG Group and Project.
08/29/2012	Meeting with Andrew Mayer (PRPA), Lorne Keller (PRPA), Katherine Beavis, (TC), Mike Henderson (TC), and Lori Young (TC)	Discussion of previous Port processes and the TERMPOL process.
09/11/2012	Meeting with Art Statham (DFO Marine Communications and Traffic Services in Seal Cove)	Initial meeting with DFO Marine Communications and Traffic Services in Seal Cove to discuss issues that should be considered as part of socio-economic research, and specifically to check data availability for ship movements.
09/13/2012	Meeting with Jim Clarke, Stefan Skocylas, Marco Presutti (MPMO)	Discuss the role of the MPMO and introduce the Project.
09/14/2012	Meeting with Director General Sylvain Ouellet (CEA Agency)	To discuss the CEAA 2012 changes with the CEA Agency.
09/25/2012	Meeting with Jack Smith (CEA Agency), Lisa Poier (CEA Agency) and David Riddell (BCEAO)	Meeting to discuss the project description.
09/26/2012	Meeting with Stefan Skocylas (MPMO)	In person introduction of BG Group and the Project.
09/27/2012	Meeting with Vanessa Schneider (TC, Director, Stakeholder Relations and Strategic Planning) and Andre Hannoush (TC, Advisor, Marine Policy)	Briefing TC on the Project.
09/27/2012	Meeting with Tim Norris (Director of Policy for the Ministry of Natural Resources Canada)	Introduction of Project and associated pipeline. Discussion included training and safety.
09/27/2012	Meeting with John Duncan (Minister of Aboriginal Affairs and Northern Development) and Laura Smith (Policy and Regional Affairs Advisor - BC)	Briefed the Minister on the Project and associated pipeline.
11/8/2012	Meeting with Kristie Trainor (EC), Scott Lewis (EC), Garth Mullins (EC), Lisa Poier (CEA Agency) and Jack Smith (CEA Agency)	Meeting with EC to discuss issues of dredge disposal for the Project. Kristie Trainor (EC) also invited CEA Agency representatives on the basis that they have an interest in dredge disposal.
11/29/2012	Meeting Joe Oliver (Minister or Natural Resources) and LNG proponents, Colin Metcalfe (Regional Affairs), Rob Seely, (Shell), Garry Weilinger (Spectra), Sarah McCullough (Spectra), David Calvert (Apache/Kitimat LNG)	Meeting between LNG proponents and Federal Minister Joe Oliver. Minister Oliver suggested a general discussion on the new EA process and how “one project – one process” was going.
12/05/2012	Meeting with Peter Delaney (DFO)	Meeting with DFO to discuss issues of compensation and loss of habitat around Ridley Island.
12/11/2012	Meeting with Ian Chatwell (TC), Charles Hansen (TC) and Colin Parkinson (TC)	Meeting with TC to discuss the TERMPOL process, and the navigable waters approval process.
01/31/2013	Meeting with senior regulators in Ottawa, organized by MPMO	Meeting to introduce the Project and BG Group and areas of federal involvement.

Date	Event	Description
Provincial Government		
08/10/2011	Meeting with Steve Carr (Deputy Minister of Energy and Mines and Responsible Housing)	Introduction to Project and BG Group 's interest in BC.
01/20/2012	Meeting with Terry Lake (Minister of Environment)	Introduction to Project and BG Group. Discussion of environmental issues and provincial policy related to the Project.
01/31/2012	Meeting with Rich Coleman (Minister of Energy and Mines and Minister Responsible for Housing)	Introduction to Project and BG Group. Discussion of energy issues and policy related to the Project.
02/20/2012	Meeting with Mary Polak (Minister of Aboriginal Relations and Reconciliation) and Pat Bell (Minister of Jobs, Tourism and Innovation)	Introduction to Project and BG Group. Discussion of Aboriginal issues related to the Project.
06/14/2012	Meeting with John Horgan (NDP Minister, Energy Critic)	Introduce BG Group and Project.
07/04/2012	Meeting with Rachel Shaw (BCEAO)	Meeting to introduce BG Group and the Project.
08/17/2012	Meeting with Rachel Shaw (BCEAO)	Discuss the role of the BCEAO in the EA and Permitting process.
10/04/2012	Phone call discussion with Dan Baker (Area Manager, Roads/ Acting Operations Manager, Ministry of Transportation)	To discuss traffic data availability for use in the EA traffic assessment, such as traffic related issues along the Highway, such as accident rates and closures due to avalanche.
10/9/2012	Meeting with Derek Sturko (BCEAO), Archie Riddel (BCEAO), Michelle Carr (BCEAO), and John Mazure (BCEAO)	Meeting with BCEAO to discuss process for EA of the Project.
Local and Regional Government		
02/08/2012	Meeting with Dave MacDonald (Mayor of Port Edward)	Introduction of BG Group and Project to the Mayor of Port Edward.
06/13/2012	Meeting with Mayor Jack Mussallem (City of Prince Rupert), Councillor Judy Carlick-Pearson(City of Prince Rupert), Councillor Gina Garron (City of Prince Rupert), Councillor Jennifer Rice (City of Prince Rupert), Derek Baker (Economic Development Co-ordinator, City of Prince Rupert)	Provide more information on the Project and its current status.
08/24/2012	Telephone call with Polly Pereira (Deputy Director of Corporate Administrative Services, District of Port Edward)	Call discussing the public notices on the air and sound monitoring equipment to be deployed in Port Edward. The discussion was to receive approval of posting the notice at the municipal office in Port Edward. The call discussed community's concern with existing noise.
09/11/2012	Meeting with Ron Bedard (CAO, District of Port Edward)	Initial socio-economics research meeting with Port Edward District staff to scope potential socio-economic issues related to the Project.
09/11/2012	Meeting with Zeno Krekic (Prince Rupert City Planner), Gord Howie (Prince Rupert City Manager), Garin Gardiner (Prince Rupert Operations Manager, Public Works Department), Dan Rodin, (Prince Rupert Finance)	Initial meeting to discuss issues that should be considered as part of socio-economic research.
09/12/2012	Joan Merrick (Skeena Queen Charlottes Regional District)	Initial meeting with the Skeena Queen Charlottes Regional District, to discuss issues that should be considered as part of socio-economic research.
09/28/2012	Phone call with Richard Pucci, Bill Horne (Public Works, City of Prince Rupert)	To identify sources of traffic data that may be useful for traffic assessment.

Date	Event	Description
10/09/2012	Meeting with Joy Thorkelson (Prince Rupert Councillor and UFAWU member)	An introductory meeting to discuss the Project and identify and understand concerns and information needs.
10/10/12	Meeting with Ron Bedard (District of Port Edward)	Discussion on current engagement plan and organize upcoming events.
10/30/2012	Meeting with Zeno Krekic (Prince Rupert, City Planner)	To gather information on land use issues in Prince Rupert, and issues related to any camp infrastructure.
11/13/2012	BG Group Presentation to Prince Rupert Mayor and Council	Further discussion on the Project.
Prince Rupert Port Authority		
08/09/2011	Meeting with Prince Rupert Port Authority (PRPA), Shaun Stevenson (PRPA), Andrew Mayer (PRPA), Lorne Keller(PRPA), Mike Graham (PRPA), Gary Paulson (PRPA), Andy Cook (PRPA), Travis Bernhardt (PRPA)	Introductory consultants meeting and Site visit and survey of Ridley Island with the PRPA.
05/08/2012	Meeting with Prince Rupert Port Authority, Lorne Keller (PRPA), Mike Graham (PRPA), Gary Paulson (PRPA), Andy Cook (PRPA)	Technical meeting reporting the results of BG Group's early feasibility work on Ridley Island Site D to the PRPA.
05/14/2012	Teleconference with Lorne Keller (PRPA)	Conference call to discuss issues and logistics around AECOM's upcoming EA field studies for BG Group on Ridley Island and the surrounding local study area.
09/10/2012	Meeting with Lorne Keller (PRPA) and Andy Cook (PRPA)	To share expectations about archaeological work on Ridley Island, specifically about permitting and the availability of TUS / archaeological data.
12/18/2012	Meeting with Lorne Keller (PRPA), Gary Paulson (PRPA), and Zoher Meratla (CDS Research)	Meeting with the PRPA to discuss integrated Site development planning.
Port Edward Harbour Authority		
09/11/2012	Meeting with Rick Hill (Port Edward Harbour Authority)	Initial meeting with the Port Edward Port Harbour Authority, to discuss and scope potential issues that should be considered as part of socio-economic research.
10/10/2012	Meeting with Kerry Weick (Port Edward Harbour Authority), Rick Hill (Port Edward Harbour Authority)	An introductory meeting to discuss the Project and identify and understand concerns and information needs.
11/1/2012	Meeting with Dwayne Nielson (Port Edward Harbour Authority)	Informal discussion to gather any information on vessel movements around Ridley Island, as part of socio-economic research.
Other Individuals and Organizations		
08/31/2012	Thank you letters to various residents	Thank you letter to residents that have participated in 2012 season's sound monitoring program.
09/10/2012	Meeting with Prince Rupert Chamber of Commerce	Initial meeting with Prince Rupert Chamber of Commerce, to discuss issues that should be considered as part of socio-economic research.
09/12/2012	Meeting with Joy Thorkelson (Prince Rupert Councillor and Northern Representative, United Fishermen and Allied Workers Union)	Meeting to discuss issues that should be considered as part of socio-economic research.
09/12/2012	Meeting with Community Futures of Pacific Northwest & Prince Rupert & Port Edward Economic Development Corporation	Initial meeting with the Prince Rupert Economic Development Manager and Community Futures, to discuss issues that should be considered as part of socio-economic research.

Date	Event	Description
10/09/2012	Presentation to Prince Rupert Seniors Centre	Introduce Project to senior community and gain a better understanding of community concerns and issues. Presentation was to discuss upcoming Open House in Prince Rupert.
10/10/12	Presentation to Prince Rupert Chamber of Commerce Board	Meeting to introduce Project to board members. Meet the business community and understand concerns and information needs as well as “advertise” upcoming Prince Rupert Open House.
10/31/2012	Meeting with Cam McIntyre (School District Secretary-Treasurer)	Gather information on K to 12 education, including available resources, educational attainment and student enrollment projections, with purpose of helping to scope issues for socio-economic research.
10/31/2012	Meeting with Kathy Bedard (Executive Director, Hecate Strait Employment Development Society)	Gather information on issues and barriers to employment in Prince Rupert, as well as employment and training programs available, with purpose of helping to scope socio-economic work.
10/30/2012	Meeting with Rudy Kelly (Director of Recreation & Community Services)	Gather information on the capacity and quality of existing recreational infrastructure, as well as the availability of recreational programs, with purpose of helping to scope issues for socio-economic research.
11/01/2012	Meeting with Jane Wylde (Director of Care, Northern Health)	Gather information on health care provision and issues in Prince Rupert and the outlying areas, with purpose of helping to scope issues for socio-economic research.
01/21/2013	Email from the Prince Rupert Chamber of Commerce	Email to inform BG Group has been nominated for a Prince Rupert and District Chamber of Commerce Business Excellence Award. Email also extended an invitation to the Business Excellence Awards Gala held on February 23, 2013.
Public Communication		
09/30/2012	Newsletter – Prince Rupert and Port Edward.	Distributed to all residents of Port Edward and Prince Rupert.
11/19/2012	Open house – Port Edward	Open to all residents of Port Edward and Prince Rupert.
11/20/2012	Open house – Prince Rupert	Open to all residents of Port Edward and Prince Rupert.

7.1.2 Key Comments and Concerns by Stakeholders

CEAA Guide 7.2
CEAA Reg 3.0
BCEAO Guide Consultation Activities

Detailed records have been kept from the engagement undertaken with local government and the public. The following is a summary (Table 7.3) of the issues identified as a result of feedback received during engagement to date. The response column describes actions that PRLNG is proposing to take as a result of the feedback received.

Table 7.3. Key Comments and Concerns by Stakeholders

Issue	Response
Worker accommodation during the construction phase, and related opportunities for local businesses and possible effects to the local community, including provision of policing.	In order to control safety risks and disruption caused by the movement of workers, PRLNG is planning to use worker accommodation close to Ridley Island during the construction phase. PRLNG will develop a worker accommodation plan that satisfies the need to provide safe accommodation and transportation for workers, as well as seeking to generate opportunities for local businesses and benefits for the local economy. Additional policing is a consideration that will be addressed as part of this plan. The development of this plan will be done in consultation with First Nations, local communities, and stakeholders.
Visual, odour and noise effects to Port Edward during operations, and night time noise effects from construction.	PRLNG recognizes that noise is a significant concern. PRLNG is conducting noise monitoring studies in Port Edward and Ridley Island in order to better understand current sound level and create a basis for any Project-related mitigation. If noise effects are determined to occur from the Project, PRLNG will work with the District of Port Edward and residents to identify reasonable options to mitigate noise issues. There is no odour associated with the LNG liquefaction process.
Effects to Port Edward marina from noise, dust, perceived safety risk or odour.	PRLNG will consult with Port Edward Harbour Authority to understand concerns and develop mitigation measures that are appropriate and practicable. The actions described above for noise at Port Edward also apply for the Port Edward marina.
Development of marine infrastructure from Canpotex and PRLNG will affect the ability of small craft to navigate along the near shore around Ridley Island, making transit difficult, particularly in bad weather.	PRLNG will work with First Nations, other developers at the Port, the PRPA and the Port Edward Port Authority to identify strategies to provide safe and effective navigation for small craft. The effect on marine users in this area will be assessed as part of the EA.
Limited availability of skilled local labour, and community expectation that the Project should provide local employment and training opportunities, including those tailored for Aboriginal people.	PRLNG's goal is to employ qualified local residents first. The Project employment and training strategy will be developed in consultation with First Nations, government agencies, and local training and employment service providers. The strategy will recognize the future high demand for local skilled workers, and the need for partnerships to create training programs that meet the needs of local people.

7.2 Proposed Public Consultation

CEAA Guide 7.3

Public consultation will be undertaken in line with BG Group's Social Performance Standard.

The public consultation component of the APEC Plan is designed to achieve the following objectives:

- Identify the information requirements for supporting meaningful engagement and consultation with the public
- Identify those individuals and groups that should be engaged and consulted
- Provide Project information to the public in a timely manner to allow meaningful engagement and consultation
- Identify issues and concerns that are relevant to the design and EA of the Project
- Record issues and concerns raised and communicate how PRLNG is responding to or addressing those issues and concerns

The activities to be undertaken as part of this Plan include:

- opening a Community Outreach Office in Prince Rupert.
- distributing Project update newsletters on a periodic basis.
- launching a Project website that will provide Project information and updates.
- holding further Open Houses in Port Edward and Prince Rupert, publicized in local media and with direct invitations distributed.
- researching interviews with stakeholders to identify issues and collect socio-economic baseline information.
- meeting and holding workshops with stakeholders to discuss key topics of interest. Based on feedback gathered to date these key topic areas may include: employment and training, camp management, and marine traffic.
- participating in community events and conferences.

The Plan is supported by the following:

- Maintaining communication records, through meeting minutes and records of other communication. Communication records include information on: parties communicated with, date of communication, discussion points, issues identified, and commitments made
- Recording issues and concerns expressed by the public, and the response taken by PRLNG in relation to those issues and concerns
- Communications plans that identify opportunities and requirements for the sharing of Project information with the public
- Stakeholder identification based on identification of legal interests, users of marine and land resources, residents and tenure holders in proximity to the Site, and businesses and public service providers in local communities
- Maintaining a contacts database to allow direct communication to publicise opportunities such as Open Houses
- Ongoing discussions with regulatory agencies to help determine adequacy of consultation activities

7.3 Discussions with Other Jurisdictions

It is not anticipated at this time that there will be other jurisdictions with EA or regulatory requirements with respect to the Project that have not already been identified in previous sections.

CEAA Guide 7.4

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Appendix A

Table of Concordance

- **A.1. Project Description Table of Concordance with Federal "Guide to Preparing a Description of a Designated Project under the *Canadian Environmental Assessment Act, 2012*"**
- **A.2. Project Description Table of Concordance with Provincial "Guidelines For Preparing A Project Description For An Environmental Assessment In British Columbia"**

A.1. Project Description Table of Concordance with Federal "Guide to Preparing a Description of a Designated Project under the Canadian Environmental Assessment Act, 2012"

Appendix A.1.

Project Description Table of Concordance with Federal "Guide to Preparing a Description of a Designated Project under the Canadian Environmental Assessment Act, 2012"

	Required Information	Reference to the Project Description
1.0	**GENERAL INFORMATION AND CONTACT(S)**	**1.0**
1.1	Describe the nature of the designated project and proposed location.	1.1
1.2	Proponent contact information	1.2.1
1.2.1	Name of the designated project.	1.0
1.2.2	Name of the proponent.	1.2.1
1.2.3	Address of the proponent.	1.2.1
1.2.4	Chief Executive Officer or equivalent (include name, official title, email address and telephone number).	1.2.1
1.2.5	Principal contact person for purposes of the project description (include name, official title, email address and telephone number).	1.2.2
1.3	Provide a list of any jurisdictions and other parties including Aboriginal groups and the public that were consulted during the preparation of the project description.	1.3
1.4	Other relevant information: • Provide information on whether the designated project is subject to the environmental assessment and/or regulatory requirements of another jurisdiction(s).	1.4
	• Provide information on whether the designated project will be taking place in a region that has been the subject of a regional environmental study.	1.5
2.0	**PROJECT INFORMATION**	**2.0**
2.1	Provide a general description of the project including the context and objectives of the project.	2.1 and 2.2
2.2	Indicate the provisions in the Regulations Designating Physical Activities setting out the designated activities that describe the project in whole or in part.	1.4.1
2.3	Components and Activities	2.4 – 2.17
Provide a description of the components associated with the proposed project, including:		
2.3.1	Physical works associated with the designated project including their purpose, approximate dimensions, and capacity. Include existing structures or related activities that will form part of or are required to accommodate or support the designated project.	2.4
2.3.2	Anticipated size or production capacity of the designated project, with reference to thresholds set out in the Regulations Designating Physical Activities, including a description of the production processes to be used, the associated infrastructure, and any permanent or temporary structures.	1.4.1, 2.1, 2.4.2 , 2.6, and 2.7

	Required Information	Reference to the Project Description
2.3.3	If the designated project or one component of the designated project is an expansion, the percent of increase in size or capacity from the existing project (relative to the thresholds set out in the Regulations Designating Physical Activities).	N/A
2.3.4	A description of all activities to be performed in relation to the designated project.	2.4 to 2.17
2.4	Emissions, Discharges and Waste	2.4.4 and 2.16
Provide a description of any solid, liquid, gaseous or hazardous wastes likely to be generated during any phase of the designated project and of plans to manage those wastes, including the following:		
2.4.1	Sources of atmospheric contaminant emissions during the designated project phases (focusing on criteria air contaminants and greenhouse gases, or other non-criteria contaminants that are of potential concern) and location of emissions.	2.4.4 and 2.16.1
2.4.2	Sources and location of liquid discharges.	2.4.4 and 2.16.3
2.4.3	Types of wastes and plans for their disposal (e.g.: landfill, licenced waste management facility, marine waters, or tailings containment facility).	2.4.4 and 2.16.4
2.5	Construction, Operation, and Decommissioning and Abandonment Phases and Scheduling.	2.4.1, 2.4.2 and 2.18
Provide a description of the timeframe in which the development is to occur and the key project phases, including the following:		
	Anticipated scheduling, duration and staging of key project phases, including preparation of the site, construction, operation, and decommissioning and abandonment.	2.4.1, 2.4.2 and 2.18
	Main activities in each phase of the designated project that are expected to be required to carry out the proposed development (e.g.: activities during site preparation or construction might include, but are not limited to, land clearing, excavating, grading, de-watering, directional drilling, dredging and disposal of dredged sediments, infilling, and installing structures).	2.4.2 and 2.5
3.0	**PROJECT LOCATION**	**3.0**
3.1	Provide a description of the designated project's location including:	
3.1.1	Coordinates (i.e.: longitude/latitude using international standard representation in degrees, minutes, seconds) for the centre of the facility or, for a linear project, provide the beginning and end points.	3.1
3.1.2	Site map/plan(s) depicting location of the designated project components and activities. The map/plan(s) should be at an appropriate scale to help determine the relative size of the proposed components and activities.	Figures 2.1 and 3.1
3.1.3	Map(s) at an appropriate scale showing the location of the designated project components and activities relative to existing features, including but not limited to:	
	• watercourses and waterbodies with names where they are known;	Figures 1.3 and 5.4
	• linear and other transportation components (e.g.: airports, ports, railways, roads, electrical power transmission lines and pipelines);	Figure 5.14
	• other features of existing or past land use (e.g.: archaeological sites, commercial development, houses, industrial facilities, residential areas and any waterborne structures);	Figures 1.2 and 1.3
	• location of Aboriginal groups, settlement land (under a land claim agreement) and, if available, traditional territory;	Figures 3.7 and 3.8
	• federal lands including, but not limited to National parks, National historic sites, and reserve lands;	Figures 3.2 and 3.8

	Required Information	Reference to the Project Description
	• nearby communities;	Figures 1.1, 1.2, 1.3
	• permanent, seasonal or temporary residences;	Figure 1.3
	• fisheries and fishing areas (i.e., Aboriginal, commercial and recreational);	Figure 5.14
	• environmentally sensitive areas (e.g., wetlands, and protected areas, including migratory bird sanctuary reserves, marine protected areas, National Wildlife areas, and priority ecosystems as defined by Environment Canada); and	Figure 3.4
	• provincial and international boundaries.	Figures 3.2 and 3.3
3.1.4	Photographs of work locations to the extent possible.	Appendix C
3.1.5	Legal description of land to be used for the designated project, including the title, deed or document and any authorization relating to a water lot.	3.2.2
3.1.6	Proximity of the designated project to:	
	• any permanent, seasonal or temporary residences;	3.1, Figure1.1
	• traditional territories, settlement land (under a land claim agreement) as well as lands and resources currently used for traditional purposes by Aboriginal peoples; and	3.2.7 and 3.2.8, Figures 3.7 and 3.8
	• any federal lands.	3.2.1 and 3.2.8, Figures 3.2 and 3.8
3.2	Land and Water Use	
	To the extent that is known at this time, describe the ownership and zoning of land and water that may be affected by the project, including the following:	3.2
3.2.1	• Zoning designations.	3.2.3
3.2.2	• Current land ownership, including sub-surface rights	3.2.1 and Figure 3.2
3.2.3	• Any applicable land use, water use (including ground water), resource management or conservation plans within and near the project site.	3.2
3.2.4	• For the proposed construction, decommission and abandonment of a marine terminal, state whether or not the lands are routinely, and have been historically, used as a marine terminal, or are designated for such use in a land use plan that has been the subject of public consultation.	Section 3.2.3
3.2.5	• If the project is to take place within the waters or lands administered by a Canada Port Authority under the *Canada Marine Act* and its regulations, describe applicable land status and zoning under the Port Land Use Plan.	3.2.6
3.2.6	• Describe whether the designated project is going to require access to, use or occupation of, or the exploration, development and production of lands and resources currently used for traditional purposes by Aboriginal peoples.	3.2.7 and 6.2
4.0	**FEDERAL INVOLVEMENT – FINANCIAL SUPPORT, LANDS, AND LEGISLATIVE REQUIREMENTS**	**4.0**
4.1	Describe if there is any proposed or anticipated federal financial support that federal authorities are, or may be, providing to the designated project.	4.1
4.2	Describe any federal lands that may be used for the purpose of carrying out the designated project. This is to include any information on any granting of interest in federal land (i.e.: easement, right of way, or transfer of ownership).	4.2

	Required Information	Reference to the Project Description
4.3	Detail any federal legislative or regulatory requirements that may be applicable, including a list of permits, licences or other authorizations that may be required to carry out the designated project.	4.3
	The information to be provided in this section is meant to be a brief assessment of the environmental interactions of the project. A detailed examination of the potential environmental effects of the project does not need to be included in the project description. Using existing knowledge and available information provide an overview of the following:	
5.1	A description of the physical and biological setting, including the physical and biological components in the area that may be adversely affected by the project (e.g.: air, fish, terrain, vegetation, water, wildlife, including migratory birds, and known habitat use).	5.1.1 Climate 5.1.2 Air Quality 5.1.3 Sound 5.1.4 Groundwater 5.1.5 Hydrology and Surface Water Quality 5.1.6 Fresh Water Fish and Fish Habitat 5.1.7 Marine Ecosystems 5.1.8 Terrestrial Ecosystems
5.2	A description of any changes that may be caused as a result of carrying out the designated project to:	
	a) fish and fish habitat	5.6.1
	b) aquatic species	5.6.2
	c) migratory birds	5.6.3
5.3	A description of any changes to the environment that may occur, as a result of carrying out the designated project, on federal lands, in a province other than the province in which the project is proposed to be carried out, or outside of Canada.	5.7 and 5.8
5.4	A description of the effects on Aboriginal peoples of any changes to the environment that may be caused as a result of carrying out the designated project, including effects on health and socio-economic conditions, physical and cultural heritage, the current use of lands and resources for traditional purposes, or any structure, site or thing that is of historical, archaeological, paleontological or architectural significance.	5.9
6.0	**PROPONENT ENGAGEMENT AND CONSULTATION WITH ABORIGINAL GROUPS**	
	Experience has shown that engagement by proponents with Aboriginal groups early in the planning and design phases of a proposed project can benefit all concerned. By learning about Aboriginal interests and concerns and identifying ways to avoid or mitigate potential impacts, proponents can build these considerations into their project design, reducing the potential for future project delays and increased costs. Provide the following information to the extent that it is available or applicable:	
6.1	A list of Aboriginal groups that may be interested in, or potentially affected by, the designated project, including contact information.	6.1
6.2	A description of the engagement or consultation activities carried out to date with Aboriginal groups.	6.3
	• names of Aboriginal groups engaged or consulted to date with regard to the project;	Table 6.2
	• date(s) each Aboriginal group was engaged or consulted; and,	Table 6.2
	• means of engagement or consultation (e.g., community meetings, mail or telephone).	Table 6.2

	Required Information	Reference to the Project Description
6.3	An overview of key comments and concerns expressed by Aboriginal groups identified or engaged to date, including any responses provided to these groups.	6.2
6.4	An overview of information on current use of lands and resources for traditional purposes by Aboriginal groups or peoples.	6.4
6.5	A consultation and information-gathering plan that outlines the ongoing and proposed Aboriginal engagement or consultation activities, the general schedule for these activities and the type of information to be collected (or, alternatively, an indication of why such engagement or consultation is not required).	6.5
	The proponent is encouraged to provide background information on Aboriginal groups' potential or established Aboriginal or treaty rights. The proponent is also encouraged to provide information on the impact area of the designated project and how it overlaps with uses by Aboriginal groups that have potential or established Aboriginal or treaty rights.	6.2
	This information will be used to facilitate the Agency's understanding of the scope of Aboriginal interests in relation to the designated project, including the potential for impacts on Aboriginal rights and issues of concern.	
7.0	**CONSULTATION WITH THE PUBLIC AND OTHER PARTIES**	**7**
	Provide the following information to the extent that it is available or applicable:	
7.1	A list of stakeholders that may be interested and potentially affected by the carrying out of the designated project. In addition, please describe consultation activities carried out to date with stakeholders.	7.1
	• name of stakeholder consulted	Table 7.2
	• date(s) stakeholder was consulted	Table 7.2
	• means of consultation (e.g., community meetings, mail or telephone)	Table 7.2
7.2	An overview of key comments and concerns expressed to date by stakeholders and any responses that have been provided.	7.1.2 and Table 7.3
7.3	An overview of any ongoing or proposed stakeholder consultation activities.	7.2
7.4	A description of any consultations that have occurred with other jurisdictions that have environmental assessment or regulatory decisions to make with respect to the project.	7.3
8.0	**EXECUTIVE SUMMARY**	
	Proponents are to include as part of the project description an executive summary that summarizes the information identified in Sections 1 to 7 of this Guide. Under CEAA 2012, the Agency is required to consult the public on a summary of the project description that has to be posted on the Agency's Internet site in both of Canada's official languages as required under the Official Languages Act. As a result, in order to be in a position to initiate the screening phase in a timely manner, the executive summary is to be prepared and submitted to the Agency in both English and French.	Summary

A.2. Project Description Table of Concordance with Provincial “Guidelines For Preparing A Project Description For An Environmental Assessment In British Columbia”

Appendix A.2.

Project Description Table of Concordance with Provincial "Guidelines for Preparing a Project Description for an Environmental Assessment in British Columbia"

	Required Information	Reference to the Project Description
PROPONENT INFORMATION		
	• The proponent's name and the representative managing the project.	1.2.1 and 1.2.2
	• Contact information, including a mailing address, phone and fax numbers, and email addresses.	1.2.1 and 1.2.2
	• Corporate information, including a website address, particulars of company incorporation, and partner's names (if applicable).	1.2
GENERAL BACKGROUND INFORMATION		
	• The type and size of the project with specific reference to the thresholds set out in the Reviewable Projects Regulation.	1.4.1
	• Project purpose and rationale.	2.2
	• Estimated capital cost.	2.3
	• Number of construction jobs (in person years) and operating jobs (actual number).	2.3
	• Location (latitude and longitude)	3.1
PROJECT OVERVIEW		
	• A brief description of the major onsite and offsite project components, including options if the final site selection are not yet available.	2.4 and 2.5
	• A conceptual site plan and map(s) at sufficient scale to allow for clear location of all major components of the project (proponents may wish to include photographs if these would be helpful to understanding the nature and location of the proposed project).	Figure 2.1
	• The project's duration, including decommissioning if appropriate.	2.18
	• The project's potential environmental, economic, social, heritage, and health effects (in general terms).	5.1, 5.2, 5.3, 5.4 and 5.5
LAND USE SETTING		
	• A general description of existing land use in the vicinity of the project site.	3.2
	• Whether the project and its components are situated on private or Crown land.	3.2 and Figure 3 2.
	• Information about First Nations interests where asserted claims to rights or title are known.	6.0
CONSULTATION ACTIVITIES		
	• A summary of consultation activities that have been carried out with First Nations, the public and local governments.	1.3, 6.3 and 7.1

	Required Information	Reference to the Project Description
PROPOSED DEVELOPMENT SCHEDULE		
	• A tentative schedule for submitting an application for an environmental assessment certificate and developing the project (should a certificate be issued).	Figure 2.4
REQUIRED PERMITS		
	• A list of required permits, if known.	4.3 and 4.4

Appendix B

Company Policies

- B.1. Social Performance Policy BG-Policy-07
- B.2. HSSE Policy BG-Policy-01d

B.1. Social Performance Policy
BG-Policy-07

B.2. HSSE Policy
BG-Policy-01

Appendix C

Photographic Series

Appendix C

Photographic Series of Project Area

Photograph C.1. Aerial View of Ridley Island

Photograph C.2. Aerial View of Area D, Ridley Island

Photograph C.3. Aerial View of Ridley Coal-Grain-Terminal and Columbia Cellulose

Photograph C.4. Aerial View of the Southern Tip of Ridley Island and Lieu Island

Photograph C.5. Viewpoint of Ridley Island from Lions Municipal Park (Port Edward)