British Columbia Environmental Assessment Office
and Canadian Environmental Assessment Agency

Kitimat Clean Ltd. Oil Refinery Project Description

March 2016

Submitted by

HATCH

Report

Project Description

H347026-0000-07-236-0011

2016-03-30	-0	Approved for Use	E.Gill	M. Windfield-Leske	M. Winfield-Leske
DATE	REV.	STATUS	PREPARED BY	CHECKED BY	APPROVED BY

Table of Contents

List of Tables

List of Figures

List of Appendices

Abbreviations	
AAQO	Ambient Air Quality Objective
ADU	Atmospheric Distillation Unit
AGO	Atmospheric Gas Oil
ARU	Amine Regeneration Unit
BAT	Best Available Technology
bbl	Barrel
BC	British Columbia
BCEAA	British Columbia Environmental Assessment Act
Bcf	Billion Cubic Feet
BC OGC	British Columbia Oil and Gas Commission
BFW	Boiler Feedwater
BGC	Biogeoclimatic
bpsd	Barrels per stream day
CAC	Criteria Air Contaminant
CDC	Conservation Data Centre
CEAA 2012	Canadian Environmental Assessment Act 2012
CEARIS	Canadian Environmental Assessment Registry Internet Site
CN	Canadian National Railway
CO	Carbon Monoxide
COS	Carbonyl Sulfide
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CWH	Coastal Western Hemclock
CWHvm1	Coastal Western Hemclock Submontane variant of the Very Wet Maritime subzone
CWHws1	Coastal Western Hemclock Submontane variant of the Very Wet Submaritime subzone
DAO	Deasphalted Oil
DFO	Fisheries and Oceans Canada
DL	District Lot
DWT	Deadweight Tonne
EA	Environmental Assessment

Abbreviations	
EAC	Environmental Assessment Certificate
EAO	Environmental Assessment Office
EC	Environment Canada
FSR	Forest Service Road
FT	Fischer-Tropsch
FWA	Framework Agreement
ha	Hectares
HP	High Pressure
H_2S	Hydrogen Sulphide
HVGO	Heavy Vacuum Gas Oil
KLNG	Kitimat Liquefied Natural Gas
KLRMP	Kalum Land and Resource Management Plan
km	Kilometre
Km^2	Square Kilometre
KPL	Kitimat Pipe Line
kV	Kilovolt
LDAR	Leak Detection and Repair Program
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
LVGO	Light Vacuum Gas Oil
m	Metre
m^3	Cubic Metre
Mft^3	Million Cubic Feet
mm	millimetre
MNBC	Métis Nation of British Columbia
MOE	Ministry of Environment
mtpa	Million tons per annum
MARR	Ministry of Aboriginal Relations and Reconciliation
MW	Megawatt

Abbreviations	
MFLNRO	Ministry of Forests, Land and Natural Resource Operations
MNGD	Ministry of Natural Gas Development
MOH	Ministry of Health
MOTI	Ministry of Transportation and Infrastructure
MPMO	Major Projects Management Office
NCLRMP	North Coast Land and Resource Management Plan
NEB	National Energy Board
NH_4	Ammonia
NO_2	Nitrogen Dioxide
NO_x	Nitrogen oxides
NRCan	Natural Resources Canada
O_3	Ozone
OCP	Official Community Plan
PAR	Pre-Assembled Rack
PAU	Pre-Assembled Unit
PD	Project Description
PJ	Petajoule
$PM_{2.5}$	Particulate Matter Less than 2.5 Microns in Diameter
PM_{10}	Particulate Matter Less than 10 Microns in Diameter
PNCIMA	Pacific North Coast Integrated Management Area
RDKS	Regional District of Kitimat-Stikine
ROW	Right of Way
SARA	Species at Risk Act
SDA	Solvent Deasphalting Unit
SFU	Sulphur Forming Unit
SMR	Steam Methane Reforming Unit
SO_2	Sulphur Dioxide
SOx	Sulphur oxides
SQCRD	Skeena-Queen Charlotte Regional District

Abbreviations	
SRU	Sulphur
SWS	Sour Water Stripping Unit
t	Tonne
TC	Transport Canada
TERMPOL	Technical Review Process of Marine Terminal System and Transshipment Sites
TGTU	Tail Gas Treatment Unit
TK/TLU	Traditional Knowledge / Traditional Land Use
tpa	Tonnes per Annum
USA	United States of America
VDU	Vacuum Distillation Unit
VGO	Vacuum Gas Oil
VLCC	Very Large Crude Carrier
VOC	Volatile Organic Compounds
VR	Vacuum Residue
WFSR	Wedeene Forestry Service Road

1. Introduction

This Project Description (PD) was prepared by Kitimat Clean Ltd. with the expert assistance of Hatch Ltd. to meet federal and provincial requirements. The submission of a Project Description begins the process of an environmental assessment (EA) to obtain approval for the Kitimat Clean Oil Refinery Project (the Project) located near Kitimat, British Columbia (BC). The PD, posted for public comment on the Canadian Environmental Assessment Registry internet site (CEARIS), is written using non-technical language to facilitate public comment. The PD was prepared following the BC Environmental Assessment Office (EAO) Guidelines for Preparing a Project Description for an Environmental Assessment in British Columbia (2008). The Guide to Preparing a Description of a Designated Project under the *Canadian Environmental Assessment Act, 2012* (Canadian Environmental Assessment Agency, 2012) was also followed pursuant to the Prescribed Information for the Description of a Designated Project Regulation (SOR/2012-148).

1.1 Project Overview

Kitimat Clean Ltd. ("Kitimat Clean" or "Proponent") is proposing to construct and operate an oil refinery and associated infrastructure in the Regional District of Kitimat-Stikine in northwest BC. The proposed Project consists of an oil refinery, rail spurs, tank farm, refined fuel delivery pipelines corridor, and a marine terminal for product export. The proposed Refinery Site covers an area of 1,000 ha and is situated about 13 kilometres (km) to the north of Kitimat, on mostly provincial crown land and intersects one parcel of private fee simple land at its' southern extent. The Refinery Site is located in the Coast Range 5 Land District and overlaps district lots (DLs) 6132, 6133, 6134, 6135, 6145, 6146, 6147, and 6148. The Fuel Delivery Pipelines Corridor intersects numerous parcels of municipal, private, and provincially owned land. The proposed Marine Terminal Site, situated only on provincial crown land is about 12 km south of Kitimat on the west side of the Douglas Channel in Kitimat Arm (Figure 1-1).

A third party will be responsible for transporting bitumen from Alberta to the receiving facility at the refinery using the existing CN rail mainline. The pure bitumen is relatively viscous in nature and will not easily flow from the rail cars unless it is heated. The refinery will feature the Fischer-Tropsch (FT) process, a state-of-the-art technology design that will process up to 400,000 barrels (bbl) (63,600 cubic metres (m^3) or 56,000 tonnes) per day of bitumen.

Bitumen will be processed into fuel products, including gasoline, diesel, some ultra-low sulphur diesel, and jet fuel. Added byproducts includes butane, propane and sulphur pellets. The processed fuels will be stored in tanks and then delivered to the marine terminal by three 23 km fuel delivery 18" pipelines, which cross numerous parcels of municipal, private, and provincially owned land. At the marine terminal, refined products will be loaded on Very Large Crude Carrier (VLCC) tankers approximately every four days for export. The refinery will

require the use of 660 million cubic feet (Mft^3) per day of natural gas. Natural gas (for hydrogen, heat and power generation) will be supplied via a third-party pipeline from northeastern BC. Normal refinery by-products like diluent, coke, asphalt, heavy residual oil and Bunker C will not be produced or shipped.

1.1.1 Need for, and Purpose of the Project

The primary purpose or objective of the Project is to refine bitumen into value-added fuels (gasoline, diesel, some ultra-low sulphur diesel, and jet fuel) for export to Asia to meet their demand for a stable supply of these fuels.

The need to develop a refinery project in Kitimat is driven by a number of fundamental economic and social considerations. Canada is a major producer and exporter of energy, including in the form of crude oil. The development of the oil sands in Alberta has depended on exports to markets in the United States that are now oversupplied with heavy crude oil from Canada, Venezuela and Mexico, resulting in reduced producer netback prices and lower provincial and federal royalty incomes. New markets are being explored by both governments and producers, with the most attractive markets being sales to the Pacific Rim and East Asian countries. Building domestic, value-added industries such as oil refining are considered nation-building projects, and will result in employment, economic and trade-building skill benefits. According to the Proponent's financial forecast, within 10 years of production this Project is expected to provide $1 billion per year in new taxes to regional, provincial and federal governments.

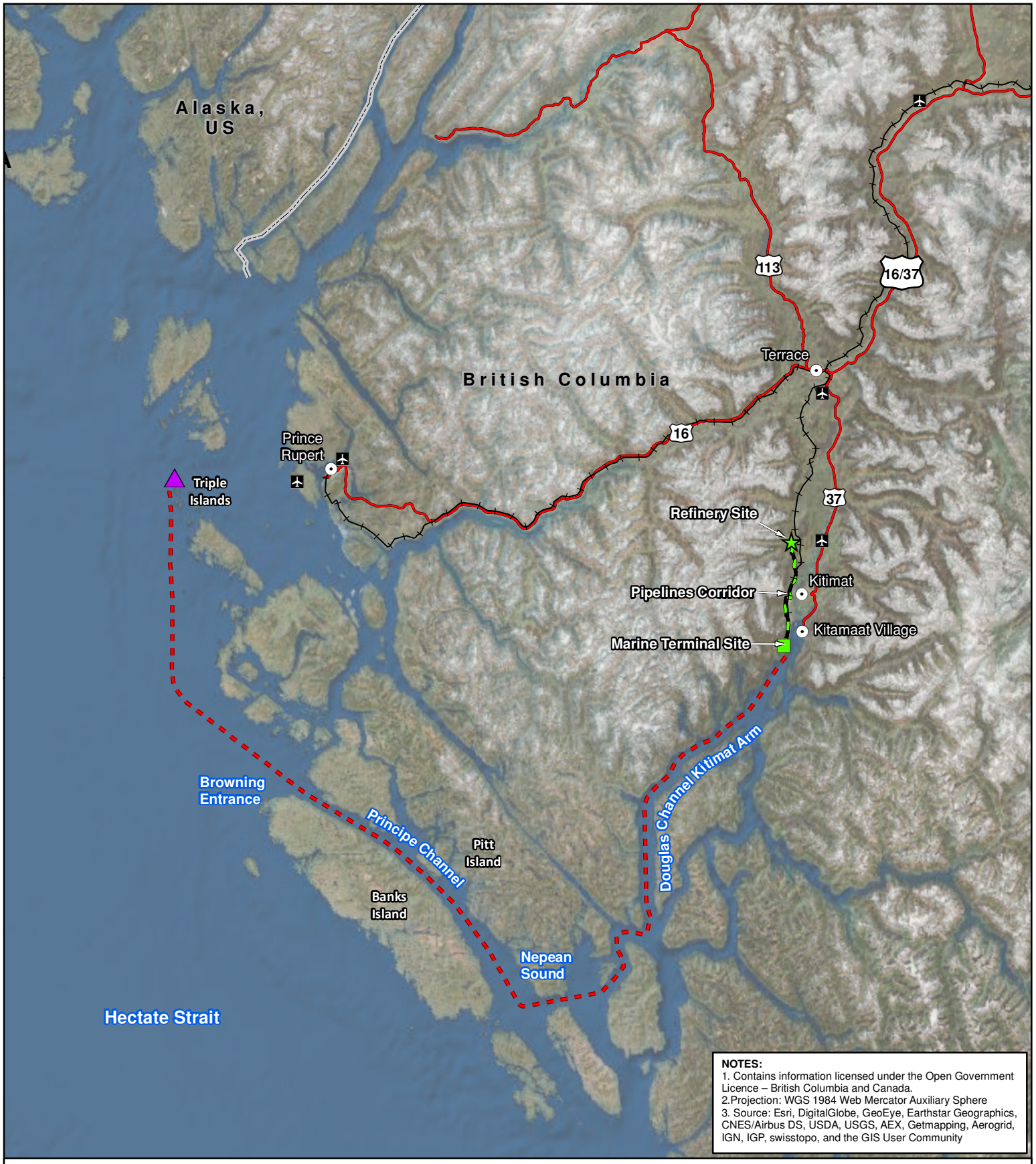


Figure 1-1
Kitimat Clean Ltd.
Kitimat Clean Refinery Project
Regional Project Location

1.2 Project Benefits

In addition to economic benefits, there are a number of other anticipated benefits to Canadians resulting from the construction and operation of the Project summarized in Table 1-1.

Table 1-1: Summary of Project Benefits

Benefits Category	Description
Environmental	• Only gasoline, jet fuel and diesel are being shipped by tanker. In the event of a spill at sea, gasoline evaporates in 2 days, jet fuel in 1 week, and diesel in 2 weeks. Usually no remediation is required. This significantly reduces the risk and duration of adverse effects to the marine environment (ITOPF, 2001).
	• Kitimat Clean is spending $5 billion extra to reduce greenhouse gas (GHG) emissions by an estimated 23 million tonnes per year, compared to all other heavy oil refineries in the world. This is the equivalent of removing 6 million cars from the road.
	• The refinery will produce up to 125,000 barrels of freshwater / day as a by-product of its new technology. This will significantly reduce the need to withdraw groundwater for make-up process water requirements. • The refinery will produce up to 470 MW of electricity as a byproduct of its new technology, which is more than is required for operations.
	• Diesel produced in the refinery will be very clean. This will reduce the downstream emissions of Criteria Air Contaminants (i.e., nitrogen oxides, sulphur oxides, particulate matter) when the diesel is burned in cars and trucks.
	• the refining process will be a closed effluent treatment system which avoids the need to discharge effluent to the receiving environment, significantly reducing effects on surface water quality, fish and fish habitat, and country foods. • Where possible, the Project footprint is designed to minimize physical disturbance, reducing the loss of terrestrial, marine, and fish habitat.

Benefits Category	Description
Social	• significant local, regional, provincial and national direct and indirect employment opportunities during construction and operation phases of the Project ◆ estimated need for 6,000-7,000 workers over 5 years of construction, or an average of 35,000 person hours of employment during construction; ◆ estimated need for 1,250 full time jobs during operations, with another 1,250 contract jobs to support operations and maintenance ◆ expected additional 2,500 full time jobs created in nearby petrochemical operations ◆ anticipated up to 5,000 indirect jobs created in the region during operations
	• skills building training opportunities (e.g., chemical engineering, construction)
	• improvements to community services and infrastructure (e.g., roads, bridges)
Aboriginal	• significant opportunities for direct and indirect employment and contracting, and related financial benefits for individuals, families, and communities.
	• opportunities for workforce skills training and business capacity building
Economic	• significant (an estimated $1B) in new municipal, provincial and federal tax revenue opportunities and royalties
	• significant induced and direct economic development opportunities, including secondary petrochemical businesses and jobs.
Technology	• implementation of Best Available Technologies (BAT) for oil refining and processing, including utilizing the Fischer-Tropsch process to produce ultra-clean naphtha, jet fuel and diesel products with a higher cetane number and lower sulphur content.
Scientific Knowledge	• Collection of scientific baseline data and traditional knowledge/traditional land use (TK/TLU) for the Project Site to support the EA process will enhance current understanding of valued ecosystem components and contribute to the body of scientific knowledge in BC.

1.3 Contact Information

1.3.1 Proponent Information

Kitimat Clean Ltd. is a privately held corporation in BC and is seeking provincial and federal approvals to enable the undertaking of the Project. Kitimat Clean Ltd.'s corporate information is summarized in Table 1-2 below. The principal contact person for the Project Description is David Black.

Table 1-2: Proponent Contact Information

Kitimat Clean Refinery Project	
Name of Proponent	Kitimat Clean Ltd.
Chief Executive Officer/President	David Black
Mailing Address	Kitimat Clean Ltd. 818 Broughton Street Victoria, British Columbia V8W 1E4
Website	www.kitimatclean.ca
Telephone	604.575.5794
Fax	250.480.3219
Email	dblack@kitimatclean.ca

1.3.2 Environmental Consultant

Hatch Ltd.,
1066 West Hastings St., Suite 400
Vancouver, BC V6E 3X2
Phone: 604.689.5767
Fax: 604.689.3918

Mellissa Winfield-Lesk, Project Director
Email: mwinfieldlesk@hatch.ca

2. Regulatory Framework

The Project exceeds provincial and federal EA threshold criteria, requiring an EA Certificate from the BC Environmental Assessment Office (EAO) and an EA Decision Statement from the Canadian Environmental Assessment Agency (the Agency). Provincially, the Project is considered a "reviewable project" pursuant to the Reviewable Projects Regulation of the *British Columbia Environmental Assessment Act* (BCEAA 2002) and a "designated project" pursuant to the Regulations Designating Physical Activities of *Canadian Environmental Assessment Act* 2012 (CEAA 2012). Table 2-1 provides an overview of the relevant EA thresholds for the Project.

Table 2-1: Summary of Provincial and Federal Environmental Assessment Thresholds

Kitimat Clean Refinery Project	BCEAA Reviewable Projects Regulation	CEAA 2012 Regulations Designating Physical Activities
Construction and operation of an Refinery facility with a processing capacity of approximately 460,000 barrels per day (72,800 m^3/day) of refined product.	Part 2 – Industrial Projects, Table 1 – Organic and Inorganic Chemical Industry; 2 Industrial Organic Chemical Industries not elsewhere classified (1) A new manufacturing facility (a) That has a production capacity of ≥ 100 000 tonnes/year.	14. The construction, operation, decommissioning and abandonment of a new (a) oil refinery, including a heavy oil upgrader, with an input capacity of 10,000 m^3/day or more.

Kitimat Clean Refinery Project	BCEAA Reviewable Projects Regulation	CEAA 2012 Regulations Designating Physical Activities
Construction of a Marine Terminal facility with a disturbance area of approximately 100 hectares. The marine facility will handle VLCCs with capacity of 250,000 DWT.	Part 8 – Transportation Projects, Table 14 Transportation Projects 4 Marine Port Facilities (other than Ferry Terminals) (1) Subject to subsection (2), a new marine port facility, other than a ferry terminal, if construction of the facility entails dredging, filling or other direct physical disturbance of (b) ≥ 2 hectares of foreshore or submerged land, or a combination of foreshore and submerged land, below the natural boundary of a marine coastline or marine estuary	24. The construction, operation, decommissioning and abandonment of a new (c) marine terminal designed to handle ships larger than 25 000 DWT unless the terminal is located on lands that are routinely and have been historically used as a marine terminal or that are designated for such use in a land-use plan that has been the subject of public consultation.
Construction and operation of a tank farm with a storage capacity of approximately 3,000,000 barrels (475,000 m^3) in volume.	Part 4 – Energy Projects, Table 8 Petroleum and Natural Gas Projects 1 Energy Storage Facilities 1. Subject to subsection (2), a new energy storage facility with the capability to store an energy resource in a quantity that can yield by combustion ≥ 3 PJ of energy	

Kitimat Clean Refinery Project	BCEAA Reviewable Projects Regulation	CEAA 2012 Regulations Designating Physical Activities
Construction and operation of an on-site electrical power generation facility with approximate capacity of 470 MW.	Part 4 – Energy Projects, Table 7 – Electricity Projects; 1 Power Plants (1) A new facility with a rated nameplate capacity of 50 MW of electricity that is (b) a thermal electric power plant.	2. The construction, operation, decommissioning and abandonment of (a) a new fossil fuel-fired electrical generating facility with a production capacity of 200 MW or more.

A list of provincial and federal authorizations that may be required for the Project are presented in Section 10.

The scope of the Project for the EA will include the construction, operation, and decommissioning of receiving and processing facilities at the Refinery Site, the construction and supply of fuel via three delivery pipelines, and the construction, operations, and decommissioning of the Marine Terminal facility including storage, hauling, shipping, and loading activities. Like other major capital projects in the regional area, marine shipping activities will be scoped from the Marine Terminal Site to the Pilotage Authority near Triple Island. Shipment of bitumen via rail to the receiving facility at the Refinery Site will be conducted by a third-party and is considered beyond the scope of this Project, as is the supply of natural gas by a third-party to the refinery.

2.1 Consultation and Engagement Overview

Early notification and discussions with key local, provincial, and federal government agencies, Aboriginal Groups, and other stakeholders began in 2012. The Proponent has shared informal Project information with the BC Ministry of Environment (MOE), Ministry of Natural Gas Development (MNGD), Ministry of Forests, Lands & Natural Resource Operations (MFLNRO), Ministry of Finance, and the Ministry of Aboriginal Relations & Reconciliation (MARR). The Proponent has also met with Natural Resources Canada (NRCan), the District of Kitimat Council, and the City of Terrace Council.

To raise public awareness about the Project and receive preliminary feedback, the Proponent has held meetings with a number of community organizations (e.g., Chambers of Commerce, Rotary Clubs, Colleges), and has given presentations at town hall forums and conferences across BC including Kitimat, Prince Rupert, Terrace, Hazelton, Burns Lake, Prince George, Victoria, and Vancouver. In an effort to understand public attitudes towards oil refineries, the Proponent commissioned two opinion polls in 2012 and 2013. The Mustel Group poll commissioned by Kitimat Clean in February 2013 showed that 66% of respondents supported the refinery proposal if an environmentally sound method of transporting bitumen from Alberta to Kitimat is used. The majority of BC residents agreed that: BC and Canada should add value to natural resources before exporting (86%), it was better to refine bitumen within B.C. rather than offshore (76%), and those polled supported diversifying exports to find markets beyond the United States for Canada's petroleum products (70%)[1].

The Proponent has also begun preliminary discussions with industry associations and utility providers including Canadian National Railway (CN), Rio Tinto, and Alberta oil producers.

The Proponent is committed to early and ongoing engagement with potentially affected and interested Aboriginal Groups, with a particular focus on engaging with the Kitselas First Nation and the Haisla Nation regarding the land-based Project Sites. The Proponent has had preliminary and informal discussions about the Project with representatives from 19 First Nations, and presented the Project to 65 First Nations Chiefs and representatives at a Gitxsan event in Hazelton in 2012.

[1] http://kitimatclean.ca/wp-content/uploads/2013/03/B465-Kitimat-Refinery-Research-Public1.pdf

3. General Project Information

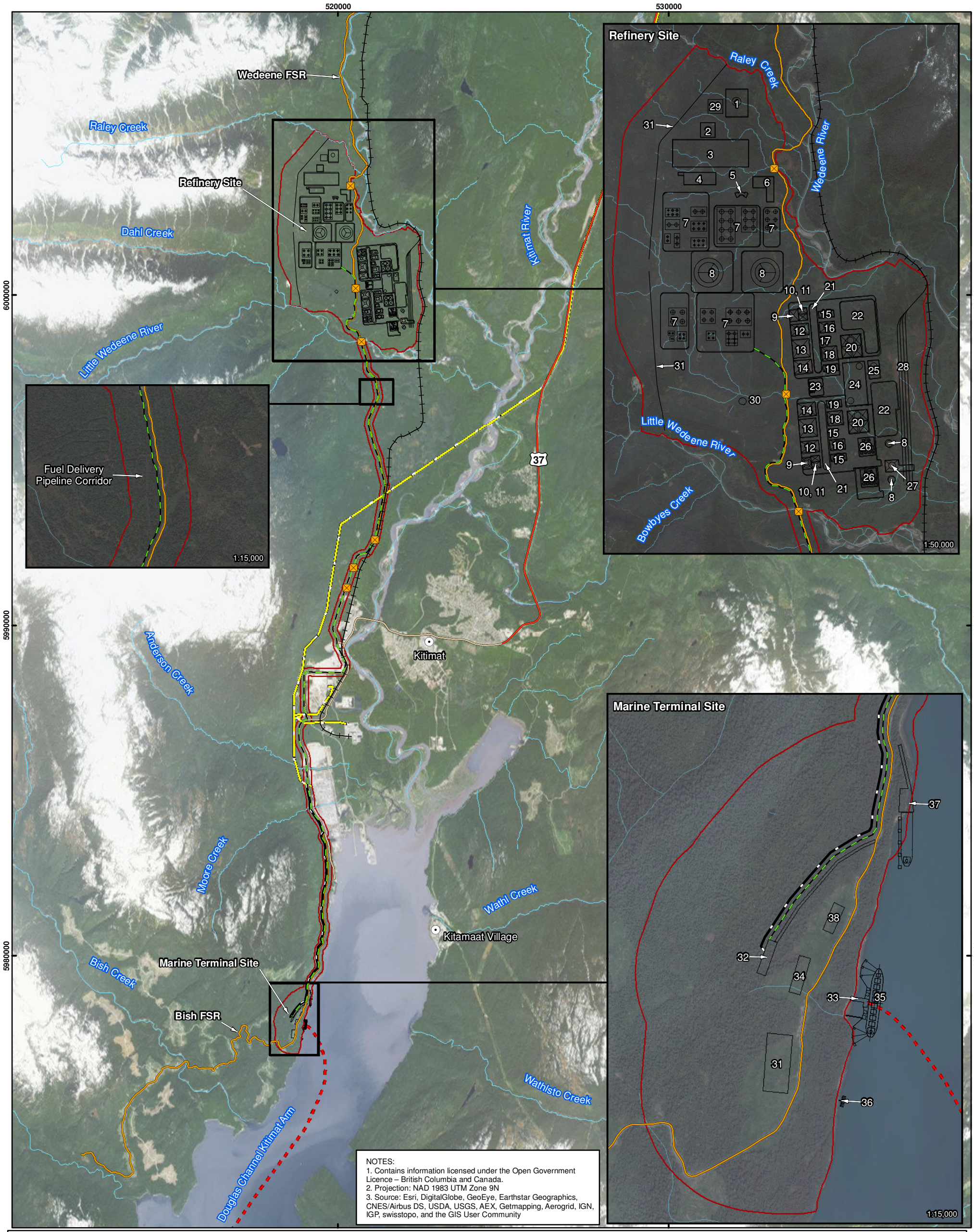
3.1 Project Location

The Project, encompassing the Refinery Site, tank farm, Fuel Delivery Pipeline Corridor and Marine Terminal Site (see Section 6 for more detail), is located on two separate sites within the Regional District of Kitimat-Stikine (RDKS). The refinery (consisting of two process trains), storage tanks, and rail spur covering an estimated 1,000 ha on a land parcel also known as the Wedeene site, is located approximately 13 km north of Kitimat at 54° 10’ 00” North and 128° 42’ 00” West. The Refinery Site is situated mostly on provincial crown land and intersects one parcel of private fee simple land at its’ southern extent. Ancillary facilities on the Refinery Site will include a tie-in to a third party natural gas pipeline, tail gas and fuel gas system, water treatment plant and surface water management pond, power generation facilities, temporary stockpile and laydown areas, site roads, administration facilities, offices and parking, and a temporary construction camp.

The proposed 23 km Fuel Delivery Pipeline Corridor alignment follows the Wedeene Forest Service Road (FSR) southward, crossing the Little Wedeene River and continuing south to the Kitimat Service Centre. From there, the pipeline corridor proceeds southward around Sandhill along the west side of Alcan Rd, and then along the Bish FSR to the Marine Terminal Site. The proposed pipeline alignment is the most direct route and has been sited to avoid steep terrain, and runs adjacent to existing roads or transmission line right of ways, to minimize physical disturbance. The north end of the Fuel Delivery Pipeline Corridor is located at 54 degrees 08' 28" N, 128 degrees 41' 21" W and the terminus is at 53 degrees 57' 19" N, 128 degrees 42' 39" W.

The marine terminal facilities (i.e., loading facility, vessel and utility berths, material off-loading facility) are proposed to be located on the west side of Kitimat Arm, just north of Bish Cove at approximately 53° 55’ 38” North and 128° 45’ 17” West. The 100 ha site is located on provincial crown land across the Douglas Channel (and slightly south) from Kitamaat Village. Figure 3-1 provides an overview of the Project sites and footprint.

The Marine Terminal Site is identified as the most feasible site along Kitimat Arm due to its physical location and acceptable marine depths required for access and passage of the VLCC tankers.



- Community
- Bridge
- Railway
- Forest Service Road
- Highway
- Road
- Existing Transmission Line

Proposed Infrastructure

- Pipeline
- Transmission Line
- Marine Shipping Route
- Infrastructure
- Project Footprint

Refinery

1 - PARKING
2 - SURFACE WATER MANAGEMENT POND
3 - CONSTRUCTION CAMP
4 - WAREHOUSE/FIREHALL/MEDI-CENTRE/MAINTENANCE SHOPS
5 - CONTROL BUILDING
6 - ADMIN. FACILITIES
7 - TANK FARMS (COMBINED TWO TRAIN AREA)
8 - FLARE AND RELIEF SYSTEM
9 - NHT HTREATER/HVY NAPTHA RFMR/LT NAPTHA ISOMERISATION
10 - NHT HTREATER/HVY NAPTHA RFMR/LT NAPTHA ISOMERISATION
11 - NHT HTREATER/HVY NAPTHA RFMR/LT NAPTHA ISOMERISATION
12 - VGO(HC) HYDROCRACKER INTEGRATED WITH DHT(DISTILLATE HT)
13 - VACUUM BOTTOM RHC INTEGRATED WITH SDA
14 - DILUENT RECOVERY UNIT(DRU)/VACUUM DISTILLATION UNIT (VDU)
15 - FT PRODUCT HC
16 - FISHER TROPSCH
17 - SYNGAS CLEANING/SWEETENING (H2S/CO2/NH3)
18 - GASIFICATION (POX GASCIFIER)
19 - ASU
20 - STEAM METHANE REFORMERS
21 - LAYDOWN AREA
22 - LAYDOWN STAGING AREA
23 - COOLING WATER SYSTEM
24 - STEAM GENERATION (COMBINED TWO TRAIN AREA)
25 - POWER SUBSTATION (COMBINED TWO TRAIN AREA)
26 - DEA/SWS/SRU/TGTU
27 - SUPLHUR PELLETIZING UNIT
28 - DIVERSION DITCH
29 - WATER TREATMENT PLANT
30 - WASTE INCINERATOR

Marine Terminal Site

31 - ADMINISTRATION & SUPPORT FACILITIES
32 - SURGE TANK FACILITIES
33 - LOADING FACILITY
34 - LAYDOWN AREA
35 - VESSEL BERTH
36 - UTILITY BERTH
37 - MATERIALS OFFLOADING FACILITY
38 - DREDGEATE DISPOSAL STOCKPILE

0 0.75 1.5 3 Km

NORTH

1:50,000

Figure 3-1
Kitimat Clean Ltd.
Kitimat Clean Refinery Project
Project Site Map

KITIMAT CLEAN

HATCH

3.2 Access Routes

Access to the Refinery Site will be from Highway 37, west along Haisla Boulevard and Third Street, then north along the existing Wedeene Forestry Service Road (WFSR) for 11 km. The nearest airport to the Project is Northwest Regional Airport (YXT) in Terrace, 43 km northwest via Hwy 37. The Refinery Site can also be accessed via rail on the Canadian National (CN) Railway's main line and Rio Tinto Alcan's spur line. Any needed improvements to the Kitimat spur rail line will be carried out by CN.

The Marine Terminal Site will be accessed from Highway 37 by travelling south on Haisla Boulevard to Alcan Road, then turning south at the junction with the Bish FSR for approximately 12 km.

Materials, supplies, and equipment needed for the Project will be delivered by third parties via road, rail and ship. Third-party owned and operated VLCC's will be used to export fuel products.

3.3 Project Capital Cost

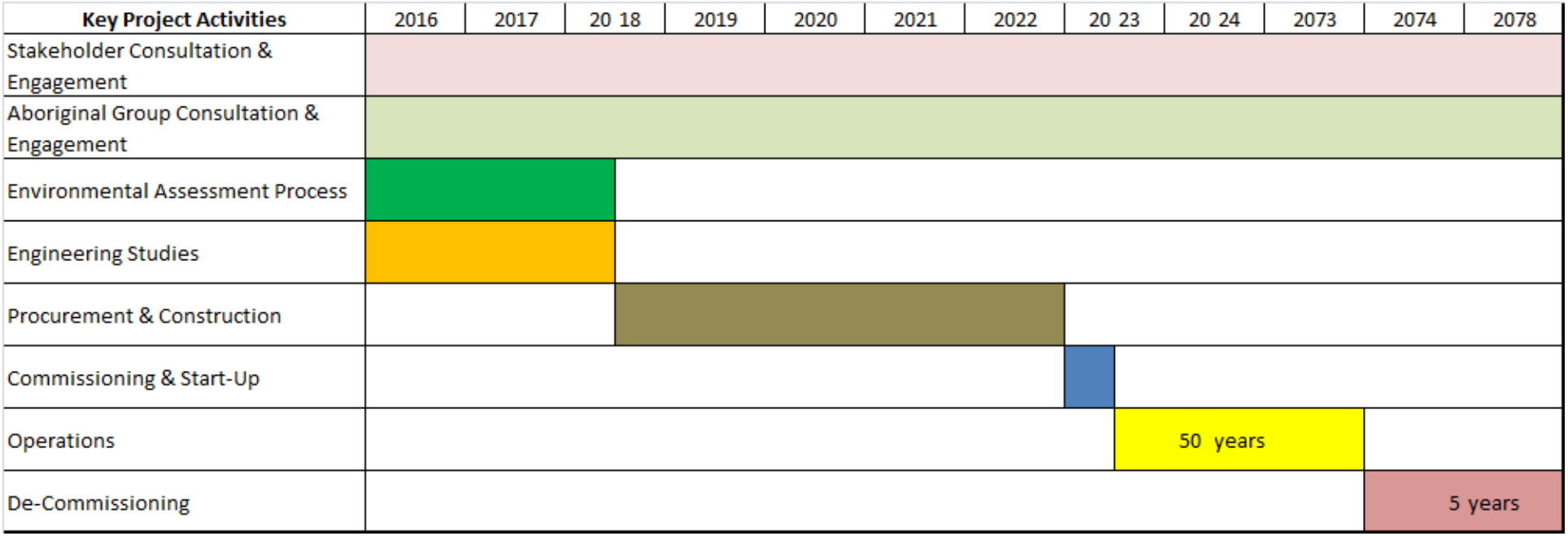
The estimated total capital cost of the Project is approximately $22 billion (B) (Hatch Ltd, 2014a). The Project Development Plan for the Refinery Site employs a modularized approach, significantly reducing the cost of the facility versus a typical "stick-build" approach. Modularized plant components will be manufactured overseas.

3.3.1 Federal Funding

No direct federal funding is being sought or provided for the Project.

3.4 Project Schedule

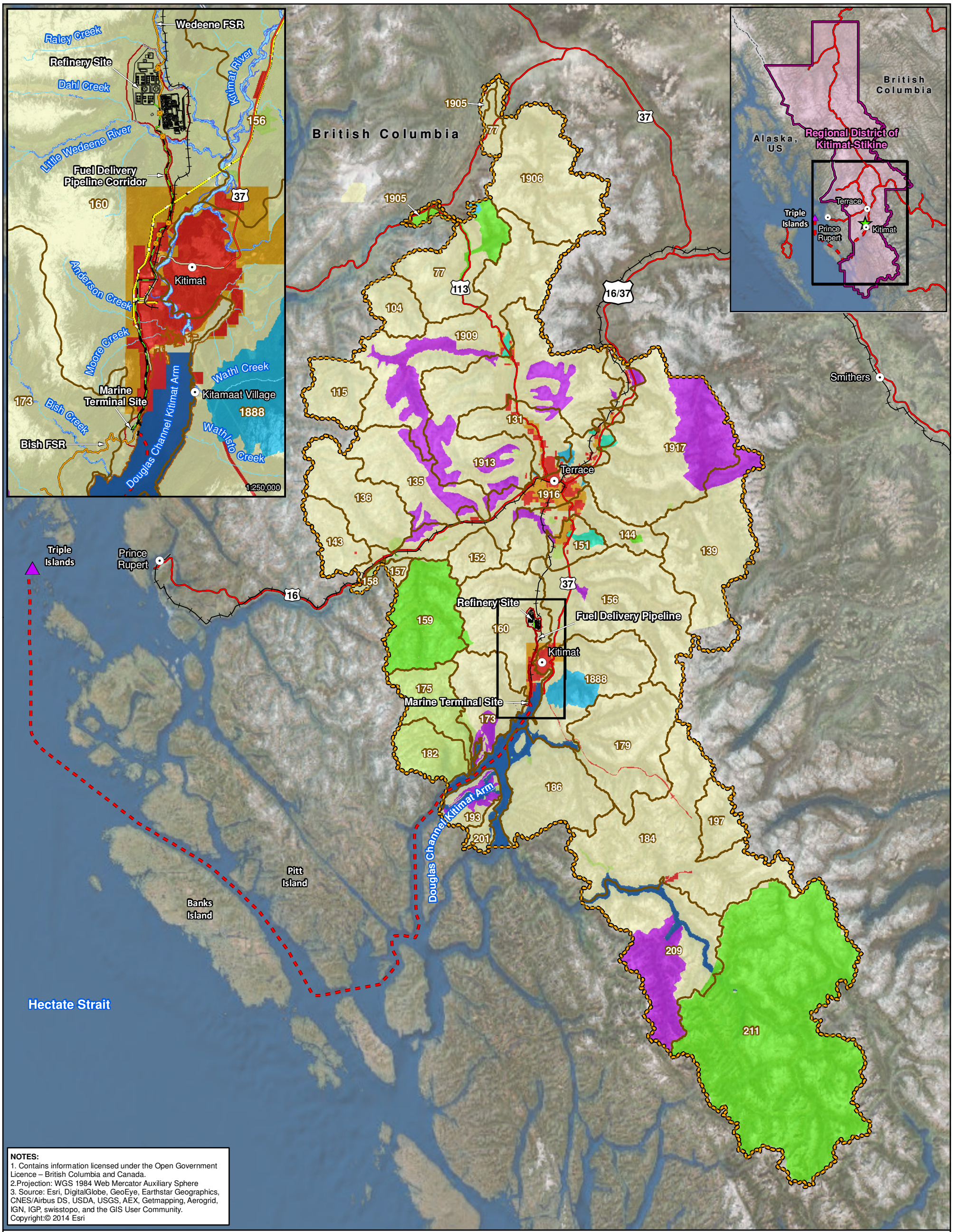
The initial stages of the Project include conceptual and detailed engineering studies, and submissions of EA and permitting applications to the responsible regulatory authorities. The Proponent expects that approvals for the Project will be obtained by the middle of 2018 followed by the commencement of pre-construction activities. Construction of the Refinery will commence in Q3 2018 and is scheduled to take up to five years (2018-2022). Upon completion of the Construction Phase, commissioning and start-up of the Refinery will take another 6 months prior to full operation of the Refinery (2023). The Refinery is planned to operate for 50 years prior to de-commissioning. De-commissioning of the Project is estimated to require 5 years. A summary of key Project milestone is provided in Figure 3-2.


Key Project Activities
2016
2017
20 18
2019
2020
2021
2022
20 23
20 24
2073
2074
2078
Stakeholder Consultation & Engagement
Aboriginal Group Consultation & Engagement
Environmental Assessment Process
Engineering Studies
Procurement & Construction
Commissioning & Start-Up
Operations
50 years
De-Commissioning
5 years

4. Regional Setting

The Refinery Site and Marine Terminal Site are located within the Regional District of Kitimat-Stikine (RDKS); the region encompasses a land area of approximately 100,000 km^2 (Statistics Canada, 2013b). The RDKS provides local government services to the municipalities of Kitimat, Terrace, Stewart, Hazelton, and New Hazelton (RDKS, n.d.). The Project is located in the Coast Range 5 Land District, under the management direction of the Kalum Land and Resource Management Plan (KLRMP) (British Columbia, 2002), see Figure 4-1. The KLRMP includes the communities of Terrace and Kitimat, and is situated within the traditional territories of three First Nation communities: Kitselas, Kitsumkalum, and Haisla (British Columbia, 2002).

Within the KLRMP, land management direction is divided into three general categories: General Resource Management; Resource Management Zones and Protected Areas (British Columbia, 2002). The Refinery Site falls within the General Resource Management category ((iMapBC 2015), which provides baseline management directions for resource activities on crown land while accommodating a variety of resource development which includes recreation, tourism, botanical forest products, trapping, guiding, agriculture and grazing, and timber and mineral extraction (British Columbia, 2002). Historically, forestry was an important economic activity within the Kalum area (British Columbia, 2002) but the area's economy has diversified, with growth in tourism and proposed industrial activity (British Columbia, 2002).



NOTES:
1. Contains information licensed under the Open Government Licence – British Columbia and Canada.
2.Projection: WGS 1984 Web Mercator Auxiliary Sphere
3. Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community.

KLRMP
- Existing Community Watershed
- General Management
- New Protected Area
- Private Land
- Proposed Community Watershed
- Existing Protected Area
- Salt Water
- Settlement
- Special Resouce Management Zone

- Kalum Land and Resource Management Plan (KLRMP) Boundary
- Landscape Units
- Regional District of Kitimat-Stikine
- Community
- Triple Island Pilot Station
- Bridge
- Railway
- Forest Service Road

- Highway
- Road
- International Boundary
- Existing Transmission Line

Proposed Infrastructure
- Pipeline
- Transmission Line
- Marine Shipping Route
- Infrastructure
- Project Footprint

0 10 20 40 Km

NORTH

1:17,500,000

Figure 4-1
Kitimat Clean Ltd.
Kitimat Clean Refinery Project

Kalum Land and Resource Management Planning Area

KITIMAT CLEAN

HATCH

The Fuel Delivery Pipeline corridor and Marine Terminal Facility also fall within the District Municipality of Kitimat, which encompasses an area of 240 km^2 (Statistics Canada, 2013a). The Fuel Delivery Pipeline Corridor crosses land designated as Private and Settlement Zones, a sub-type of the Resource Management Zone (British Columbia, 2002). Within the Settlement Zone, both settlement and economic development are prioritized (British Columbia, 2002).

The District of Kitimat, through the 2013 Official Community Plan (OCP) (Stantec, 2013) is responsible for the management of lands in the municipality. The majority of Kitimat's industrial land is located to the west of the Kitimat River in an industrial corridor that runs north from the area across the channel from Kitamaat Village to the northern municipal boundary. In 2011, the population of Kitimat was 8,335, a 7.3% decrease from 2006 (Statistics Canada, 2013a). Demographics are closely tied to industrial development within the District (District of Kitimat, 2014). Within the population, 920 individuals self-identify as Aboriginal (Statistics Canada, 2013a). The median age in Kitimat is 44.4, and in 2010 the median income was $34,038 (Statistics Canada, 2013a). There are 4,270 individuals in the workforce, and manufacturing is the primary employment sector (Statistics Canada, 2013a).

In 1950, the Aluminum Company of Canada (Alcan) chose to construct an aluminum smelter in the area. The District of Kitimat was developed as a planned community in 1953, and was designed to encourage industrial development (District of Kitimat, 2014). For a number of years Kitimat's economy was based on three major industries: Alcan's aluminum smelter; Eurocan's pulp and paper mills; and Methanex's methanol and ammonia plants (British Columbia, 2002). Since the closure of the Eurocan and Methanex facilities, Alcan's (now Rio Tinto) smelter is the primary driver of Kitimat's economy (District of Kitimat, 2014). Supplementary industries include tourism, small business, port development, and international trade development (District of Kitimat, 2014).

The District of Kitimat has a number of characteristics that continue to encourage industrial development: flat land that can accommodate heavy industry; a deep-water harbour; access to hydroelectric power; availability of aggregate resources; and, Kitimat is located one full day closer to Asian ports than other larger ports located in Southern BC (District of Kitimat, 2014). As of 2014, there were 2,000 ha available for industrial development, located to the west of the Kitimat River (District of Kitimat, 2014).

Tenures for commercial, recreational and other development activity (e.g., forestry, mineral exploration) are held in the vicinity of the Project. A heli-ski commercial recreation tenure is located to the west and outside of the Project footprint (Figure 4-2), and five registered traplines cross the Project Site. There is a guided freshwater recreation tenure held for the Kitimat River. There are no drinking water intakes within the Project footprint.

520000
530000
6000000
5990000
5980000
Wedeene FSR
Raley Creek
6407801
1037107
1040995
6407609
1039788
Dahl Creek
1039292
1040026
1042598
Kitimat River
Refinery Site
1040161
Little Wedeene River
6407801
1039790
1040100
1040997
1040162
C055545
37
C055545
1039789
Wedeene River
Bowbyes Creek
Fuel Delivery
Pipeline Corridor
1:50,000
6407801
C035712
6407801
C025408
C049651
C132175
C132194
C125877
C060174
1:40,000
601324
6407801
Kitimat
C101242
C101722
C132165
C132193
C132192
1012567
Moore Creek
F011268
C025955
Kitamaat Village
F011268
F011268
Wathl Creek
Marine Terminal Site
Bish Creek
Bish FSR
Wathlsto Creek
Douglas Channel Kitimat Arm
Marine Terminal Site
Fuel Delivery
Pipeline Corridor
1:15,000

NOTES:
1. Contains information licensed under the Open Government Licence – British Columbia and Canada.
2. Projection: NAD 1983 UTM Zone 9N
3. Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Water Licence (Point of Diversion)
Water Intake for Human Drinking Water Systems

Mineral Tenure
- LEONG, KERRY NING
- MOULD, WILLIAM CHARLES
- PACIFIC EMPIRE MINERALS CORP.
- YEARWOOD, HAWARD PETER

Commercial Recreation Tenure
- Guided Freshwater Recreation
- Heli Ski

Cutblock
- Active
- Historical

Community
Bridge
Railway
Forest Service Road
Highway
Road
Existing Transmission Line

Proposed Infrastructure
- Pipeline
- Transmission Line

Marine Shipping Route
Infrastructure
Project Footprint

0 0.75 1.5 3 Km
NORTH
1:15,000

Figure 4-2
Kitimat Clean Ltd.
Kitimat Clean Refinery Project
Land Tenures in the Project Area

520000
530000
540000
6000000
5990000
5980000

Wedeene FSR
Raley Creek
Refinery Site
Dahl Creek
Little Wedeene River
Kitimat River
37
Hirsch Creek
Kitimat
JUGWEES 5
KITAMAAT 1
Cordella Creek
Minette Bay Creek
Anderson Creek
Moore Creek
HENDERSON'S RANCH 11
Wathl Creek
Kitamaat Village
KITAMAAT 2
Marine Terminal Site
Bish Creek
Bish FSR
WALTH 3
Wathlsto Creek
BEES 6
Douglas Channel Kitimat Arm
KITASA 7

NOTES:
1. Contains information licensed under the Open Government Licence – British Columbia and Canada.
2. Projection: NAD 1983 UTM Zone 9N
3. Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Refinery Site
Wedeene FSR
Raley Creek
Wedeene River
Little Wedeene River
Bowbyes Creek
Fuel Delivery Pipeline Corridor
1:50,000

Marine Terminal Site
013061089
029462142
Fuel Delivery Pipeline Corridor
013061089
1:20,000

Land Ownership
- Federal
- Municipal
- Private
- Provincial
- Unknown
- Haisla Nation Indian Reserve
- District Municipality of Kitimat

- Community
- Bridge
- Railway
- Forest Service Road
- Highway
- Road
- Existing Transmission Line

Proposed Infrastructure
- Pipeline
- Transmission Line
- Marine Shipping Route
- Infrastructure
- Project Footprint

0 0.5 1 2 Km
NORTH
1:110,000

Figure 4-3
Kitimat Clean Ltd.
Kitimat Clean Refinery Project
Land Ownership in the Project Area

KITIMAT CLEAN
HATCH

4.1.1 Refinery Site

The proposed Refinery Site covers an area of 1,000 ha and is situated about 13 kilometres (km) to the north of Kitimat, on mostly provincial crown land and intersects one parcel of private fee simple land at its' southern extent (Figure 4-3). The Refinery Site is located in the Coast Range 5 Land District and overlaps district lots (DLs) 6132, 6133, 6134, 6135, 6145, 6146, 6147, and 6148. There is one mineral tenure and active forestry cutblocks overlapping the Refinery Site (Figure 4-2). The Refinery Site is accessed via the Wedeene FSR which requires widening and upgrades, including improvements to potentially 6 bridge crossings (Appendix A).

Currently, utility lines (i.e., Pacific Northern Gas Ltd. natural gas and BC Hydro transmission line) extend from Terrace to Kitimat along highway 37, on the east side of the valley, providing services to both communities (BC Hydro 2015, PNG 2015). A 287 kiloVolt (kV) BC Hydro transmission line runs along Highway 37 from the Skeena substation (2L99) to the Minette substation. BC Hydro is currently in the process of planning the replacement and re-routing of this line to travel along the west side of the valley (BC Hydro 2015). This new line is scheduled to be in service within the 2018/2019 time period (BC Hydro 2015). BC Hydro is proposing expansions to the Skeena and Minette substations to allow for increased industrial project activity in the region (BC Hydro 2015). The Project will tie into the existing line for its start-up electrical requirements. Operational electricity requirements will be supplied by the Refinery processes and excess electricity may be sold to BC Hydro for distribution. Discussions with BC Hydro are on-going and an alignment has yet to be determined for the tie-in with the Refinery Site.

An existing natural gas pipeline (Pacific Northern Gas Pipeline) runs east of the Refinery Site parallel to Highway 37. The natural gas requirements for the Refinery will be supplied by a third party pipeline and an alignment is yet to be determined due to on-going discussions (see section 4.1.2).

4.1.2 Fuel Delivery Pipeline Corridor

Three fuel delivery pipelines will run from the Refinery Site along a 45 m wide right of way (ROW) corridor to the Marine Terminal Site, intersecting numerous parcels of municipal, private, and provincially owned land Figure 4-3, Figure 4-4 4-4). There are active cutblocks at the northern end of the Fuel Delivery Pipeline Corridor. Within the District of Kitimat, the right-of-way crosses areas zoned as greenbelt and industrial land under the Kitimat Official Community Plan (2013). The OCP (2013) defines "Industrial" land use as "intended for medium and heavy industrial uses, and port development" (Stantec, 2013). The Kitimat Municipal Code further classifies this land as either Greenbelt or Industrial: M1 – Manufacturing (District of Kitimat, 2016) (Figure 4-5).

The Fuel Delivery Pipeline corridor crosses land where Sandhill Materials Inc. has a mineral tenure (tenure #601324). There are three water licenses that occur along the current alignment of the Fuel Delivery Pipeline Corridor.

The BC Ministry of Transportation and Infrastructure is conducting a corridor study along the west side of the Douglas Channel (West Douglas Channel Corridor Study) to be completed this year. The study will lay out a proposed utility corridor (for pipelines and electrical lines) along the west side of the channel. The findings of this study may affect the Fuel Delivery Pipeline Corridor alignment.

510000
520000
530000
6010000
6000000
5990000
5980000

Inset 1
015460827
Little Wedeene River
Wedeene FSR
Fuel Delivery Pipeline Corridor
015460495
015460479
015460436
015460401
015459900
015460339
1:60,000

Inset 2
015460339
015459900
013061402
013061402
013061305
015459888
013061305
009649646
009649743
009649581
010961780
009649581
010961372
009475231
010961631
009525980
009525947
010961372
011842164
009433724
010962298
015459381
004730046
015459306
009647236
013121103
004641817
004639022
1:32,500

Inset 3
009647236
015459306
013121103
004639022
004641817
015458954
010782036
010782036
013121138
013121014
015458954
015459144
013121065
013121171
010781927
015459144
026241013
007737939
005628237
004165811
015459233
010782249
005627648
005628229
015459683
004165829
1:7,250

Inset 4
010781927
010782249
005628237
007739761
005628245
007700407
005627648
007681968
007694326
007686901
007745249
004336976
004337069
012877298
1:25,000

Inset 5
004337069
012877298
013085590
004337191
013085549
013085395
013085352
004332041
013061208
013061208
013061186
013061186
013061127
013061127
013061267
013061267
029462142
013061089
013061089
1:50,000

Wedeene River
Raley Creek
Wedeene FSR
Refinery Site
Kitimat River
See Inset 1
See Inset 2
See Inset 3
See Inset 4
See Inset 5
37
Hirsch Creek
Kitimat
JUGWEES 5
Cordella Creek
KITAMAAT 1
Minette Bay Creek
Moore Creek
HENDERSON'S RANCH 11
Wathl Creek
Kitamaat Village
KITAMAAT 2
WALTH 3
Marine Terminal Site
Bish FSR
BEES 6
Wathlsto Creek
Douglas Channel Kitimat Arm
KITASA 7

NOTES:
1. Contains information licensed under the Open Government Licence – British Columbia and Canada.
2. Projection: NAD 1983 UTM Zone 9N
3. Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Land Ownership
- Federal
- Municipal
- Private
- Provincial
- Unknown
- Haisla Nation Indian Reserve
- District Municipality of Kitimat

- Community
- Bridge
- Railway
- Forest Service Road
- Highway
- Road
- Existing Transmission Line

Proposed Infrastructure
- Pipeline
- Transmission Line
- Marine Shipping Route
- Infrastructure
- Project Footprint

0 0.75 1.5 3 Km

NORTH

1:110,000

Figure 4-4
Kitimat Clean Ltd.
Kitimat Clean Refinery Project
Land Ownership - Fuel Delivery Pipeline Corridor

KITIMAT CLEAN
HATCH

510000 520000 530000

6000000 5990000 5980000 5970000 5960000

Fuel Delivery Pipeline Corridor

Refinery Site

Wedeene FSR

Raley Creek

Humphrys Creek

Dahl Creek

Kitimat River

Little Wedeene River

Nalbeelah Creek

Hirsch Creek

37

Kitimat

Anderson Creek

JUGWEES 5

Cordella Creek

KITAMAAT 1

Minette Bay Creek

Moore Creek

HENDERSON'S RANCH 11

Wathl Creek

Kitamaat Village

KITAMAAT 2

Marine Terminal Site

Bish Creek

Bish FSR

Wathlsto Creek

WALTH 3

Emsley Creek

BEES 6

KITASA 7

Douglas Channel Kitimat Arm

KUASTE 8

1:30,000

Marine Terminal Site

Fuel Delivery Pipeline Corridor

1:30,000

NOTES:
1. Contains information licensed under the Open Government Licence – British Columbia and Canada.
2. Projection: NAD 1983 UTM Zone 9N
3. Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Municipal Zoning
- Commercial
- GreenBelt
- Industrial
- Residential
- District Municipality of Kitimat
- Haisla Nation Indian Reserve

- Community
- Bridge
- Railway
- Forest Service Road
- Highway
- Road
- Existing Transmission Line

Proposed Infrastructure
- Pipeline
- Transmission Line
- Marine Shipping Route
- Infrastructure
- Project Footprint

0 0.75 1.5 3 Km

NORTH

1:135,000

Figure 4-5
Kitimat Clean Ltd.
Kitimat Clean Refinery Project

District Municipality of Kitimat Zoning

KITIMAT CLEAN

HATCH

4.1.3 Marine Terminal Site

The 100 ha Marine Terminal Site will be located on the west side of Kitimat Arm, just north of Bish Cove, and across the channel from Kitimaat Village, which is the principal community of the Haisla Nation. This site is situated on provincial crown land in an area zoned as greenbelt in the District of Kitimat. The marine area is located within a salmon net commercial fishery area (Figure 4-6). The Site has not been routinely or historically used as a marine terminal facility, nor is there a Land Use Plan in place for the area that has been the subject of public consultation. Logging has occurred historically over a large portion of the Marine Terminal Site.

The Marine Terminal Site will be accessed from Highway 37 by travelling south on Haisla Boulevard to Alcan Road, then turning south at the junction with the Bish FSR for approximately 12km. The Bish FSR was recently upgraded and does not any require any improvements.

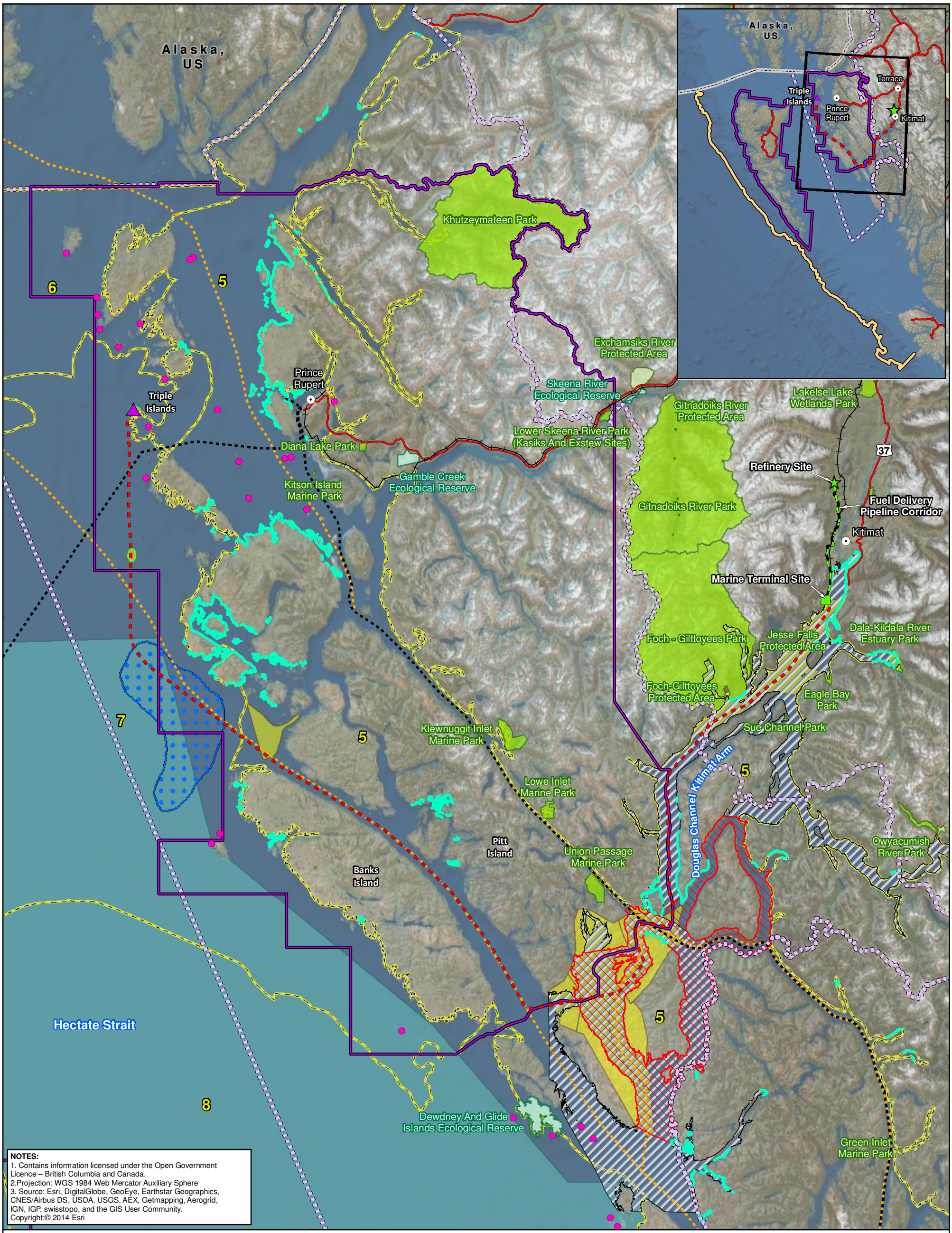
4.1.4 Marine Shipping Route

Ocean-going vessels up to 50,000 DWT (Deadweight Tonnes) have been navigating through Douglas Channel to Kitimat since the 1950s. Shipping routes in the area are well known to the BC Coast Pilots Ltd. (BCCP). Although the proposed vessels are a larger class of vessel than those that currently call on the Kitimat area, navigation to Kitimat by VLCC-class vessels has been previously reviewed as part of the Technical Review Process of Marine Terminal System and Transshipment Sites (TERMPOL) assessments for the Kitimat Pipe Line (KPL) Limited Project (1976) and Enbridge Northern Gateway Project (2012) and has been assessed as safe and feasible. In both previous TERMPOL assessments, detailed route analyses were proposed for routing 320,000 DWT oil tankers to the same area as the currently proposed Marine Terminal Site.

The proposed shipping route for the Project is approximately 286 km from the Marine Terminal Site to the Triple Islands Pilotage Station (Figure 4-6). The route navigates south-west down the Douglas Channel, through Wright Sound, Lewis Passage, Squally Channel, and Otter Channel; then turns north in Nepean Sound and transits through Principe Channel, past Anger Anchorage and Dixon Island Narrows, and continues north through Browning Entrance and Hecate Straite to the Triple Islands Pilotage station. From the pilot pick-up/departure point, the route continues through Dixon Entrance to the open ocean. The same route will be used for in-bound vessels but in reverse.

The route passes though the Skeena-Queen Charlotte Regional District (SQCRD) and is located within the North Coast Land and Resource Management Plan (NCLRMP) area (Figure 4-6). The marine shipping route also lies within the Pacific North Coast Integrated Management Area (PNCIMA) that establishes an integrated approach to oceans management that balances ecological, economic, social and cultural interests.

VLCC tanker shipping and associated marine vessel operation between the Marine Terminal Site and Triple Islands Pilotage Authority, including undertaking a voluntary TERMPOL assessment will be evaluated as part of the environmental assessment (EA) process.



NOTES:
1. Contains information licensed under the Open Government Licence – British Columbia and Canada.
2.Projection: WGS 1984 Web Mercator Auxiliary Sphere
3. Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community.

- Nesting Areas for Bird Colonies
- Ferry Route
- Cruise Ship Route
- Herring Spawing Site
- Critical Habitat for Humpback Whale
- Potential Critical Habitat for Northern Resident Killer Whale
- Ecological Reserve
- Protected Area
- Provincial Park

Areas of Marine Commercial Fisheries

- Red and Green Sea Urchin
- Groundfish
- Salmon Net
- Areas of Marine Commercial Salmon Trawl Fisheries
- Marine Ecosection
- Pacific North Coast Integrated Management Area Boundary
- Skeena-Queen Charlotte Regional District (SQRCD)
- North Coast Land Resource Management Plan Area
- Refinery Site
- Marine Terminal Site
- Pipelines Corridor
- Marine Shipping Route
- Community
- Road
- Railway
- Triple Island Pilot Station

0 5 10 20 Km

NORTH

1:1,250,000

Figure 4-6
Kitimat Clean Ltd.
Kitimat Clean Refinery Project
Regional Setting – Marine Shipping Route

KITIMAT CLEAN

HATCH

4.2 Regional Studies

4.2.1 Kitimat Airshed Study

The Project is located within the Kitimat airshed, which due to its location at the head of the Douglas Channel, offers an attractive location for industries seeking a marine terminal along BC's Pacific Coast to access foreign markets. A regional study was undertaken by the BC MOE to conduct a rapid scoping level assessment of the potential combined effects on the environment and human health from criteria air contaminants (sulphur dioxide (SO_2) and nitrogen dioxide (NO_2)) in the Kitimat airshed (BC MOE, 2014). The objective of the study was to provide information that regulators can use to understand and compare the potential risks under different development scenarios to determine how many industrial facilities could be added to the Kitimat airshed without causing unacceptable impacts to human health and the environment. There are no other regional studies currently underway in the area.

4.2.2 BC Ministry of Transportation and Infrastructure Study

The BC Ministry of Transportation and Infrastructure is completing a corridor study along the west side of the Douglas Channel (West Douglas Channel Corridor Study). The study is anticipated to be completed this year, and will lay out a proposed utility corridor (for pipelines and electrical lines) along the west side of the channel. The findings of this study may affect the pipeline corridor alignment.

4.2.3 Other Projects and Activities

Environmental studies have been conducted for a number of past, existing and future projects and activities in the Kitimat area as outlined in Table 4-1. This list will be updated as necessary.

Table 4-1: Past, Existing and Future Projects in the Kitimat Area

	Project Name	Project Description
Past	Eurocan Pulp and Paper Co. site	A pulp and paper mill producing linerboard and kraft paper for 40 years until it was closed down in January 2010.
Past	Methanex/Cenovus Terminal	The Methanex/Cenovus site was sold to Shell in 2011 and was decommissioned.
Past	Moon Bay Marina	The lease was terminated for this recreational marina in June of 2010. Rio Tinto Alcan currently owns the property.
Past	MK Bay Marina	Marina with 140 berths located at the head of Douglas Channel.
Past	Pacific Northern Gas Pipeline	Pacific Northern Gas' Western system's distribution system comprises approximately 1,180 km of distribution pipelines. The Western system transmission pipeline connects with the Spectra Energy pipeline system near Summit Lake, BC and extends 587 km to the west coast of BC at Kitimat.
Present	Rio Tinto Alcan Facility and Kitimat Modernization Project	Expanded facility, from 280,000 tpa to 420,000 tpa by 2015. Facility includes an existing 287 kV BC Hydro transmission line and a 230 kV transmission line to the Kemano powerhouse.
Future	Coastal GasLink Pipeline Project	Proposed 650 km natural gas pipeline from near Dawson Creek to Kitimat, BC. Pipeline capacity is 1.7 Bcf/day with a single compressor station, with provisions for up to 5 Bcf/day with five compressor stations.
Future	Enbridge Northern Gateway	Proposed oil export terminal in Kitimat. The project includes two parallel pipelines; one to transport bitumen from Edmonton to Kitimat (for export) and the other to transport condensate from Kitimat to Edmonton.
Future	Chevron Kitimat LNG Terminal Project	LNG plant and marine terminal facilities to be located at Bish Cove, with a 10 mtpa capacity. The project includes a 14 km natural gas pipeline to connect with Pacific Trail Pipeline near the Minette substation. The project includes re-developing the former Eurocan mill site as a construction camp.
Future	Pacific Trails Pipelines Project	470 km, 914 mm natural gas pipeline between Summit Lake and Kitimat BC. Includes a new compressor station as well as upgrades to existing stations.
	Kitamaat Renewable Energy Corp – Hydro Power	Development of a 134-MW Crab/Europa hydroelectric project on Crab River and Europa Creek in British Columbia
	LNG Canada (Shell)	LNG Terminal located in Kitimat Harbour with plant site on the former Methanex/Cenovus site. The final investment decision has been delayed until end of 2016.

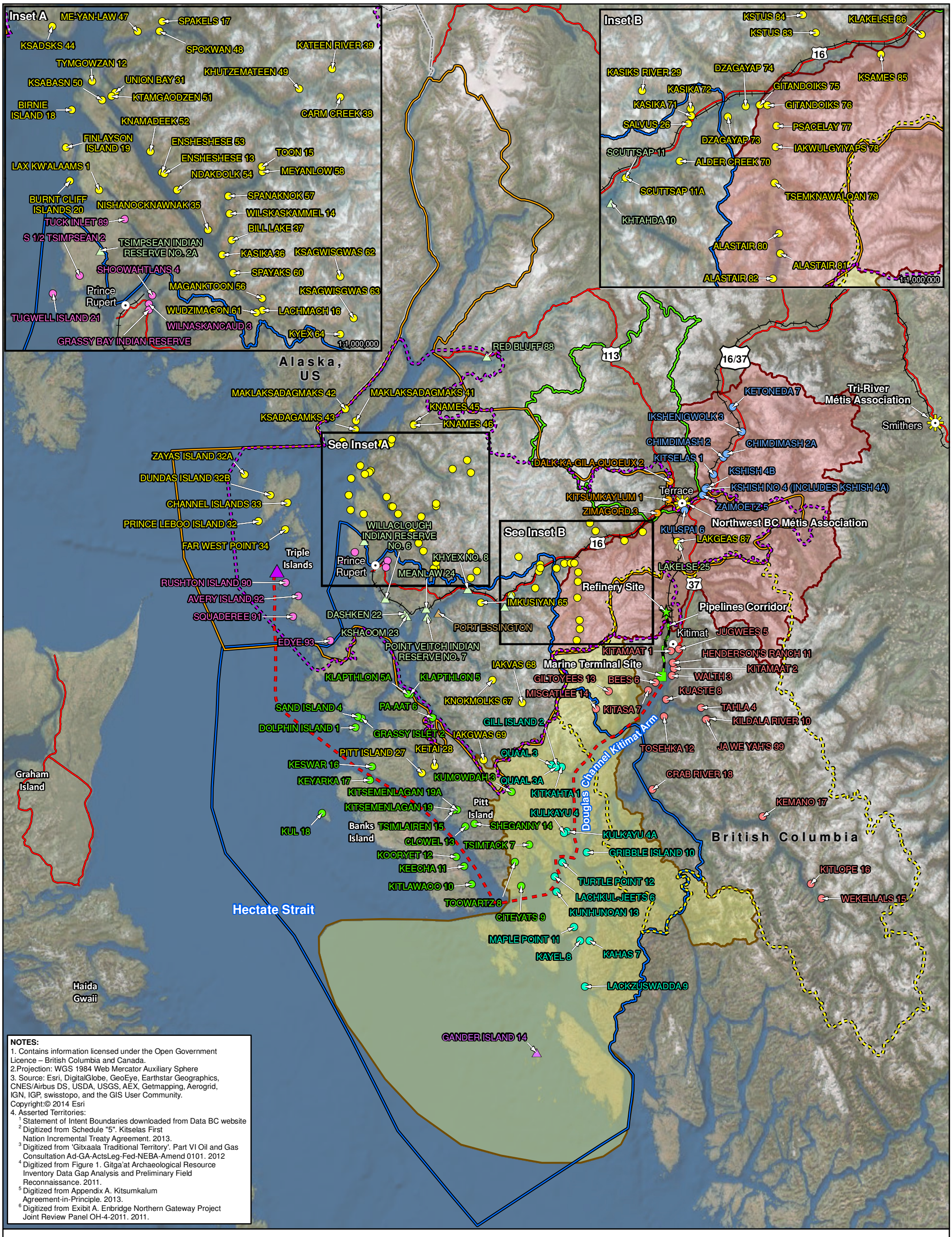
5. Aboriginal Groups

First Nations people comprise approximately 34% of residents within the RDKS (Stats Can, 2013). Traditional land use activities include fishing, harvesting and trapping, and these activities continue to be an important part of the local culture. In the summer and fall, plants, wildlife and fish – especially salmon – are harvested and preserved for the winter months (British Columbia, 2002).

There are a number of Aboriginal asserted territories potentially affected by the Project . The Refinery Site lies within the asserted traditional territories (Figure 5-1) of the:

- Haisla Nation;
- Lax Kw'alaams First Nation; and
- Kitselas First Nation.

Although the land-based portions of the Project Site are not located within the asserted traditional territory of the Kitsumkalum First Nation (KFN), the KFN have identified Harvest Lands in its Agreement in Principle with the Government of BC that do overlap with the proposed Refinery Site.



NOTES:
1. Contains information licensed under the Open Government Licence – British Columbia and Canada.
2.Projection: WGS 1984 Web Mercator Auxiliary Sphere
3. Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community.
Copyright:© 2014 Esri
4. Asserted Territories:
[1] Statement of Intent Boundaries downloaded from Data BC website
[2] Digitized from Schedule "5". Kitselas First Nation Incremental Treaty Agreement. 2013.
[3] Digitized from 'Gitxaala Traditional Territory'. Part VI Oil and Gas Consultation Ad-GA-ActsLeg-Fed-NEBA-Amend 0101. 2012
[4] Digitized from Figure 1. Gitga'at Archaeological Resource Inventory Data Gap Analysis and Preliminary Field Reconnaissance. 2011.
[5] Digitized from Appendix A. Kitsumkalum Agreement-in-Principle. 2013.
[6] Digitized from Exibit A. Enbridge Northern Gateway Project Joint Review Panel OH-4-2011. 2011.

Indian Reserves
- Haisla Nation
- Lax Kw'alaams
- Kitselas
- Gitxaala
- Gitga'at
- Kitsumkalum
- Metlakatla
- Gitga'at / Haisla Nation
- Lax Kw'alaams / Metlakatla
- Kitsumkalum / Kitselas

Aboriginal Asserted Territory
- Haisla Nation[1]
- Allied Tribes of Lax Kw'alaams[1]
- Kitselas[2]
- Gitxaala[3]
- Gitga'at[4]
- Kitsumkalum[5]
- Metlakatla[6]
- Métis Nation Chartered Communities

- Refinery Site
- Marine Terminal Site
- Pipelines Corridor
- Marine Shipping Route
- Community
- Road
- Railway
- International Boundary
- Triple Island Pilot Station

0 15 30 60 Km

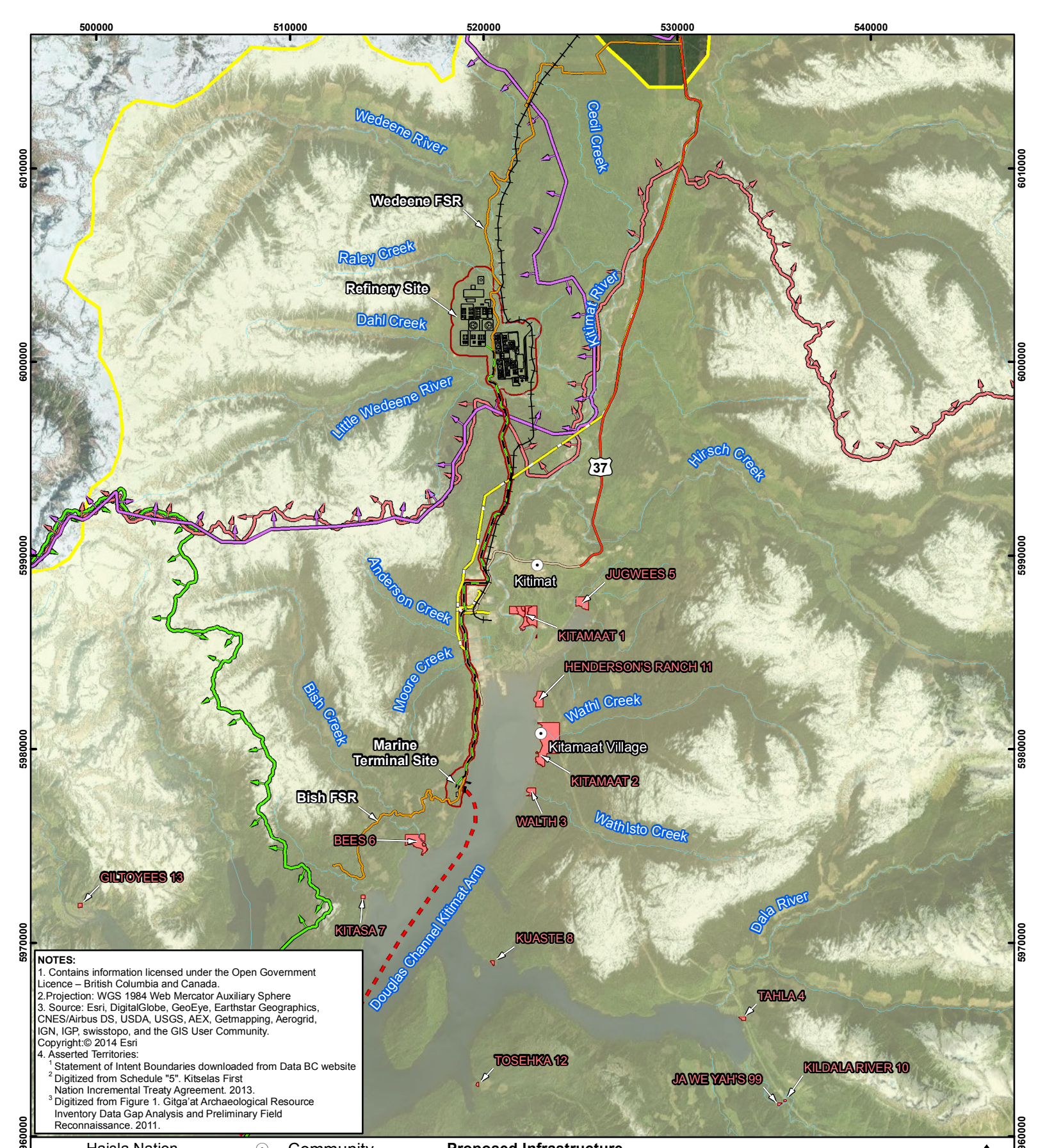
NORTH

1:2,250,000

Figure 5-1
Kitimat Clean Ltd.
Kitimat Clean Refinery Project

Overview of Aboriginal Traditional Territories and Indian Reserves

HATCH



NOTES:
1. Contains information licensed under the Open Government Licence – British Columbia and Canada.
2.Projection: WGS 1984 Web Mercator Auxiliary Sphere
3. Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community. Copyright:© 2014 Esri
4. Asserted Territories:
   [1] Statement of Intent Boundaries downloaded from Data BC website
   [2] Digitized from Schedule "5". Kitselas First Nation Incremental Treaty Agreement. 2013.
   [3] Digitized from Figure 1. Gitga'at Archaeological Resource Inventory Data Gap Analysis and Preliminary Field Reconnaissance. 2011.

Haisla Nation Indian Reserve

Aboriginal Asserted Territory
- Haisla Nation[1]
- Allied Tribes of Lax Kw'alaams[1]
- Kitselas[2]
- Gitga'at[3]

- Community
- Railway
- Forest Service Road
- Highway
- Road
- Transmission Line

Proposed Infrastructure
- Pipeline
- Marine Shipping Route
- Infrastructure
- Project Footprint

0 2 4 8 Km

1:250,000

NORTH

Figure 1-1
Kitimat Clean Ltd.
Kitimat Clean Refinery Project

Indian Reserves and Asserted Traditional Territories near Refinery Site

The Marine Terminal Site is located only within the asserted traditional territory of the Haisla Nation.

The marine shipping route crosses the asserted traditional territories of the following Aboriginal groups (Figure 5-2):

- Gitxaala Nation;
- Gitga'at Nation;
- Kitsumkalum First Nation;
- Metlakatla First Nation; and
- Lax Kw'alaams First Nation.

Although there are no specific Métis communities within the Project area, there are two Métis Nation of British Columbia (MNBC) Chartered Communities in the vicinity: the Northwest BC Métis Association in Terrace and the Tri-River Metis Association in Smithers. The Northwest BC Métis Association in Terrace has approximately 164 members (MNBC 2013). There are 935 Métis residing in the Regional District of Kitimat Stikine (Statistics Canada 2006 census).

5.1 Haisla Nation

The traditional territory of the Haisla Nation encompasses the Kitimat area and the North Coast. The total registered population of the Haisla Nation is 1,867 members, of which 670 members reside on reserves or crown land and 1,197 members reside off reserve (AANDC, 2016).

The Haisla Nation is currently participating in the First Nations Agreement for Land Management. The Lands and Resources Department is working with the Haisla First Nation Land Code Committee and their legal counsel, to prepare the Land Code as required by the Agreement (*Haisla First Nation, 2015*).

The Haisla Nation has 19 reserves on 666 ha of land (AANDC, 2016). The main Haisla reserve is Kitamaat Village, which is home to 700 Haisla members and is located 10 kilometres southwest of Kitimat on the east side of the Douglas Channel, across from the Marine Terminal Site (Figure 5-2).

The proposed Refinery Site, Fuel Delivery Pipeline Corridor, and Marine Terminal Site are located in the asserted traditional territory of the Haisa Nation (Figure 5-2). An estimated 42 km of the shipping route is also in Haisla traditional territory. Haisla Nation's Bees Indian Reserve No. 6 is located approximately 4 km southwest of the Marine Terminal Site at Bish Cove, and is currently being proposed for use by the Chevron Kitimat LNG (KLNG) Project.

The Haisla Nation is engaged in the BC Treaty Process and members approved and signed their Stage 3: Framework Agreement on December 5, 1996 (BC Treaty Commission, 2015).

The Haisla Nation is currently in Stage 4: Agreement in Principle (BC Treaty Commission, 2015).

Haisla Nation members report that they hunt, trap, fish and gather vegetation and use cabins and campsites for these purposes in their traditional territory, including in Moore Creek and Anderson Creek watersheds. Species traditionally harvested by the Haisla Nation in the Moore Creek and Anderson Creek watersheds include deer, grouse, moose, seals, black bear, grizzly bear, ducks, geese, quail, marten, mink, fox, wolf, beaver, fisher, otter, weasel, and muskrat. Fish species harvested in these two watersheds include four species of salmon: coho, spring, pink, and chum; herring, herring roe, octopus, and prawns. Plant species that are traditionally harvested include blueberries, raspberries, red huckleberries, gooseberries, crab applies, large cedar, cedar bark, hemlock cambium, spruce root and gum, fireweed, cattails, cow parsnip, wild rhubarb, fern roots, clover roots, buttercup roots, wild rice, hellebore, alder bark, devil's club, rose hips, and salmonberries (LNG Canada, 2014).

Marine fishing was a mainstay of both Haisla Nation and Tsimshian groups. Traditionally, important areas for fishing activities included the area around Triple Island, Stephens Island, Porcher Island, and Dolphin Island, as well as Principle Channel, Otter Channel, Seal Rocks, and Douglas Channel (EAO, 2014). Shellfish and marine plant resources were important subsistence foods for Haisla Nation members and the Tsimshian, who consumed shellfish and seaweed throughout the year as food. Salmon of all species were harvested in the Kitimat River and were vitally important to Haisla Nation and Tsimshian groups for food and cultural practices. Similarly, eulachon was an important food source because they spawn in late winter or early spring, and were often the earliest food source available for harvest. In Kitimat Arm, halibut, cod, herring, shrimp, and pawn are currently harvested (EAO, 2014).

As a result of engagement activities conducted with the Haisla Nation for other projects in the Kitimat area, issues of concern with relevance to this Project include: adverse effects on fish and wildlife habitat as a result of watercourse crossings; effects on marine and vegetation resources and cultural sites and practices from Project activities; effects of light and noise, concerns about potential habitat loss in Anderson Creek; effects of shipping on Aboriginal, commercial, and recreational fishing; concerns regarding shipping safety and effects from carrier wake; air quality effects; loss of archaeological resources, and socio-economic effects related to an increase in local traffic as well as increased crime, alcohol use, housing costs and infrastructures stresses in the region (EAO, 2014).

5.2 The Nine Allied Tsimshian Tribes

The Lax Kw'alaams First Nation and Metlakatla First Nation are ethnographically and linguistically identified as the *Nine Allied Tsimshian Tribes*. Before contact with European settlers, ten Tsimshian tribes located their winter villages from the Skeena River to the Prince Rupert Harbour area, of which nine survived (*Giluts'aaw, Ginandoiks, Ginaxangiik, Gispaxlo'ots, Gitando, Gitlaan, Gits'iis, Gitwilgyoots*, and *Gitzaxlaal*). The Lax Kw'alaams First Nation and Metlakatla First Nation are understood by ethnographers to have descended from the *Nine Allied Tsimshian Tribes*, and each has its own territories, harvesting areas, and villages.

5.2.1 Lax Kw'alaams First Nation

The Lax Kw'alaams First Nation includes the tribes of Giluts'aaw, Ginandoiks, Ginaxangiik, Gispaxlo'ots, Gitando, Gitlaan, Gits'iis, Gitwilgyoots, and Gitzaxlaal, currently represented by the Allied Tsimshian Tribes.[2]

The Lax Kw'alaams First Nation has 81 reserves on 57,238.3 ha of land (AANDC, 2016). The village of Lax Kw'alaams (Port Simpson), Lax Kw'alaams 1 reserve, is located on the Tsimpsean Pensinsula 30 km northwest of Prince Rupert on the lower Skeena River (BC Treaty Commission, 2015). The total registered population of the Lax Kw'alaams Band is 3,794 members, of which 723 members reside on reserves and crown land and 3,071 members reside off-reserve (AANDC, 2016). Lax Kw'alaams First Nation's main community (Lax Kw'alaams 1) is located north of Prince Rupert at Port Simpson, and has a population of 678 individuals[3].

The Lax Kw'alaams First Nation is currently in Stage 2 of the BC Treaty Process (Grassy Point, 2014). Over 2,000 traditional sites have been identified in the Interim Land and Marine Resources Plan of the Nine Allied Tsimshian Tribes of Lax Kw'alaams First Nation, including, but not limited to trap lines, fishing areas, hunting areas, forest harvesting areas, and berry-picking areas. Many of these areas are still used for traditional fishing, hunting and harvesting purposes.

Fishing is an important part of Lax Kw'alaams First Nations culture, and they have historically and presently rely on harvesting a wide variety of fish species, shellfish, molluscs and other marine resources for food, social, spiritual and commercial purposes. The Lax Kw'alaams First Nation harvest a variety of fish species, including all five salmon species (sockeye, coho, chinook, chum and pink), steelhead, eulachon, herring, and halibut.

---

[2] http://laxkwalaams.ca/who-we-are/test-topic/

[3] http://www12.statcan.gc.ca/census-recensement/2011/dp-pd/hlt-fst/pd-pl/Table-Tableau.cfm?LANG=Eng&T=301&SR=2626&S=3&O=A&RPP=25&PR=0&CMA=0

The proposed Refinery Site falls within the southern edge of the Lax Kw'alaams asserted traditional territory and proposed treaty settlement lands (Figure 5-2), and an estimated 21 km of the proposed marine shipping route fall within the Lax Kw'alaams asserted traditional territory. As a result of engagement on other projects, the Lax Kw'alaams First Nations have raised concerns about the potential effects on marine navigation for fishing vessels and potential underwater noise effects from vessels. Key fishing areas potentially affected by marine shipping activity includes Stephens Island.

5.2.2 Metlakatla First Nation

Metlakatla First Nation is a Tsimshian community located in the Metlakatla Pass approximately 7 km west of Prince Rupert, BC (Metlakatla, 2015). The total registered population of the Metlakatla First Nation is 889 members, of which 96 members reside on reserves and crown land and 793 members reside off reserve (AANDC, 2016). Metlakatla First Nation has about 7,740 ha of land on 21 reserves (AANDC, 2016), 7 of which are shared with Lax Kw'alaams First Nation.

The Metlakatla First Nation is currently engaged in the British Columbia Treaty Process and had begun negotiations in 1990 under the Tsimshian Tribal Council Society. The Tsimshian Tribal Council Society disbanded in 2004, and Metlakatla First Nation joined other First Nations wanting to continue treaty negotiations to form the Tsimshian First Nations Treaty Society. The Metlakatla First Nation is currently in Stage 4 in treaty negotiations (negotiating an Agreement in Principle) under the Tsimshian First Nations Treaty Society.[4]

The Metlakatla Stewardship Society has a mandate to protect the lands, waters and resources within the territory (Metlakatla, 2015).

An estimated 28 km of the proposed marine shipping route falls within Metlakatla First Nation asserted traditional territory (Figure 5-2). Stephens Island is an important marine harvesting area for the Metlakatla First Nation. Marine species that are typically hunted include sea lions, seals, and marine birds. Concerns raised during the review for other projects that are potentially relevant to this Project include: increased marine traffic in the area with the potential to alter acess to traditional fishing grounds, effects on benthic and near shore marine life through shoreline modification and ship wake, effects on marine life due to an increase in marine traffic, potential access restrictions to important marine harvesting areas, and effects from accidents and spills (EAO, 2014).

[4] http://www.metlakatla.ca/treaty/treaty-faq

5.3 Canyon Tsimshian

The Kitselas First Nation and Kitsumkalum First Nation have been identified as the Canyon Tsimshian, or Interior Tsimshian. They are ethnographically distinct from the Nine Allied Tsimshian Tribes but their ancestors travelled to the coast for harvesting and trading purposes.

5.3.1 Kitselas First Nation

Kitselas First Nation is one of the five Tsimshian Nations and is based at Kitselas Canyon in the Skeena River valley to the northeast of the city of Terrace, BC (Kitselas First Nation, 2015). The total registered population of the Kitselas First Nation is 645 members, of which 307 members reside on reserves and crown land and 338 members reside off reserve (AANDC, 2016).

The Kitselas First Nation is a signatory to the Framework Agreement (FWA) on Land Management (Kitselas First Nation, 2015). The FWA allows signatory First Nations to manage their own reserve lands and resources instead of having their lands administered by the Department of Indian Affairs. The *First Nations Land Management Act* only involves those sections of the *Indian Act* pertaining to the administration of lands and resources and only to Indian Reserve boundaries[5] (Kitselas First Nation, 2015). The Kitselas First Nation has 10 reserves, comprising 1,069 ha (AANDC, 2016). None of these reserves falls within the proposed Project site(s). The Kitselas First Nation is engaged in the BC Treaty Process under the Tsimshian First Nations Treaty Society and is in Stage 5, having signed an agreement-in-principle with Canada and BC in 2015.

The Refinery Site falls within the southern edge of the Kitselas First Nation asserted traditional territory (Figure 5-2). The Kitselas First Nation members hunt a variety of species throughout their traditional territory including deer and moose (hunted near the Wedeene River), mountain goat, black bear (hunted near Little Wedeene River and Wedeene River valleys), duck, and geese. First Nation members actively trap near the Kitimat River and its tributaries, and trapline cabins occur on the North and Upper Kitimat River sections. Fishing for salmon, trout, sturgeon, whitefish, suckers, chubs and kokanee salmon in the Kitimat River and tributaries is also carried out. Kitselas First Nation members gather forest plants and berries in the Upper Kitimat River and tributary valleys, typically at lower elevations adjacent to marshes, lakes, streams, and rivers. Berries, crab-apples, wild rice, various tubers, and roots are gathered. Issues raised on other projects relevant to the scope of this Project include potential effects on surface water quality, fish and fish habitat, lake acidification from air emissions, and bioaccumulation of contaminants in country foods (EAO, 2014).

[5] http://www.kitselas.com/index.php/resources/lands/

5.3.2 Kitsumkalum First Nation

Kitsumkalum First Nation is a galts'ap (community) of the Tsimshian Nation, and an original Tribe of the Tsimshian Nation[6]. Kitsumkalum First Nation has a registered population of 746 members, of which 249 members reside on reserves and crown land and 497 members reside off reserve (AANDC, 2016). Kitsumkalum has 4 reserves on 597 ha of land (AANDC, 2016).

Kitsumkalum First Nation is currently in Stage 5 of the BC Treaty Process, having signed a Stage 4 Agreement in Principal in 2015[7]. The Refinery Site falls within the southern edge of a Shared Harvest Area with Kitselas First Nation, and the proposed marine shipping route crosses their asserted territory (Figure 5-1)[8].

According to the EAO (2014) report, Kitsumkalum First Nation members hunt mountain sheep, deer, and black bear in the vicinity of the Kitsumkalum River and tributaries, hunting traditionally occurring within the Kitsumkalum, Skeena, and Ecstall river valleys and certain coastal islands. In addition, Kitsumkalum First Nation members hunt sea lion, seals, and sea otter. Important sites along the marine shipping route include:

- Stephens Island;
- Arthur Island;
- William Island;
- Porcher Island;
- Henry's Island; and
- Edye Passage.

Marine species that are harvested include cod, octopus, halibut, herring, flounders, red snapper, shrimp, abalone, crab, prawns, and eulachon. Fish species traditionally harvested throughout the territory include salmon, trout, whitefish, sturgeon, suckers, chubs, and Kokanee salmon. Concerns raised during the review of other projects that are relevant to the scope of this Project include: lake acidification, human health effects from bioaccumulation of contaminants, vessel wake, increased marine traffic, effects on fish and fish habitat, cumulative effects of shipping on fish migration routes, effects of underwater noise, and ship strikes on marine mammals (EAO, 2014).

[6] http://www.kitsumkalum.bc.ca/aboutus.html

[7] http://kitsumkalumtreaty.com/

[8] http://www.bctreaty.net/nations/agreements/Kitsumkalum_AIP.pdf

5.4 Southern Tsimshian

The Gitx'aala Nation and Gitga'at Nation (along with Gidestsu Nation) have been classified by ethnographers as Southern Tsimshian and distinct from the Nine Allied Tsimshian Tribes by language as well as territories held.

5.4.1 Gitx'aala Nation

Gitx'aala (Kitkatla) First Nation has a registered population of 1,963 members, of which 470 members reside on reserves and 1,493 members reside off reserve (AANDC, 2016). The Gitx'aala Nation's main community is the Village of Kitkatla, on Dolphin Island, which is boat and plane accessible only. The Gitxaala Nation has 21 reserves totaling 1,885 ha (AANDC, 2016).

An estimated 229 kilometers of the proposed marine shipping route falls within Gitx'aala Nation traditional marine territory, which extends south to the coastal islands just north of Kitasu Bay (Figure 5-1). The Gitx'aala Nation asserted marine territory extends westward to the marine territories of the Haida Nation.

Gitxaala Nation traditionally followed a seasonal round, similar to the coastal and southern Tsimshian groups and had seasonal fishing, hunting, and gathering camps spread out throughout their territory. Terrestrial mammal species identified as important to the Gitxaala include deer, mountain goats, bear, beaver, mink, marten, otter, and weasel (EAO, 2014). Bird species, including ducks, geese, and other sea birds, were also important resources. A variety of plant species were harvested (and continue to be harvested) for medicine, food, and materials. Herring, eulachon, salmon, steelhead, cod, halibut, flounder, and a variety of rockfish are collected by Gitxaala community members. The intertidal zones are rich with clams, cockles, mussels, and other invertebrates, as well as seaweed and kelp, all of which are harvested for food. Marine mammals of interest in the area include seals and sea lions, sea otters, porpoises, and whales. Gitxaała Nation embers report that significant harvesting times occur from February to June and again in October through December (EAO, 2014).

Gitxaała Nation has extensive marine travelways used to access harvesting areas, sacred areas and culturally important sites throughout their traditional territory, including several areas within the proposed Project's shipping route. Gitxaała Nation members fish and harvest marine resources throughout their asserted traditional territory. Specific locations within the proposed Project shipping route include (EAO, 2014):

- Salmon – west of Porcher Island, Principe, Otter, and Douglas channels, south of Fin Island and Wright Sound, as well as along Stephen's Island, the Tree Knob group, and Goschen Island;
- Herring – Goschen Island and Principe Channel;
- Prawns – Principe Channel;

- Halibut and cod – specific locations around Goschen Island, Principe and Otter Channels, in Wright Sound, and areas around Gurd and Dolphin Islands;
- Octopus and invertebrates – all around Dolphin and Banks Islands, north end of Principe Channel, north of Anger Island, and Otter Passage;
- Greenling and rockfish – reported in areas around Goschen Island, Principe and Otter channels, and South of Fin Island;
- Shellfish – west of Banks Island, Principe Channel, and Otter Channel, south of Fin Island and Wright Sound; and
- Kelp and seaweed – specific locations around Goschen, Dolphin, and Gurd Islands, throughout Principe Channel, and in Otter Channel.

Issues raised by the Gitxaala Nation during the review process for other projects include concerns around the potential for increased air emissions, effects on benthic and near shore marine resources through shoreline disturbance, and ship wake, increased marine traffic in the area and altered acces to traditional fishing grounds, effects on the marine environment including fish and fish habitat, marine plants, marine mammals, and cumulative effects on marine resources (EAO, 2014).

5.4.2 Gitga'at Nation

Gitga'at Nation (Hartley Bay) is one of the five Tsimshian Nations and has a registered population of 754, with roughly 155 living on reserve or crown land, and another 599 living off-reserve (AANDC, 2016). The Gitga'at Nation has 15 reserves on 641 ha of land (AANDC, 2016).

The Gitga'at Nation is currently reviewing its engagement in the BC Treaty Process[9]. Gitga'at Nation has been in Stage 4 of the BC Treaty Process under the Tsimshian First Nations Treaty Society, having signed the Tsimshian Nation Framework Agreement in 1997[10].

Hartley Bay is the home community of the Gitga'at Nation, and lies roughly 90 miles southeast of Prince Rupert and 50 miles southwest of Kitimat, at the confluence of Grenville and Douglas Channels. Hartley Bay is accessible by ferry or float plane only.

[9] http://www.gitgaat.net/contact/treatyoffice.htm

[10] http://www.bctreaty.net/nations/agreements/tsimshia_framewrk.pdf

An estimated 102 km of the proposed marine shipping route falls within the Gitga'at asserted marine territory, and the proposed marine shipping route passes by Hartley Bay (Figure 5-1). Marine resources traditionally harvested include (EAO, 2014):

- Salmon – harvested at Hartley Bay, Old Town, along rivers and creeks feeding into Douglas Channel, and Union Pass;
- Halibut and cod – around Hartley Bay;
- Seagull eggs – collected near water on Campania Island;
- Crab – around islands, in inlets and bays;
- Shrimps and prawns – Douglas Channel and associated inlets; and
- Seaweed and kelp – around Otter Channel, Otter Pass, and Estevan Sound.

Concerns raised on other projects relevant to the scope of this Project include viewsheds from Hartley Bay and marine harvesting sites along the proposed shipping route, interference from shipping activities on Aboriginal and commercial fisheries, invasive species, and effects of shipping on marine mammals.

5.5 Métis Nation of British Columbia

The Métis are descendants from the union of European (predominantly French and Scottish) men and First Nation women during the 17th and 18th century fur trade, and are an Aboriginal people with their own cultural identity, settlements, language, and traditions.

The federal government, including the Canadian Environmental Assessment Agency, recognizes the Métis Nation of BC and its assertions of Métis rights and traditional land uses in BC. The Métis Nation "Assertion of Métis Rights and Traditional Land Uses" study in 2009, which is a compilation of 14,000 historical documents, indicated "a significant Métis presence throughout BC. Métis traditional land use interviews support Métis use since 1920 and verify Métis continue to exist and use land as our ancestors did" (MNBC 2010a). Unlike other Aboriginal Groups, the Métis Nation does not claim territories.

MNBC have expressed a desire for the sustainable use of natural resources, including managing natural resources to meet present needs without compromising the needs of future generations, providing stewardship of natural resources, balancing economic, spiritual and traditional values the natural environment, and conserving biological diversity, soil, water, fish, wildlife, and scenic diversity. Based on the information presented in EAO (2014), it is likely that MNBC members have fishing, camping, crabbing and sites potentially affected by Project activities.

6. Project Description

The Project is comprised of components and physical activities that span the construction, operations, and decommissioning phases. Table 6-1 summarizes the Project components which are described in more detail below. See Figure 3-1 for an overview of the layout of Project components.

Table 6-1: Project Components

Project Component	Sub-Components
Bitumen Receiving Facility	• Rail yard off-loading facility • Unloading racks • 4 tracks • Stack for discharge of scrubbed air

Project Component	Sub-Components
Refinery Site	• Atmospheric Distillation Unit • Vacuum Distillation Unit • Resid Hydrocracker integrated with a Solvent Deasphalting Unit (SDA) • Vacuum Gas Oil (VGO) Hydrocracker • Distillate Hydrotreater • Sulphur Recovery Unit • Steam Methane Reformer • Naphtha Hydrotreatment Unit • Pitch Gasification Unit • Syngas Sweetening • Fischer-Tropsch with Mild Hydrocracker • Air Separation Unit • Flare System • Tank Farm (8 Bitumen Storage Tanks; 24 Intermediate Product Storage Tanks; 22 Processed Fuel Storage Tanks) • Non-hydrocarbon Storage Systems (e.g., raw water, amine and sulphur) • Supporting Infrastructure: ◆ Power Generation (Two co-generation plants with two gas turbine generators and four steam turbine generators) ◆ transmission line (route TBD) ◆ Tail Gas and Fuel Gas System ◆ Boiler Feedwater (BFW) and Condensate System ◆ Cooling Water System ◆ Instrument Plant Air and Nitrogen System ◆ Firewater System ◆ Closed Blowdown System ◆ Groundwater well ◆ Surface Water Management Pond and diversion structures ◆ Water Treatment Plant ◆ Waste incinerator ◆ Administration facilities, offices and parking
	◆ Access roads and upgrades; new site roads ◆ 6,000 to 7,000 person temporary construction work camp

Project Component	Sub-Components
Fuel Delivery Pipeline	• 18” Diesel Pipeline • 18” Jet Fuel Pipeline • 18” Gasoline Pipeline
Marine Terminal Facility	• 1 Deep water vessel berth comprising: ◆ Loading Platform with Gangway Tower ◆ Four breasting dolphins; ◆ Six mooring dolphins or shore moorings; ◆ Access Trestles and Catwalks ◆ Mooring Systems • 1 utility berth • 1 material off-loading facility • Temporary laydown areas • Dredge stockpile area • Pipeline PIG launch facility • Surge tank facilities • Supporting Infrastructure: ◆ Administration facilities, offices and parking ◆ Site roads

6.1 Bitumen Receiving Facility

Pure bitumen will be transported to the Refinery Site by CN Rail. The Bitumen Receiving Facility will process 400,000 barrels of bitumen arriving in two 120 rail car trains per day. The bitumen will be viscous in nature and will require heating to enable its off-loading from the rail cars. A rail yard and off-loading facility will be constructed to transfer bitumen from the rail cars to the Refinery Site for processing. The rail yard will consist of 4 rail spurs, with storage for up to four unit trains. Each unit train will contain up to 120 rail cars. Rail cars will be delivered to the rail yard from the CN spur line between Terrace and Kitimat. Shunting of cars within the rail yard will be the responsibility of a third party. The rail yard will be designed and constructed to the latest track safety design standards in accordance with CN Rail requirements. CN Rail will pick up empty unit trains from the rail yard and deliver them back to Alberta via the same route. A rail unloading rack will be part of the rail yard, and cars will be pulled in to the rail unloading rack as required.

The rail unloading rack will consist of four tracks enabling the simultaneous unloading of up to 240 rail cars. The unloading rack will be fully covered and enclosed with a simple steel shed roughly 20 metres wide by 1,000 metres long, allowing the unloading process to be completed in all weather conditions. The bitumen will be pumped and stored in 8 storage tanks with a nominal capacity of 265,000 bbl per tank.

6.2 Refinery

The proposed Refinery will process 400,000 barrels per stream day (bpsd) of pure bitumen and will be split between two identical refinery processing trains with each train having 50 percent capacity (or 200,000 bpsd). The Refinery will use world class, state-of-the-art processing technologies to produce petroleum products, including diesel, ultra-low sulphur diesel, gasoline and jet fuel for export (Figure 6-1). It will also produce propane and butane products for domestic and export markets. Estimated product volumes are:

- 320,000 barrels per stream day (bpsd) of diesel fuel and jet fuel (of which 50,000 bpsd will be ultra-low sulphur diesel);
- 119,000 bpsd of gasoline;
- 11,000 bpsd of butane; and
- 9,000 bpsd of propane.

Butane and propane will be sold to the domestic market or shipped by a third-party by train to Prince Rupert for export, or used in the refining process. Approximately 3,200 tonnes per day of sulphur will be produced as a by-product of the refining process. Sulphur may be used in local petrochemical applications or shipped by a third-party to Prince Rupert by rail for export.

A conceptual block flow diagram is provided in Figure 6-1 (Hatch Ltd, 2014b) and shows the layout of the major process units.

6.2.1 Atmospheric Distillation Unit (ADU) and Vacuum Distillation Unit (VDU)

The first major processing units in the refinery are an Atmospheric Distillation Unit (ADU) and a Vacuum Distillation Unit (VDU). The ADU unit will separate the feed stream into naphtha, atmospheric gas oil (AGO) and atmospheric residue. The ADU bottom, called the atmospheric residue (AR), is sent to the VDU where it is further separated into various hydrocarbons streams under reduced pressure. VDU separates the feed into light vacuum gas oil (LVGO), heavy vacuum gas oil (HVGO) and vacuum residue (VR). The atmospheric gas oil coming from the ADU and LVGO from VDU is sent as feed to the Distillate Hydrotreater while the heavy vacuum gas oil from the VDU is sent as feed to the integrated Vacuum Gas Oil Hydrocracker for further processing. VR will be routed to the integrated Resid Hydrocracker integrated with a Solvent Deasphalting Unit (SDA) block.

6.2.2 Resid Hydrocracker Integrated with a Solvent Deasphalting Unit

The secondary processing units include a two stage resid hydrocracker unit (ebullated bed) that has an integrated SDA in between the first and second stages. The residue from the VDU is processed in the first stage resid hydrocracker at moderate conversion to produce Liquefied Petroleum Gas (LPG), naphtha diesel and gas oil. The second stage processes the Deasphalted Oil (DAO) from the SDA to produce more LPG, naphtha diesel and gas oil. In this way, the most difficult to hydrocrack asphaltenes are rejected in the SDA pitch, producing a clean second stage feed. SDA pitch is sent to a gasifier which subsequently feeds Fischer-Tropsch units. Naphtha from both first and second stages feed a naphtha hydrotreater unit while diesel is sent on to the Distillate Hydrotreater or a finishing VGO Hydrocracker.

6.2.3 Distillate Hydrotreater and Vacuum Gas Oil Hydrocracker

6.2.3.1 *The Vacuum Gas Oil (VGO) hydrocracker will process the heavy VGO, and streams from the integrated resid hydrocracker-SDA combination, while the integrated distillate hydrotreater processes a feed blend comprising straight run distillate, light vacuum gas oil and streams from the integrated resid hydrocracker. The objective of the VGO hydrocracker integrated with distillate hydrotreater is to produce light fuel products and maximize the conversion of the feedstock to produce Ultra Low Sulphur Diesel product that meets required specifications and hydrotreated naphtha. The VGO hydrocracking will also reduce the sulphur and nitrogen contents in the product to acceptable levels.*

6.2.4 Pitch Gasification

The residue from the Solvent Deasphalter, called SDA pitch, is gasified into syngas, a mixture of carbon and hydrogen, in a gasifier reactor. This syngas is then sweetened (processed to remove H_2S, COS and CO_2) and combined with additional hydrogen syngas from steam methane reformers and fed to Fischer-Tropsch units to produce hydrocarbons such as naphtha and diesel fuel.

6.2.5 Fischer-Tropsch with Mild Hydrocracker

Fischer-Tropsch (FT) synthesis collectively refers to processes for the conversion of synthesis gas to synthetic crude oil. Fischer-Tropsch/Mild Hydrocracker units convert the sweetened syngas into mainly linear paraffins (condensate and wax) using a FT reactor with a catalyst. These intermediate products from the FT unit are fed to a mild hydrocracker to produce sulphur-free diesel and naphtha. In addition, there is a net tail gas produced which is used to generate power for the refinery.

6.2.6 *Naphtha Block*

The naphtha processing block will upgrade lower-value naphtha intermediate streams to produce high-quality naphtha product yields. The Naphtha Hydrotreater block is a component of the naphtha processing block and includes units that remove sulphur and nitrogen compounds contained in hydrocarbon fractions, removes organometallic compounds, saturates olefinic compounds and increase the octane rating of the naphtha streams, to produce finished gasoline that meets all the required specifications. These include Naphtha Hydrotreating, Catalytic Reforming and Isomerization/Benzene Saturation Units.

6.2.7 *Sulphur Recovery Units*

The sulphur recovery units (or sulphur block) include a sour water stripping unit (SWS), an amine regeneration unit (ARU), Claus Sulphur Reaction Units (SRU) with Tail Gas treatment units (TGTU) for a recovery of over 99.9% of all sulphur. The produced molten sulphur is converted into pellets in the sulphur forming or pelletizing unit (SFU), which will be conveyed to storage silos.

6.2.8 *Steam Methane Reformer*

6.2.8.1 *The additional hydrogen syngas for FT and the other hydrogen requirements for the Refinery will be met by reforming natural gas in steam methane reforming units (SMR). The syngas produced in the SMR after taking out FT requirements and after shift conversion, will go to a Pressure Swing Adsorption (PSA) unit for raw hydrogen purification.*

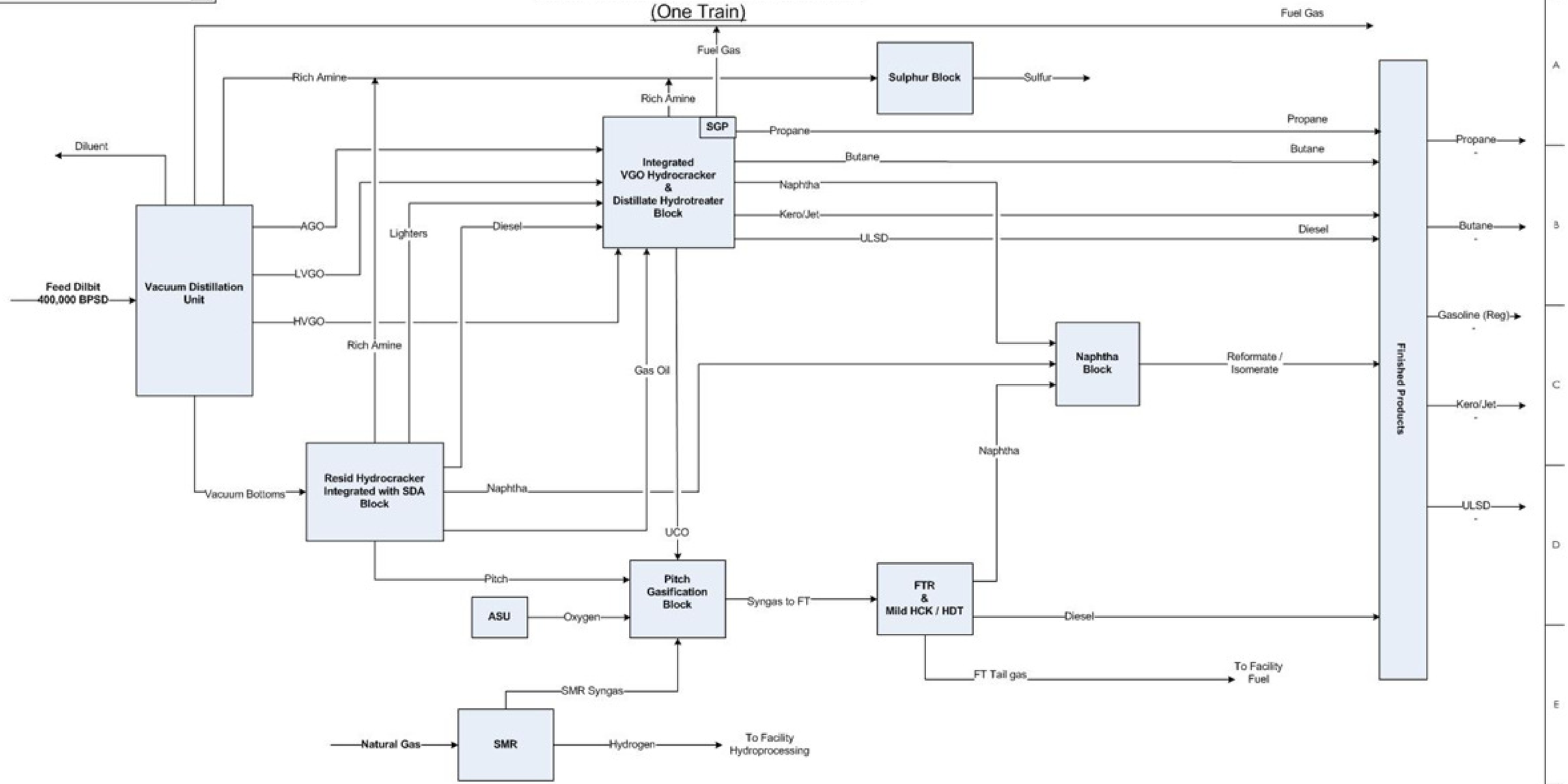
6.2.9 *Air Separation Unit*

The air separation unit will supply oxygen and nitrogen to meet the Refinery requirements. Oxygen will be used in the pitch gasifier and sulphur recovery units, while nitrogen will be used for various blanketing and start-up requirements.

6.2.10 *Flare System*

There will be four flare systems within the refinery; each refinery train possesses a hydrocarbon flare system and an acid gas flare system. The hydrocarbon flare system is envisaged to have separate low and high pressure headers. The acid gas flare system manages flaring requirements from the sulphur block. Flaring will be conducted following the BC Oil and Gas Commission Flaring and Venting Reduction Guideline (BC OGC, 2015).

KITIMAT CLEAN REFINERY SCHEME
(One Train)



NOTES

1. THIS BLOCK FLOW DIAGRAM SHOWS KITIMAT CLEAN REFINERY PROCESSING SCHEME

REVISIONS						
A	ISSUED FOR USE	01/14/2014	D.P.	S.V.	S.V.	P.C.O.

HATCH

KITIMAT CLEAN REFINERY PROJECT

OVERALL PROCESS SCHEME
BLOCK FLOW DIAGRAM

-

REFERENCE DRAWINGS

6.2.11 Tank Farm

The Tank Farm will primarily consist of above-ground bitumen storage tanks, hydrocarbon storage tanks, and intermediate product tanks, listed in Table 6-2. Applicable guidelines (e.g., the "Environmental Code of Practice for Aboveground Storage Tank Systems Containing Petroleum Products" (CCME, 1994) will be followed.

Table 6-2: Summary of Tank Farm Components

Type	Purpose	Number of Tanks	Nominal Capacity per tank (bbl)	Height (m)	Inner Diameter (m)	Type of Tank
Bitumen	Storage for 5 days of Bitumen Deliveries	8	265,000	14.4	61	Internal floating roof with Geodesic roof, activated carbon, and vapour recovery system. Heated
Intermediate Products	Temporary storage	24	varies	varies	Varies	
Refined Fuel Products	Diesel Product for Export	6	450,000	19.2	67	
	Jet Fuel Product for Export	2	350,000	19.2	60	
	Gasoline Product for Export	4	350,000	19.2	59	
Other Refined Fuel Products	Variations of the foregoing	10	varies	varies	varies	

Five days of train deliveries of bitumen will be stored at the Tank Farm in 8 tanks, each with a nominal capacity of 265,000 barrels. The storage tanks for the bitumen will have internal floating roofs as well as vapour recovery systems to capture hydrocarbon emissions which will be sent to the Refinery for processing.

Intermediate products from the refining processes will be stored at the Tank Farm in 24 storage tanks with nominal capacity ranging from 16, 579 bbl to 168,695 bbl. The storage tanks for the intermediate products will also have internal floating roofs with activated carbon and vapour recovery systems.

Additionally, finished products, including refinery diesel product, Fischer-Tropsch diesel, certified diesel, certified jet fuel, gasoline, propane and butane, will be stored in 22 storage tanks. The tanks will have nominal capacities ranging from 15,938 bbl to 242,203 bbl and will also have internal floating roofs with activated carbon and vapour recovery systems.

6.2.12 *Non-hydrocarbon Storage Systems*

The non-hydrocarbon storage systems include all the tanks and pumps required to store make-up water, firefighting water supply, stripped sour water, sour water, amines and boiler feed water (Table 6-3).

Table 6-3: Non-Hydrocarbon Storage Tank Requirements

Services	Number of Tanks	Anticipated Nominal Capacity (bbl)	Height (m)	Inner Diameter (m)
Sour Water	2	47,175	14.4	26
Raw freshwater	2	317,016	14.4	67
Stripped Sour Water	2	47,175	14.4	26
Molten Sulphur Tank	2	3500	14.4	8.50
Refinery Firefighting Water	2	128,646	14.4	43
Marine Terminal Facility Fire Water	2	107,229	14.4	39
Boiler Feed Water	2	296,636	14.4	58
Clean Process Water	4	78,499	14.4	34
De-mineralized Water	4	236,781	14.4	58

An estimated land area of approximately 170 ha is required for the Tank Farm as well as for the corresponding secondary containment systems (e.g., dykes surrounding the tanks).

6.2.13 *Supporting Infrastructure*

6.2.13.1 *Power Generation*

The Refinery will require a power supply of approximately 470 MW which will be supplied by a power and cogeneration facility (“Power Facility”) included in the design of the Refinery complex. The Power Facility consists of the following two key components:

- Two co-generation plants powered by two gas turbine generators each generating up to 120 megawatts (MW) power at ISO ambient conditions; and
- Four steam turbine generators (each generator is capable of producing a maximum of 75 MW).

The two co-generation plants will use refinery gas products, Fischer-Tropsch tail gas and natural gas to produce approximately 240 MW nominal electric power and about 690 tonnes (t) of High Pressure (HP) steam. Some of the HP steam will be used to drive large compressors and pumps in the refinery process units. The remaining excess HP steam from the co-generation plants will be combined with HP steam from the refinery process to drive four steam turbine generators and generate up to 300 MW of electric power and low-pressure steam for refinery use. The co-generation plants will be designed to run continuously during normal operation of the Refinery to meet all of the Refinery's internal power requirements. The Refinery is designed to be self-sufficient with no power imported from the BC Hydro grid during normal operations.

6.2.13.2 Natural Gas, Tail Gas and Fuel Gas System

The natural gas requirements for the Refinery will be supplied by a third party pipeline. A portion of the natural gas will be used for power generation and the remainder will be used to meet Refinery fuel requirements. The balance of fuel gas needed for the Refinery will be produced from the on-site Saturated Gas Plant, and tail gas produced from the Fischer-Tropsch process.

6.2.13.3 Process Water Supply

The Refinery will require 1,666 m^3/hr (250,000 bpd) of make-up process water. The Refinery process, including the Fischer-Tropsch process, steam generation, and gasification will generate about 833 m^3/hr (or 125,000 bpd) of water; an additional 833 m^3/hr (125,000 bpd) will be sourced from groundwater in the vicinity of the Refinery Site. Water will be stored at the Refinery Site in storage tanks sitting on concrete pads before being routed to the on-site raw water treatment plant. The combined water from the Refinery process and the treated raw water will be used to meet cooling water make-up, process water, steam generation, firewater, and potable water requirements for the Refinery.

6.2.13.4 Wastewater Treatment Plant

Wastewater from the Fischer-Tropsch process, gasifiers and the blowdown from the steam system will be directed to a wastewater treatment system. In the wastewater treatment plant, oil will be removed and the water treated by a membrane biological reactor. The wastewater treatment capacity is estimated to treat 925 m^3/hr of dirty process water generated from the Refinery process. Treated waste water will be combined with raw water streams to meet the Refinery make-up water process requirements.

6.2.13.5 Raw Water Treatment Plant

Raw water will be treated by lime softening, clarification and a zeolite softening process. Treated waste water and raw water streams will be combined to meet the Refinery make-up water process requirements. A portion of the treated water, after meeting any process or utility water requirements, will be sent to the boiler feed water treatment where the water is demineralized (through ultra filtration, reverse osmosis and ion exchange) and then used for steam generation. The demineralized water is then sent by high and medium pressure boiler feed water pumps to their respective users. High and medium pressure pumps are then used to send the remaining water to process users within the refinery and for cooling water makeup.

6.2.13.6 Electricity Transmission

The Proponent will tie into the existing BC Hydro 287 kV line for its start-up electrical requirements at the Minette sub-station. An alignment for the transmission line will be defined once BC Hydro's re-routing study is completed. Operational electricity requirements will be supplied by the Refinery processes and excess electricity may be sold to BC Hydro for distribution.

6.2.13.7 Access

Access to the site will be from Highway 37, west along Haisla Boulevard and Third Street, then north along the existing Wedeene FSR for approximately 7 km. The Wedeene FSR will require upgrades and improvements, including widening, some straightening, and substantial re-surfacing to allow heavy equipment and wide loads (e.g., pre-fabricated modules) and other materials to be transported to site during the Construction Phase. Upgrades, de-commissioning and replacement of six existing bridge crossings along the Wedeene FSR may be required (Figure 3-1).

6.2.13.8 Administration Facilities, Offices and Parking

Permanent administration facilities, including offices and parking and maintenance facilities will be established for the Project. These facilities will be located within the Refinery site.

6.2.13.9 Temporary Construction Facilities and Areas

The Project will require the establishment of temporary infrastructure during construction activities. This will include a 6,000 to 7,000 person temporary construction camp, site offices and parking, electricity supply, water supply and storage, fuel and chemical storage facilities, laydown/stockpile areas, facilities for the storage and disposal of waste, sewage treatment facilities and a concrete batch plant. All of these facilities will be located within the Refinery Site.

6.3 Fuel Delivery Pipeline Corridor

The Fuel Delivery Pipeline Corridor consists of three pipelines in a proposed 45 m wide right-of-way to transport processed fuel products to the Marine Terminal Site. The pipelines will be buried and the final width of the ROW will depend on staging, sequencing and construction methodology for installation of the three pipelines as well as factors such as terrain and soil considerations. To accommodate changes in the pipeline alignment, the pipeline footprint includes a 100 m buffer on either side of the center line of the ROW. Surge tanks will be constructed at the downstream end of the pipelines to enable loading of fuel. See Table 6-4 for additional information.

Table 6-4: Preliminary Information on Fuel Delivery Pipelines

	Flow rate (m^3/h)	Pipe Size (inch)	Diameter (inch)	Length (km)
Diesel Pipeline	1.082	18	17.25	20
Jet Fuel pipeline	1.082	18	17.25	20
Gasoline Pipeline	1.082	18	17.25	20

6.4 Marine Terminal Site

6.4.1 Marine Terminal Infrastructure

The Marine Terminal Site consists of a single tanker berth that will be equipped to load fuel onto the VLCCs. The Marine Terminal will also include a utility berth with facilities necessary for accommodating harbour tugs and utility work boats.

The tanker berth will be equipped for loading fuel onto the VLCCs and will include the following components (Figure 3-1**):**

- 1 deep water tanker berth compised of;
  - a central loading platform with loading arms and gangway tower;
  - four breasting dolphins;
  - six mooring dolphins or shore moorings;
  - two access trestles and catwalks;
- 1 utility berth;
- 1 material off-loading facility;
- Dredged/blasted material storage stockpile
- Surge tank facilities; and,

- Supporting Infrastructure:
  - Administration facilities, offices and parking
  - On-site roads

The refined fuels to be shipped by tankers will be pumped through dedicated product pipelines to surge tanks located at the Marine Terminal. There will be no processed fuel storage tanks at the marine terminal so that in the event of a severe earthquake, the potential for spills is avoided.

Due to the deep-water access at the site, dredging requirements at the Marine Terminal Site are anticipated to be minimal. Construction of the Material Terminal Site in-water works will require the need to blast rock benches into the channel side to accommodate the vessel and utility berths, and materials off-loading facility. A total of approximately 30,000 m^3 of material (20,000 m^3 rock; 10,000 m^3 of overburden) will be removed from along the shoreline and stored on-land in a stockpile. Where possible, clean non-Potentially Acid Generating (NPAG) material will be re-used for construction purposes.

6.4.2 Marine Shipping

The manufactured diesel, jet fuel and gasoline products will be sent to Asia by VLCC tankers. One VLCC will leave Kitimat on a 40 day round trip voyage to Asia every four days. About 90 VLCC tanker visits annually are anticipated during full operation. The Proponent will use VLCC's fuelled by either LNG or diesel, and work with VLCC operators to limit idling at the Marine Terminal Site. The marine shipping route to the Triple Island Pilotage Authority is an estimated 286 km in length.

Kitimat Clean will work with Transport Canada and may participate in a voluntary Transport Canada Technical Review Process of the Marine Terminal Systems in Transshipment Sites (TERMPOL) to assess the safety and risks associated with Project-related marine shipping activities and marine terminal operations. The TERMPOL Review Process will identify measures to minimize risks to the marine environment and improve navigation safety, including a consideration of the following:

- Design and operation of the VLCC's;
- Physical characteristics and navigation requirements of the approaches to the terminal;
- Designs of the terminal and associated infrastructure;
- A risk and accident analysis of the VLCC's at the terminal and along the marine shipping route and related mitigating measures;

- Evaluation of proposed mitigation measures and any pollution prevention programs; and
- Adequacy of any contingency plans.

6.4.3 Supporting Infrastructure and Facilities

Supporting infrastructure and facilities for the marine terminal include on-site access roads, administration facilities, office and parking.

6.4.3.1 Access

The Marine Terminal Site will be accessed from Highway 37 by travelling south on Haisla Boulevard to Alcan Road, then turning south at the junction with the Bish FSR for approximately 12 km. The Bish FSR was recently upgraded and does not any require any improvements.

Short segments of site access road(s) will be built within the Marine Terminal Site for movement of equipment and personnel, and emergency access.

6.4.3.2 Administration Facilities, Offices and Parking

Permanent administration facilities, including offices and parking and maintenance facilities will be established in the Marine Terminal Site.

6.4.3.3 Electricity Transmission

The Marine Terminal's maximum power consumption of around 5 MW required during loading of products into VLCCs will be met through power imported from the BC Hydro grid. A new transmission line linking the refinery to the marine terminal is required (Figure 3-1), however, if there are constraints that prevent this, generators will be used to provide electricity for the Marine Terminal Site.

6.4.3.4 PIG Launchers and Receivers

Facilities to allow pigging of the pipelines are required. Typically, PIG launchers and receivers allow the PIG to enter and exit the pipeline and are generally above ground funnel, Y-shaped sections of the pipeline which can be pressurized or depressurized and then safely opened to insert or remove PIGs. Most pigging systems use bidirectional launchers and receivers that can work in either direction. This is important to allow the PIG to be retrieved by the launcher if there is a blockage in the pipeline.

6.4.3.5 Temporary Construction Areas

The Project will require the establishment of temporary areas during construction activities, including areas for water supply and storage, fuel and chemical storage facilities, laydown and topsoil stockpile areas, and facilities for the storage and disposal of waste.

6.5 Waste Discharges

Solid, liquid and gaseous wastes will be generated from various components of the Project. Kitimat Clean will optimize the Project design to minimize the generation of atmospheric emissions and wastes. All waste streams will be identified and classified to help determine the appropriate handling and disposal / management practices for the waste material generated. A brief description of the various waste streams is provided below.

6.5.1 Air Emissions

Atmospheric emissions from the Refinery Site during operations include greenhouse gases, volatile organic compounds, oxides of sulphur (SO_x), oxides of nitrogen (NO_x), ammonia (NH_4), particulate matter (PM_{10}, $PM_{2.5}$), and fugitive emissions (hydrocarbons and dust). Major emission sources will be the stacks for each of the two gas turbines, the four flare stacks within the refinery for hydrocarbon and acid gas flaring (two for each train) and approximately 10 smaller stacks throughout the refinery to vent waste gases from the various process units utilizing fired heaters to generate heat by burning fuel gas. Limited emissions may also result from a waste incinerator. Various abatement technologies will be evaluated and preferred abatement options will be selected to optimize plant performance and ensure the plant meets all applicable ambient air quality objectives and other regulatory requirements. An Air Quality Management Plan will be developed.

6.5.2 Effluent

The refining process has been designed to be a closed-loop system, with all effluent streams from the refinery processes directed to a wastewater treatment system and used to meet the Refinery make-up water process requirements. No effluent generated from the Refinery will be discharged to the receiving environment.

Diversion structures will direct surface runoff to a Surface Water Management Pond which will be used to make-up process water requirements. A Surface Water Management Plan will be developed to manage site water.

6.5.3 Solid and Domestic Waste

Waste generated at the Refinery site shall be managed in accordance with a prescribed waste management hierarchy. Efforts will be made to reduce, reuse and recycle waste before incineration if appropriate. Wastes that cannot be eliminated by these practices shall be transported off-site for final disposal at an approved licensed facility. Incineration is a possible disposal option for combustible, non-hazardous wastes including putrescible wastes (food waste, food oil), paper, wood, sewage sludge, and waste oil (not refinery oil).

Sewage waste will also be generated at the Refinery and Marine Terminal sites, during the construction and operational phases of the Project. All sewage generated on site, will be collected and stored in holding tanks before being transported to an acceptable disposal facility. This temporary system will be implemented until permanent facilities become available for the treatment and disposal of sewage waste. Trucks for the transport of sewage waste will be adequately sealed to prevent any leakages and the unloading facility will be designed to minimize odor generation during transfer of sewage waste. A Solid and Domestic Waste Management Plan will be developed.

6.5.4 Hazardous Waste

Hazardous wastes including medical waste cannot be incinerated as they can produce / release toxins with effects on human health and the environment. All hazardous waste streams will be contained and stored in appropriate facilities and transported and disposed of at an approved hazardous waste management facility. Management of all waste to be generated on site will be addressed in their respective Waste Management Plans.

6.6 Project Phases and Physical Activities

The key phases associated with Project development include construction, commissioning and start up, operations, and closure (de-commissioning and reclamation). The sequence of activities for each of the phases of the Project is outlined below.

6.7 Construction Phase

Construction of the Project is expected to take approximately five years. A number of the site activities will be undertaken in parallel to enable efficient and timely construction of the Project. The sequence of activities to be undertaken during the construction phase is as follows:

- Early Works Site Mobilization – sufficient materials, equipment, labour and management will be mobilized in order to establish the site and prepare for initial works. This initial work will develop access to the site by developing the Bitumen Receiving Facility and rail yard with inter-connect to the CN main rail line, improvements to the Weedene FSR, and tie-in to the BC Hydro grid.
- Bridge upgrades, replacements, and/or de-commissioning as needed along the Wedeene FSR;

- Development of on-site roads to access all Project components from the Weedene FSR.
- Site Establishment and Site Preparation – activities will include geotechnical assessment, surveying, drilling and mapping soil horizons, clearing and grubbing, and salvage and storage of topsoil and subsoil as summarized in Table 6-5.

Table 6-5: Site Establishment and Preparation

Activity	Description
Surveying	Site survey activities including staking the boundaries of the Refinery Site, access road, supporting infrastructure, on/offsite utilities, Fuel Delivery Pipeline Corridor, and Marine Terminal Site.
Clearing and Grubbing	Trees, brush, and other vegetation will be cleared from the Project Site as needed and as approved. Merchantable timber will be cut and decked. Other non-woody vegetation will be mowed. Non-merchantable timber will be burned in accordance with the Open Burning Smoke Control Regulation or chipped. Large stumps and rocks will be removed from the Project sites.
Topsoil and Subsoil Salvage	Topsoil salvage will be conducted at the Project site as needed. Prior to topsoil and subsoil salvage operation, a Closure and Reclamation Plan (including soil salvage) will be developed to guide the soil stripping and stockpiling operation. Topsoil and subsoil will be stockpiled in temporary laydown areas in designated locations that are well drained, marked and free from disturbances to enable progressive site reclamation or following decommissioning.
Site Grading	Undertake earthwork and rock excavation to prepare site to required levels and grades. Establish diversion structures and drainage system for the construction phase to de-water the site foundation. Completion of initial construction accommodation, site offices and supporting temporary infrastructure.
Geotechnical Assessment	Geotechnical assessment activities which include drilling and a geotechnical report which outlines the soil conditions, water tables and soil resistivity. Assessment will define the cut and fill in order for site preparation and foundation design.

Activity	Description
Dredging	Dredging of overburden and rock may be required to accommodate construction of the marine structures. Volume of dredgeate is anticipated to be minimal (approximately 30,000m^3) due to the relatively steep underwater rock slope. Dredged and blasted rock will be stored on-land.

- Construction of the Bitumen Receiving Facility
  - Commencement of civil work and installation of foundations, underground services, utilities and buildings for the rail yard and offloading facility, including the rail tracks;
  - Construction of sidings on the CN Rail mainline to handle refinery rail traffic and tie-in of the CN spur to the rail yard;
  - Construction of the building for the offloading facility and the unloading rack;
  - Installation and termination of aboveground power and instrument cables; and
  - Pre-commissioning of systems, units and areas as required to meet the handover plan.
- Construction of the Refinery and Tank Farm
  - Commencement of civil work and installation of foundations, underground services and utilities and buildings for process plant, equipment and modules;
  - Construction of the plant process buildings;
  - Delivery of all pre-fabricated components of the Refinery facility, including Pre-Assembled Units (PAU's), Pre-Assembled Racks (PAR's), equipment skids etc.;
  - Mechanical and structural erection – commencement of process module placement and hook up; Installation of the remaining Refinery components, and storage tanks;
  - Construction of the warehouses, workshops, offices;
  - Setting of main equipment such as compressors, flare stacks, gas turbines and generators;
  - Laying of cables and connection of above-ground power and instrument cables including those to substations, field auxiliary rooms, warehouses, workshop and offices as part of the required electrical and instrumentation works; and
  - Pre-commissioning of systems, units and areas as required for meeting the handover plan; and commissioning in process plant sequence.

- Construction of the Fuel Delivery Pipelines Corridor to the Marine Terminal Facility
  - Right of way (ROW) preparation, including culvert installations at water-course crossings as needed;
  - Site preparation including vegetation clearing, rock or material removal, grading, ditching; paving, grading and levelling;
  - Installation of Fuel Delivery Pipelines including pipe laying and filling;
  - Pre-commissioning.
- Construction of the Marine Terminal Facility
  - Clamshell dredging of overburden and blasting of rock materials to accommodate construction of the marine structures (berths, material offloading facility).
  - Commencement of civil work and installation of foundations, underground services and utilities;
  - Construction of utility berth and vessel berth;
  - Construction of Material Offloading Facility capable of receiving pre-fabricated modules, heavy plant and equipments;
  - Installation of piping and electrical infrastructure; and
  - Pre-commissioning.
- Removal of construction facilities and infrastructure where not required in the future, and
- Site cleanup and landscaping of land based facilities and progressive reclamation of construction areas.
- Transportation of materials, supplies, equipment, and personnel to the Project Site via road, rail, and ship.

6.8 Commissioning and Start Up Phase

Commissioning and start-up activities will be undertaken at various stages following installation of the processing facilities and associated infrastructure to ensure equipment and systems supporting the major components are functioning efficiently and safely.

Prior to operations, a staged commissioning plan including detailed testing and start-up procedures will be implemented to allow functional testing and verification of the following Project Components:

- Bitumen Receiving Facility
  - Bitumen unloading system.
  - Steam heating system.
- Refinery
  - Refinery Processing Units:
    - Atmospheric Distillation Unit (ADU) & Vacuum Distillation Unit (VDU)
    - Resid Hydrocracker
    - Solvent Deasphalting Unit (SDA)
    - Secondary Resid Hydrocracker
    - Vacuum Gas Oil (VGO) Hydrocracker
    - Distillate Hydrotreater (DHT)
    - Resid Gasifier & Air Separation unit (ASU)
    - Steam Methane Reformer (SMR)
    - Naphtha Block(Naphtha Hydrotreater, Naphtha Splitter, Light Naphtha Isomerization, Heavy Naphtha Reformer)
    - Sulphur Block(Amine Regeneration unit (ARU), Sour Water Stripper (SWS), Sulphur Recovery Unit(SRU) & Tail Gas Regeneration unit (TGTU)
    - Fischer-Tropsch section for the production of additional distillate using syngas.
    - Fischer-Tropsch distillate mild Hydrocracker to produce diesel.
  - Tank Farm components including hydrocarbon & non-hydrocarbon storage facilities & pumping systems.

- Fuel Delivery Pipeline
  - The pipelines will be cleaned and tested using inline devices called pigs. Pigs are propelled through the pipelines with manifolds installed at either end. Any liquids or solids collected in the pipelines will be collected and disposed of according to regulations; and
  - The pipelines will be pressure tested using hydrostatic or pneumatic methods. Hydrostatic testing fills the pipelines with water, held at high pressures, and will be checked for leaks. Once testing is done, the water is released by pushing pigs through the pipe with air. The test water will be discharged according to regulations. Pneumatic testing uses high pressure air to monitor for leaks. After testing, the test air will be released into the atmosphere and the pipeline will be dried.
- Marine Terminal
  - Product facilities: Diesel & Gasoline product system; and
  - Hydro-testing of piping & vessels.
- Supporting Infrastructure
  - Utilities Facilities: Plant & Instrument Air System, Natural Gas , Nitrogen System, Fuel Gas System, Steam Generation (Heat Recovery Steam Generation), Power Generation (Gas Turbine), Boiler Feed Water System, Raw Water System, Hydrocarbon & Sour flare system, Vapour recovery system, Gas & Fire Protection System, groundwater wells, waste water treatment, etc.

6.9 Operations Phase

The operational phase of the Refinery is expected to be at least 50 years. The following key activities will occur for the various Project components during the operations phase of the Project:

- Bitumen Receiving Facility
  - 24/7 shift operation of the receiving rail yard will be required to unload a unit train every 4 hours. Unloading entails shunting cars into steel sheds, attaching live steam pipes to heat the bitumen to approximately 60 degrees C, draining it out of the cars, and reforming the unit trains for return to Alberta.
  - Maintenance of rail cars if required will be done in a third party railcar plant.
- Refinery
  - The Refinery will produce processed fuels from the bitumen through a number of processes. The finished products will be stored at the Refinery for final certification before being routed to the Marine Terminal Site by the Fuel Delivery Pipelines Corridor for export;
  - Ongoing upgrading of refinery processes and equipment as new technology is introduced or specifications for feedstocks or finished inventory change,
  - Ongoing maintenance of Refinery and Tank Farm facilities. The reactor catalyst will be replaced as per catalyst life recommended by manufacturers and operating experience of the Refinery and regular equipment cleanings will be undertaken; and
  - Major maintenance shutdown of the Refinery and Tank Farm facilities approximately every five years.
- Fuel Delivery Pipeline Corridor
  - The pipeline ROW will be clearly marked with signs and post markings at public roads, watercourse crossings, and other areas as required. Monitoring activities will include: electronic inspection using pigs; periodic surface inspections of the ROW, valve monitoring and servicing, vegetation control, investigation and control of encroachment from third parties, and maintenance of above ground facilities.

- Marine Terminal Site
  - Ongoing maintenance of Marine terminal facility
  - Shipping of processed fuel products for export markets
  - Maintenance dredging as needed
- Supporting Infrastructure
  - Operation of utilities, including power, nitrogen, air, water treatment, wastewater treatment;
  - Associated safety related flaring of gas. Gas leak detection including hydrogen & fire protection system; and
  - Waste management and disposal.

6.10 Closure and Decommissioning Phase

Where possible, throughout the construction and operations phases, progressive reclamation activities will occur. A Closure and Reclamation Management Plan will be developed to guide decommissioning, reclamation, and closure activities. Closure activities will comply with the laws, regulations, and standards in effect at that time.

7. Environmental Setting

The Project is located between two parallel mountain belts (the discontinuous St. Elias-Insular mountains and the Coast-Cascade mountains) with Lakelse Lake to the north. To the south of the Project is the Kitimat Arm of the Douglas Channel, a deepwater fjord. Figure 7-1 provides an overview of parks, protected areas and environmental features in the regional area of the Refinery Site. The closest provincial park, Kitimat River Park is located about 3.5 km to the east of the Refinery Site. Gitnadoiks River Provincial Park is located approximately 16 km west of the Project Site. There are five registered traplines that intersect the Project footprint (Figure 7-1).

The marine shipping route passes through Humpback Whale Critical Habitat and Potential Killer Whale Critical Habitat. In the vicinity of the marine shipping route there are a number of bird colonies, commercial fishing areas, and marine protected areas (Figure 4-6).

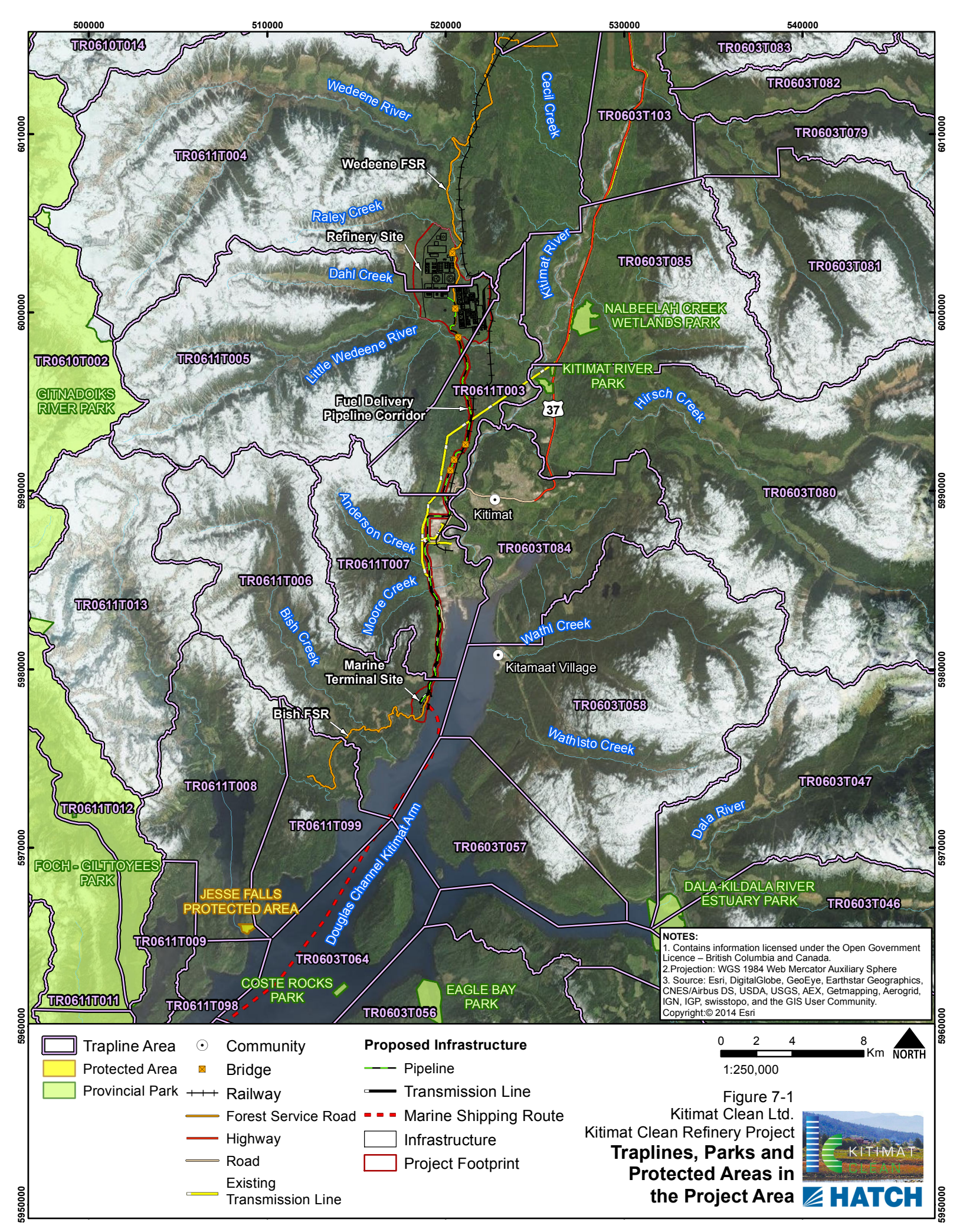


Figure 7-1
Kitimat Clean Ltd.
Kitimat Clean Refinery Project
Traplines, Parks and Protected Areas in the Project Area

7.1 Climate and Air Quality

Kitimat Valley is influenced by maritime inflows from the Pacific Ocean that result in mild temperatures year round. Average summer temperatures are about 20°C while the average winter temperature is about 0°C. Average annual precipitation ranges from 2,200 to 2,300 millimeters (mm) with the majority occurring in winter in the form of snowfall (300 mm from November – March) while summer months are comparatively drier (60 to 90 mm). Higher wind speeds are recorded in the winter months. The local meteorology in the Kitimat Valley is strongly controlled by the north-south valley axis. Outflow winds from the north dominate during the winter months, funneling air emissions down the Douglas Channel. Summer months see inflow winds from the south taking emissions up-valley towards Terrace. Valley haze has been observed associated with inflow conditions (Environment Canada 2015).

The Kitimat airshed has been extensively studied in recent years due to existing and proposed industrial development activities in the Kitimat area. Emissions from the existing Rio Tinto aluminum smelter cause exceedances of BC Level A sulphur dioxide (SO_2) ambient air quality objectives (AAQOs). Due to climate and topographic constraints, dispersion of criteria air contaminants (CACs) can be poor in the airshed. There are five continuous ambient air quality monitoring stations within a 50 km radius of the Project monitoring carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), particulate matter ($PM_{2.5}$ and PM_{10}), sulphur dioxide (SO_2) and hydrogen sulphide (H_2S).

7.2 Aquatic Resources

7.2.1 Freshwater Environment

The Project is situated within the Kitimat River watershed catchment which drains an area of 1,456 km^2 into the Kitimat Arm of the Douglas Channel. The Project Site has been sited to avoid watercourses as much as possible, however avoiding all watercourse crossings is not possible. Raley Creek and a number of unnamed tributaries of the Wedeene River are located immediately north of the refinery Project footprint, while a number of unnamed tributaries of the Little Wedeene River are located south of the refinery Project footprint (Figure 3-1). Numerous un-named tributaries cross the Refinery Site (Figure 3-1). Both the Wedeene River system and the Little Wedeene River system are fish-bearing and provide habitat for Chinook, Chum, Coho and Pink Salmon; Rainbow Trout; and Dolly Varden, while the Wedeene River also supports Sockeye Salmon (FISS 2015). The Kitimat River, downstream of the Refinery Site is also fish bearing with the following species observed: Cutthroat, Rainbow and Bull Trout; Chinook, Chum, Coho, Pink and Sockeye Salmon; and Dolly Varden (FISS 2015).

The Fuel Delivery Pipeline Corridor crosses a number of tributaries of the Kitimat River, including Little Wedeene River, Anderson Creek and Moore Creek (Figure 3-1), and a number of unnamed tributaries. Notable fish species found in these watercourses collectively include Chinook, Chum, Coho, Pink and Sockeye Salmon; Cutthroat and Rainbow Trout; and Dolly Varden (FISS 2015).

Two unnamed streams cross the Marine Terminal Site and drain into Kitimat Arm.

The fish-bearing status of all streams within the Project footprint will be assessed during the EA process.

7.2.2 Marine Environment

The Marine Terminal is located in the Kitimat Arm of Douglas Channel. Tides in the Kitimat Arm area are classified as mixed with primarily semi-diurnal components (i.e., two low and two high tides a day). Marine riparian vegetation, which is dominated by Western redcedar and Western hemlock, immediately borders the intertidal zone where habitat types are found to primarily consist of rock walls and ramps with some shallow platforms as well as boulder beaches. Rockweed and green algae (*Ulva sp.*) are dominant seaweeds in mid and upper intertidal zones, while red algae with occasional kelp species cover the lower intertidal zone. These species meet the definition of the marine plants under s.47 of the *Fisheries Act*. Subtidal substrate is predominantly bedrock with overlaying surface sediments, which consists of fines (primarily gravel and silt) and boulders. Filamentous red algae species are the predominant macrophytes in the subtidal zone. Eelgrass beds are primarily found in the Kitimat River estuary to the northeast.

The marine waters surrounding the Project and its shipping activities support diverse marine species. Aquatic species present in the Douglas Channel and the local shipping route beyond include Coho, Chum, Pink, Sockeye and Chinook Salmon; Pacific Herring; English Sole and Halibut; Dungeness Crab, shrimps and bivalves.

Marine mammals that frequent the Douglas Channel and the shipping route include Killer Whale (Resident and Bigg's), Humpback Whale, Dall's porpoise, Harbor Porpoise, Steller Sea Lion and seals.

7.2.3 Aquatic Species at Risk

Aquatic species of conservation concern in the water bodies in the vicinity of the Project are listed in Table 7-1 (BC CDC 2015a). Kitimat River's eulachon population experienced significant decline in the 1990s due to industrial effluents discharged into the river (COSEWIC 2011). Fisheries and Oceans Canada (DFO) has implemented various measures to manage the eulachon fishery since 1995, however the eulachon population in Kitimat River is yet to recover. Currently, eulachon is listed as "Endangered" by the Committee on the Status of

Endangered Wildlife in Canada (COSEWIC) and is Blue listed in BC. Bull Trout occurs in the Kitimat River and is listed as “Special Concern” by COSEWIC, and is also a blue-listed species in BC. Cutthroat Trout, is blue-listed in BC. Northern Resident Killer Whale is listed as “Threatened” by COSEWIC, designated as “Threatened” under the *Species at Risk Act* (SARA; 2002) and red-listed in BC. Harbour Porpoise, Sea Otter and Sea Lion are listed as “Special Concern” by COSEWIC, designated as “Special Concern” under SARA, and blue-listed in BC. Northern Pacific Humpback Whale is listed as “Special Concern” by COSEWIC, designated as “Threatened” under SARA, and blue-listed in BC.

Table 7-1: Aquatic Species of Conservation Concern in the Project Area

Scientific Name	English Name	BC[11]	COSEWIC[12]	SARA	Location
Salvelinus confluentus	Bull Trout	Blue	Special Concern	-	Kitimat River
Oncorhynchus clarkii clarkii	Cutthroat Trout	Blue	-	-	Kitimat River, Lone Wolf Creek, Raley Creek Wedeene River and Little Wedeene River, Douglas Channel
Thaleichthys pacificus	Eulachon	Blue	Endangered	-	Kitimat River
Phocoena phocoena	Harbour Porpoise	Blue	Special Concern	Special Concern	Douglas Channel
Enhydra lutris	Sea Otter	Blue	Special Concern	Special Concern	Douglas Channel
Eumetopias jubatus	Steller Sea Lion	Blue	Special Concern	Special Concern	Douglas Channel
Megaptera novaeangliae	Humpback Whale	Blue	Special Concern	Threatened	Douglas Channel
Orcinus orca	Northern Resident Killer Whale	Red	Threatened	Threatened	Douglas Channel

[11] Provincial status
Red-list: Extirpated, Endangered, or Threatened;
Blue-list: Special Concern

[12] *Federal status
COSEWIC - Committee on Status of Endangered Wildlife in Canada;
SARA - Species At Risk Act;
E: Endangered; T Threatened; SC Special Concern;
1: Schedule 1 of SARA
(Source: BC CDC 2015a)

7.3 Terrestrial Ecology

The proposed Project is located within the Ecodistrict No. 945, Coastal Gap Ecoregion (No. 191) of the Pacific Maritime Ecozone, and within the Coastal Western Hemlock (CWH) Biogeoclimatic (BGC) Zone. While the Marine Terminal and the Fuel Delivery Pipeline fall within the Submontane variant of the Very Wet Maritime subzone (CWHvm1), the Refinery falls within the Submontane variant of the Wet Submaritime subzone (CWHws1). CWHws1 is adjacent to CWHvm1 at similar elevations inland.

Forests of CWHvm1 are typically comprised of Western hemlock, Amabilis fir and Western red cedar, along with Sitka spruce and yellow cedar. Typical understory vegetation includes a well-developed shrub layer dominated by conifer regeneration and blueberries and a sparse herb layer of bunchberry, deer fern and spiny wood fern. A carpet of feather and leafy mosses is common. Drier sites are typically comprised of tree species of Western hemlock and Western red cedar with common understory vegetation including blueberries, salal, spiny wood fern, oak fern and sword fern. Wetter sites dominate the landscape of CWHvm1. These sites are typically comprised of tree species of Western red cedar, Amabilis fir and Sitka spruce with understory vegetation including blueberries, devil's club, salmonberry, skunk cabbage, foamflower, spiny wood fern, oak fern, deer fern, sphagnum and other mosses. Floodplain sites are typically comprised of tree species of Sitka spruce and black cottonwood with understory vegetation including salmonberry, devil's club, red-osier dogwood, stink currant, willows, ferns and mosses.

Forests of CWHws1 are typically comprised of Western hemlock, Amabilis fir and Western redcedar, along with Sitka spruce and lodgepole pine. Shrub layers are usually well developed with conifer regeneration and Alaskan blueberry, among others, although some sites may have little understory development. Major herb species include bunchberry, five-leaved bramble and Queen's cup. Drier sites are typically comprised of tree species of Western hemlock and lodgepole pine with poorly developed or scattered shrub and herb layers, which may include Kinnikinnick and draft blueberries. Feather moss is common in drier sites. Wetter sites are typically comprised of tree species of Western redcedar, Amabilis fir and Sitka spruce with shrub and herb species including devil's club, salmonberry, blueberries, red-osier dogwood, highbush-cranberry, skunk cabbage, foamflower, five-leaved bramble, oak fern, spiny wood fern. Moss layer includes step moss, lanky moss, leafy mosses and sphagnum mosses in wetter sites. Floodplain sites are typically comprised of tree species of Sitka spruce and black cottonwood. Major shrub and herb species include salmonberry, devil's club, red-osier dogwood, red elderberry and willows.

In both CWHvm1 and CWHws1, red alder and black cottonwood are common in disturbed sites where mineral soils are exposed. There is one Old-Growth Management Area (Legal) found on the Refinery Site (Figure 7-2). Bog Adder's-mouth Orchid is also known to potentially occur in the Project area.

520000
530000
6000000
5990000
5980000
Wedeene FSR
Raley Creek
Refinery Site
Dahl Creek
Kitimat River
Little Wedeene River
Fuel Delivery Pipeline Corridor
37
Anderson Creek
Kitimat
Moore Creek
Wathl Creek
Kitamaat Village
Marine Terminal Site
Bish Creek
Bish FSR
Wathlsto Creek
Douglas Channel Kitimat Arm
Wedeene River
Bowbyes Creek
1:50,000
Marine Terminal Site
1:15,000

NOTES:
1. Contains information licensed under the Open Government Licence – British Columbia and Canada.
2. Projection: NAD 1983 UTM Zone 9N
3. Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Species and Ecosystems at Risk

Animal
- Coastal Tailed Frog (Blue Listed)

Plant
- Cryptic Paw (Blue Listed)
- Oldgrowth specklebelly (Blue Listed)
- Bog Adder's-mouth Orchid (Blue Listed)
- Eminent Bluegrass (Red Listed)
- White Adder's-mouth Orchid (Blue Listed)

- Old Growth Management Area (Legal)
- Proposed Grizzly Bear Habitat

Ungulate Winter Range
- Moose (M-ALAL)
- Mountain Goat (M-ORAM)
- Potential Critical Habitat for Marbled Murrelet
- Waterbody
- Wetland
- Watercourse

- Community
- Bridge
- Railway
- Forest Service Road
- Highway
- Road
- Existing Transmission Line

Proposed Infrastructure
- Pipeline
- Transmission Line
- Marine Shipping Route
- Infrastructure
- Project Footprint

0 0.75 1.5 3 Km

NORTH

1:110,000

Figure 7-2
Kitimat Clean Ltd.
Kitimat Clean Refinery Project
Terrestrial Environmental Setting in the Project Area

KITIMAT CLEAN
HATCH

7.3.1 *Wetlands*

Wetlands are present in the general Project area and on the Refinery Site, with limited occurrences along the Fuel Delivery Pipeline Corridor (Figure 7-2). The most common wetland types are non-forested fens and bogs, which occur in scattered depressions and occasionally on slopes. Non-forested fens are typically dominated with willows, sedges and grasses, while sphagnum mosses are common but not dominant. In non-forested bogs, sphagnum mosses are dominant with the presence of dwarf lodgepole pine, Labrador tea and other ericaceous shrubs. The presence of red or blue-listed wetlands within the Project footprint with the potential to occur in the CWHws1 (e.g., western red cedar-sitka spruce-skunk cabbage wetland swamp) and CWHvm1 (e.g., sitka willow-sitka sedge wetland swamp) biogeoclimatic zones will be determined during field studies.

7.3.2 *Rare Plants and Ecological Communities at Risk*

BC CDC (2015b) identifies seven species of conservation concern within a 50 km radius from the Project area, including:

- eminent bluegrass (Red-listed);
- cryptic paw (Blue-listed and “Special Concern” on Schedule 1 of SARA);
- bog Adder’s-mouth orchid (Blue-listed);
- lance-fruited Draba (Blue-listed);
- smoker’s lung (Blue-listed);
- bog rush (Blue-listed); and
- white Adder’s-mouth orchid (Blue-listed).

These rare plant species could potentially be found on the Project Site although none of them are currently known to occur on the site (Figure 7-2).

BC CDC (2015a) also lists 19 plant communities of conservation concern in the CWHws1 and CWHvh1 and Kalum Forest District, including:

- amabilis fir - Sitka spruce / devil's club (Blue-listed);
- amabilis fir - western red cedar / devil's club Moist Submaritime (Blue-listed);
- amabilis fir - western red cedar / oak fern (Blue-listed);
- black cottonwood - red alder / salmonberry (Blue-listed);
- buckbean - slender sedge (Blue-listed);
- dune wildrye - beach pea (Red-listed);

- Labrador-tea / western bog-laurel / peat-mosses (Blue-listed);
- lodgepole pine / kinnikinnick (Red-listed);
- shore sedge - buckbean / peat-mosses (Blue-listed);
- Sitka sedge / peat-mosses (Red-listed);
- Sitka spruce / salmonberry Very Wet Maritime (Red-listed);
- Sitka spruce / salmonberry Wet Submaritime 1 (Red-listed);
- Sitka spruce / salmonberry Wet Submaritime 2 (Blue-listed);
- Sitka willow / Sitka sedge (Blue-listed);
- western hemlock - amabilis fir / deer fern (Blue-listed);
- western hemlock - lodgepole pine / red-stemmed feathermoss (Blue-listed);
- western hemlock - western red cedar / salal Very Wet Maritime (Blue-listed);
- western red cedar - Sitka spruce / skunk cabbage (Blue-listed); and
- western red cedar - western hemlock / sword fern (Blue-listed).

7.4 Wildlife Resources

Wildlife habitat in the Project area supports a number of large and small mammal species, including blacktailed deer, moose, grizzly bear, black bear, Pacific marten, striped skunk and snowshoe hare. Documented amphibian species include coastal tailed frog, Columbia spotted frog, northwestern salamander, long-toed salamander, and western toad. A variety of migratory and resident species of songbirds, raptors, waterfowl, and seabirds also occur in the area. A number of migratory bird species listed under the *Migratory Birds Convention Act* (1994) potentially occur in the Project area, including Canada goose, western sandpiper, greater white-fronted goose, mallard, mew gull, herring gull, California gull, and common merganser. The Refinery Site and the northern portion of the Fuel Delivery Pipeline Corridor overlaps with moose Ungulate Winter Range (u6-009) (Figure 7-2). Mountain goat ungulate winter range occurs west of the Refinery Site. Potential marbled murrelet critical habitat and proposed grizzly bear critical habitat is distributed widely across the Project area, including across the Refinery Site.

Wildlife species of conservation concern known to occur in the Kitimat valley are listed in Table 7-2.

Table 7-2: Wildlife Species of Conservation Concern in the Kitimat Valley

Scientific Name	English Name	BC List[13]	COSEWIC[14]	SARA
Mammals				
Ursus arctos	Grizzly Bear	Blue	SC	
Amphibians				
Anaxyrus boreas	Western Toad	Blue	SC	1-SC
Ascaphus truei	Coastal Tailed Frog	Blue	SC	1-SC
Birds				
Ardea herodias fannini	Great Blue Heron, *fannini* subspecies	Blue	SC	1-SC
Brachyramphus marmoratus	Marbled Murrelet	Blue	T	1-T
Euphagus carolinus	Rusty Blackbird	Blue	SC	1-SC
Hirundo rustica	Barn Swallow	Blue	T	
Megascops kennicottii kennicottii	Western Screech-Owl, *kennicottii* subspecies	Blue	T	1-SC

[13] Provincial status
Red-list: Extirpated, Endangered, or Threatened;
Blue-list: Special Concern

[14] Federal status
COSEWIC - Committee on Status of Endangered Wildlife in Canada;
SARA - Species At Risk Act;
E: Endangered; T Threatened; SC Special Concern;
1: Schedule 1 of SARA
(Source: BC CDC 2015a)

8. Potential Effects

8.1 Air Quality and Climate

Construction activities associated with the Project that will generate air emissions include site preparation, ground disturbance, operation of construction equipment and vehicles. These activities will generate carbon dioxide (CO_2), carbon monoxide (CO), and particulate matter (PM_{10} and $PM_{2.5}$). These effects are anticipated to be short term and localized. Dispersion of criteria air contaminants will be modelled during the EA process, and adequate mitigation measures identified.

Emissions generated during the Operations Phase at the Refinery Site are expected to be greenhouse gases (CO_2e), CO_2, CO, volatile organic compounds (VOCs), sulphur oxide (SO_x), nitrogen oxides (NO_x), ammonia (NH_4), PM_{10}, $PM_{2.5}$, and fugitive emissions (hydrocarbons and dust).

SO_x emissions will be reduced through the use of amine scrubbers to remove sulphur from the feed gas. Almost all (99.9%) of all sulphur will be recovered during processing by three Claus Units and Tail Gas Cleanup facilities.

CO emissions will result from the incomplete combustion of natural gas in process heaters and furnaces. These emissions are low due to the use of clean fuels. For the larger furnaces, the Proponent proposes the application of SCR technology with specific catalysts to further reduce CO emissions.

The sources of particulate emissions include furnaces, boilers, and flares. Furnaces and boilers will burn primarily natural gas which will significantly minimize PM emissions. Flares will be designed for smokeless operation, and gas recovery systems will minimize flaring events.

Emissions of VOCs and fugitive hydrocarbons will be minimized by enclosing storage tanks and fitting them with vapour recovery systems. Pumps and compressor seal designs that provide multiple seals and barriers, the use of low emission packages for valves, and vapour recovery systems for all loading and handling operations will significantly reduce fugitive emissions. A leak detection and repair program (LDAR) will be implemented.

Greenhouse gas emissions (CO_2) from the Refinery are primarily as a by-product of the manufacturing of hydrogen and from the fired heaters. Early in Project planning, a decision was made to change the Project design away from the use of delayed/fluidized coker and coke gasification technology toward Fischer Tropsch technology, which in total will reduce CO_2 emissions from 33 million tonnes per year to 10 million tonnes per year. Additionally, CO_2 emissions will be minimized by:

- Maximizing the recovery of energy from the process units and co-generation;
- Designing furnaces and heaters to maximum efficiency;

- Providing flare gas recovery systems;
- Using co-generation for the production of steam and power to minimize fuel consumption; and
- Integrating power generation with hydrogen manufacture to minimize fuel needs.

Physical activities at the Marine Terminal Site will emit CACs and GHGs, principally from loading and maneuvering activities of ships and tugboats at the terminal, using main engines and auxiliary engines. Fugitive dust from travel on unpaved road surfaces, and mobile emissions from the use of light and heavy-duty vehicles during construction and operation of the Marine Terminal Site may also occur. Changes in air quality as a result of the Project will be predicted during the EA process. Critical load estimates for acidification and eutrophication of mineral soils and terrestrial ecosystems will also be undertaken. An Air Quality Management Plan to minimize potential effects on air quality will be implemented.

8.2 Noise

During construction activities at both the Refinery Site and Marine Terminal Site, it is anticipated that noise will be generated during site clearing and foundation preparation; material delivery; blasting (if required); and from the use of equipment and vehicles. Noise levels will also increase during operations due to continuous gas combustion, movement of railcars, trucks and other vehicles. Noise modeling to evaluate potential effects on receptors (humans, wildlife) in the area of the Project during construction, operations, and de-commissioning will be completed as part of the EA process.

Initiatives and technologies to mitigate noise levels will be incorporated into the design of the Project and standard operating procedures to minimize noise emissions during all phases of the Project will be implemented using a Noise Management Plan.

8.3 Soils and Terrain

Construction activities such as site clearing and foundation preparation, earthworks and blasting (if required) may physically disturb and alter the soils and terrain at the Refinery Site, Marine Terminal Site and along the Pipelines Corridor. Temporary and permanent laydown areas to store topsoil and excavated materials will be identified prior to construction.

Geotechnical assessment of the Project Site is anticipated to identify areas of geotechnical concern (e.g., ecologically valuable soil, geohazards, clay stability concerns).

Emissions of Criteria Air Contaminants (e.g., NOx, SOx) from air discharges have the potential to result in long-term acidification and eutrophication of mineral soils in the Kitimat region.

Detailed mitigation measures, in addition to a Construction Management Plan, will be prepared to minimize adverse effects of Construction and Operations on soils and terrain. Air quality dispersion modeling results will be used to assess the effects of the Project on soil acidification and eutrophication.

8.4 Groundwater

In addition to water generated from the refining process, groundwater will be needed to make-up the remaining balance of water requirements for the refinery. Approximately 840 m^3/hr (125,000 bpd) of groundwater during Operations will be needed, which has the potential to affect groundwater supply for other users in the regional area.

Effects on groundwater quality are not anticipated as a result of the Project; the Tank Farm will be equipped with primary and secondary containment and an Emergency Spill Response Plan will be implemented. Requirements under the *Water Sustainability Act* will be met for groundwater protection and abstraction.

8.5 Surface Water

The Project has the potential to affect both surface water quantity and quality. The Refinery will be designed to be a closed loop system and will minimize the use of fresh water and maximize the recycle and reuse of water.

During construction activities, on-site streams will need to be diverted and the site de-watered to support site preparation and foundation activities. Diversion of clean surface water around the perimeter of the Refinery Site and Marine Terminal Site will be required. Re-routing surface water will physically alter flow levels and pathways of natural drainages both within and downstream of the Project footprint. For example, annual, monthly, peak and low water flows may either increase or decrease as a result of the Project until diversion structures are de-commissioned during closure. Drainages will be re-aligned to follow the natural drainage pathway during reclamation activities.

Surface water quality degradation in streams near the Project Site may occur as the result of stormwater run-off and discharge, and nitrogen residues from explosives during blasting. Treated process water will be re-used as process make-up water and will not be released to the receiving environment.

A Stormwater Management Plan will be implemented to manage run-off and control erosion and sedimentation during Construction site preparation, clearing, and earthworks activities. A system of force mains and pumps, or gravity-fed pipelines will gather site run-off and pump it for containment in a Surface Water Management Pond. Stormwater will be stored to allow settling of suspended particles and will be used in the refining process.

8.6 Fish and Aquatic Resources

The Project has the potential to adversely affect Aboriginal, Commercial, or Recreational fish and fish habitat as defined under the *Fisheries Act*, and other aquatic resources (i.e., benthic invertebrates, sediment quality) in streams in the local and regional Project area (e.g., Little Wedeene River, Raley Creek, unnamed tributaries, Kitimat River) as a result of:

- physical loss, alteration or disturbance to fish habitat from site preparation, clearing, fish salvage, and crossings (bridge upgrades, pipeline and transmission line crossings);
- increased or decreased stream flows with the potential to affect fish habitat productivity (e.g., flooding, scouring);
- surface water degradation (high turbidity, total suspended solids, nitrogen residues, accidental spills, lake acidification); and
- sedimentation and erosion of fish habitat.

A detailed assessment of potential adverse effects to fish and fish habitat and aquatic resources will be undertaken during the EA process. Project activities will adhere to the Skeena Region Reduced Risk In-Stream Work Windows and Measures (DFO, 2005) and pipeline watercourse crossings will be constructed according to DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat (DFO 2013). Where possible, pipelines will be routed to avoid waterbodies. If required, a Fish Habitat Offsetting Plan will be developed in discussion with DFO and a Fish and Aquatic Resources Management Plan will be developed and implemented for all Project phases to mitigate the potential for significant adverse effects.

8.7 Terrestrial Ecology

The construction and operation of the Project is expected to result in the direct loss, alteration (e.g., edge effects, foliar injury) and fragmentation of vegetation resources through site preparation clearing and earthworks activities; the introduction of invasive species; and air and fugitive emissions. Potential effects on ecological communities at risk (i.e., wetlands, old-growth forests, rare plants) will be evaluated and a Vegetation Management Plan will be implemented to mitigate adverse effects.

8.8 Wildlife and Wildlife Habitat

The Project area supports a variety of terrestrial wildlife species and provides suitable staging and overwintering habitat for migratory birds, waterfowl and shorebirds. Potential effects on terrestrial wildlife and wildlife habitat and migratory birds (as listed under the *Migratory Bird Convention Act*) associated with Project construction and operation include changes in wildlife habitat availability (including habitat loss and habitat alteration), sensory disturbance to wildlife, mortality or injury, and an increased potential for bear-human conflicts. A detailed assessment of adverse effects to terrestrial wildlife and wildlife habitat, aquatic birds, and

species at risk will be undertaken during the EA and detailed mitigation measures proposed to minimize these effects.

8.9 Marine Environment

Construction and operation activities of the Project has a potential to adversely affect marine plants (as defined in s. 47 of the *Fisheries Act*), fish and marine mammals through site preparations, clearing, blasting and dredging, and piling activities associated with the marine structures and shipping activities. Potential effects include changes in sediment and water quality from maintenance dredging, fish habitat alteration as a result of marine terminal berth structures and dredging activities, and direct mortality or physical injury or sensory disturbance to fish and marine mammals from elevated underwater noise as a result of pile driving and vessel movement. Marine foreshore disturbance has the potential to affect fish, plants, animals, invertebrates and their habitats. A detailed assessment of adverse effects to the marine environment will be undertaken during the EA process and mitigation measures will be proposed to minimize effects. Where possible, in-water works will be conducted during appropriate species timing windows.

8.10 Economic

The majority of economic effects from the Project are expected to be beneficial and are described above in Section 1.2. Adverse economic effects may result from:

- Effects of changes to labour availability for the proposed Project as well as other businesses and Projects in the region;
- Indirect effects of increased marine traffic on commercial fishing and tourism opportunities; and
- Loss of income after the Project is de-commissioned.

8.11 Social

The Project has the potential to result in beneficial and adverse social, land use, and visual quality effects to local and regional communities and commercial tenure holders in the Project area. Potential adverse effects include:

- Project-induced demographic changes on local community networks and culture;
- Project-induced demographic changes on local services, amenities, and infrastructure including health care, education, temporary housing, transportation, emergency services, and recreational facilities;
- Reduced access and loss of user enjoyment for recreation, tourism and navigational capabilities;

- increased local traffic and effects on public safety;
- Effects on visual quality of existing viewscapes for the public, recreational users, and Aboriginal groups as a result of activities such as flaring, VLCC tanker shipping and associated marine vessel operation; and.
- Effects of Project-related activities on residents, commercial tenure holders, trapline industrial property owners, other stakeholders and their current use of lands and resources.

8.12 Human Health

The following potential human health effects are anticipated as a result of the Project:

- Effects of increased air emissions during construction and operations;
- Effects of increased noise levels associated with construction phase activities;
- Effects of increased noise levels during the operations phase associated with vehicle movement, train cars and maintenance works;
- Effects of increased traffic on local populations, including potential increase in accidents and injuries;
- Reduced community well-being (i.e., increased stress) as a result of noise and light emissions, increased traffic, and increased populations in the Project area; and
- Potential effects on the quality of country foods

8.13 Heritage Resources

Heritage and archaeological resources in British Columbia are protected under the BC *Heritage Conservation Act*. Early discussions with Aboriginal Groups as well as government representatives indicate that the potential for heritage and archaeological resources within the proposed Project footprint is low. A BC Ministry of Industry and Small Business Development Study conducted by Management Services in 1986 entitled “A Selection of Undeveloped Strategically Located Industrial Sites in British Columbia, Canada” states that archaeological potential on the Wedeene site is limited.

Regardless, there could be unknown artefacts with the potential to be disturbed, altered, or destroyed as a result of Project activities. An Archaeological Overview Assessment and Archaeological Impact Assessment will be undertaken during the EA process. A Heritage Management Plan including chance-find procedures will be implemented prior to any ground disturbance activities.

8.14 Indirect Environmental Effects on Aboriginal People

Potential effects on Aboriginal peoples as a result of Project-induced changes to the environment, including health, socio-economic conditions, physical and cultural heritage, current use of lands and resources for traditional purposes, or any structure that is of historic archaeological, paleontological, or architectural significance will be evaluated during the EA process.

During preparation for the EA application, the Proponent will work with Aboriginal Groups to undertake traditional knowledge/traditional land use (TK/TLU) studies, ethnographic studies, and socio-economic studies, and identify potential direct and indirect Project effects as well as develop mitigation, management, and accommodation measures as needed.

A preliminary list of potential indirect effects on Aboriginal peoples is presented in Table 8-1.

Table 8-1: Potential Indirect Effects on Aboriginal People

Categories	Potential Indirect Effects on Aboriginal People
Socio-economic	• Potential effects to fisheries, tourism, and other commercial or industrial interests in the Project area • Demographic changes on local community networks and culture; and • Increased pressure on local services and amenities, including health care, education, temporary housing, transportation emergency services, and recreational facilities.
Human Health	• Potential effects on human health due to air quality, noise and light effects caused by Project construction and operation • Potential effects on quality of country foods as a result of air emissions, soil and lake acidification • Potential effects on availability of country food resources due to habitat loss, alteration, sensory disturbance, and serious harm to fish habitat • Safety hazards caused by Project construction and operation.
Physical and Cultural Heritage	• Modification, damage, or loss of archaeological, spiritual, or cultural heritage features or practises.
Traditional and Cultural Activities	• Reduced availability, loss of, or access restrictions to marine, terrestrial, wildlife or fish resources used for traditional harvesting, hunting, or fishing • Changes to or loss of access to asserted traditional land use areas

8.15 Accidents and Malfunctions

The effects of accidents and malfunctions that could potentially arise during the construction and operation of the Project will be assessed during the EA process to satisfy any federal requirements under CEAA and/or any provincial requirements. An assessment of the Project related accidents and malfunctions on the immediate and surrounding environment will be undertaken including understanding risks related to storm events, flooding, fires, and earthquakes. This assessment is anticipated to include the potential effects associated with incidental spills, fire, explosions, and vehicle accidents.

8.16 Cumulative Effects

A number of past, existing, and reasonably forseeable future projects occur or are planned in the Project. A cumulative effects assessment will be conducted to meet federal and provincial requirements. This assessment will evaluate the potential for residual adverse effects of the Project to interact with the residual effects of past, present, and reasonably foreseeable future projects and activities in the Project area.

8.17 Transboundary Effects

The Project footprint is located approximately 235 km from the Canada-USA border and 965 km from the BC-Alberta border. Atmospheric emissions during Project Construction and Operations are not anticipated to result in any transboundary environmental effects beyond the province or to the USA, based on a preliminary review of the design of the proposed Project, the Project location, and available regional information.

Surface water drains from the Project area into the Kitimat Arm of the Douglas Channel, which is approximately 500 km from the USA waters. Since there are no effluent discharges from the Project, there is no potential for transboundary surface water quality effects.

The Project marine shipping route between BC and Alaska of USA is frequently used by marine vessels, including BC ferries and other commercial vessels. Routine shipping activities are not anticipated to induce adverse transboundary effects (e.g., air quality, health) to the USA.

9. Consultation and Engagement

9.1 Aboriginal Groups

The Proponent is committed to early and ongoing engagement with potentially affected and interested Aboriginal Groups. The Proponent's engagement with Aboriginal Groups has been preliminary to date with extensive activities scheduled to commence during the EA process.

Pre-EA engagement with potentially affected Aboriginal groups was initiated in 2012, with a particular focus on engaging with the Kitselas First Nation and the Haisla Nation regarding the proposed use of the Refinery Site and Marine Terminal Site. Contact information for each Aboriginal Group is listed in Table 9-1. Consultation activities and the nature of the discussions and/or issues raised to date for each Aboriginal group are summarized in Table 9-2.

Table 9-1: Contact Information for Aboriginal Groups contacted by the Proponent

Aboriginal Group	Address	Phone/Fax/Email	Contact Person
Haisla Nation	PO Box 1101, Kitamaat Village, BC V0T 2B0	Telephone: 250-639-9361 Fax: 250-632-2840 Email : reception@haisla.ca	Sasha Jacobs, Front Desk Reception, Haisla Nation
Lax Kw'alaams Band	206 Shashaak Street, Lax Kw'alaams, BC V0V 1H0	Telephone: 250-625-3293 Fax: 250-625-3246 Email: linda_admin@laxband.com	Linda Simon, Adminstration, Lax Kw'alaams Band
Metlakatla First Nation	PO Box 459, Prince Rupert, BC V8J 3R2	Telephone: 250-628-3234 Fax: 250-628-2905 Email : executive.director@metlakatla.ca	Gordon Tomlinson, Executive Director, Metlakatla Governing Council
Kitselas First Nation	2225 Gitaus Road, Terrace, BC V8G 0A9	Telephone: 250-635-5084 Fax: 250-635-5335 Email : sdnabess@kitselas.com	Sharon Nabess – Bennett, Reception, Kitselas First Nation
Kitsumkalum First Nation	PO Box 544, Terrace, BC V8G 4B5	Telephone: 250-635-6177 Fax: 250-635-4622 Email: kitsumkalum@citywest.ca	Steve Roberts, Band Manager
Gitxaala Nation	PO Box 149, Kitkatla, BC, BC V0V 1C0	Telephone: 250-848-2214 Fax: 250-848-2238 Email: contact@gitxaalanation.com	N/A

Aboriginal Group	Address	Phone/Fax/Email	Contact Person
Gitga'at Nation	445 Hayimiisaxaa Way, Hartley Bay, BC VOV 1A0	Telephone: 250-841-2500 Fax: 250-841-2541 Email: hbvc@gitgaat.net	Kathy Robinson, Office Manager, Gitga'at Nation
Métis Nation of BC	Unit #103 - 5668 192nd Street, Surrey, BC V3S 2V7	Telephone: 604-557 5851 Fax: 778-571-9402 Email: reception@mnbc.ca	Tracey Thornhill, Executive Assistant and Communications Officer, Métis Nation of BC

Table 9-2: Aboriginal Groups Engagement and Consultation

Aboriginal Group	Participants	Location	Date	Discussion
Haisla Nation	Haisla Nation representatives	Vancouver	October 2012	Preliminary meeting to introduce the Project and receive feedback
Haisla Nation	Haisla Nation public meeting for broader membership	Kitimat	March 2015	Presentation to introduce the Project
Haisla Nation	Haisla Nation representatives	By phone, in person (Kitimat or Vancouver)	March 2016	Preliminary discussions regarding historical and current land use, as well as access to and potential use of the Wedeene site, the fuel delivery pipelines and the Marine Terminal site.
Haisla Nation	Haisla Nation representatives	n/a	December 2015	Provision of draft Project Description to for review and preliminary comments (none received to date)
Kitselas First Nation	Kitselas First Nation representatives	Terrace	July 2010	Preliminary meeting to introduce the Project and receive feedback
Kitselas First Nation	Representatives, including Councillors and negotiators	Kitselas Band Office	November 2012	Proposed Refinery Site location discussions
Kitselas First Nation	Representatives, including Councillors and negotiators	Victoria	January 2013	Proposed Refinery Site location discussions
Kitselas First Nation	Representatives, including Councillors and negotiators	Kitimat and Victoria	July 2013	Proposed Refinery Site location discussions

Aboriginal Group	Participants	Location	Date	Discussion
Kitselas First Nation	Representatives, including Councillors and negotiators	Kitimat	November 2013	Proposed Refinery Site location discussions.
Kitselas First Nation	Representatives, including Councillors and negotiators	Vancouver and Victoria	January 2015	Proposed Refinery Site location discussions
Kitselas First Nation	Representatives, including Councillors and negotiators	By email	December 2015	Provision of draft Project Description for review and preliminary comments (none received to date)
Gitxaala First Nation	Meeting with Chief	Vancouver	March 2013	Preliminary meeting to introduce the Project and receive feedback

In October 2012, the Proponent gave a presentation about the Project to over 65 First Nations Chiefs and representatives at Gitxsan event in Hazelton. In 2014, the Proponent gave a presentation about the Project to the National Aboriginal Business Opportunities Conference in Prince Rupert.

The President of Kitimat Clean has also engaged with some 25 other Aboriginal Groups representatives across northern British Columbia from Haida Gwaii to Prince George (including Haida Nation, Burns Lake Band, Stellat'en First Nation, Nadley Whut'en First Nation, Cheslatta Carrier First Nation, Carrier Sekani Tribal Council, Skin Tyee Nation, Yekochee First Nation, Wet'suwet'en First Nation, Saik'uz First Nation, and Nakazdli First Nation, Lake Babine First Nation, Lheidli T'enneh First Nation, Nazko First Nation, and Nisga'a Nation) to introduce the Project and receive preliminary feedback.

9.1.1 Preliminary Feedback from Aboriginal Groups

The Proponent's meetings to date with Aboriginal groups have focused on discussing preliminary Project information and potential economic and social benefits the Project may provide. During these meetings, the following issues and/or areas of interest were raised.

- *Project Benefits.* The potential benefits of the Project has been well received by the Kitselas and Haisla First Nations, who have indicated that long-term jobs, indirect economic spin-off opportunities, and skills training are needed among their communities in northwest BC.
- *Environmental Management and Monitoring.* Representatives from both Kitselas and Haisla Nations have indicated that environmental management and monitoring of Project activities are a priority.

No objections have been raised by any Aboriginal groups against the Project.

9.1.2 Aboriginal Consultation Plan

The Proponent is committed to continuing open and transparent consultation with Aboriginal Groups, and believes that meaningful and collaborative relationships with Aboriginal Groups are critical to Project success. The Proponent will develop an Aboriginal Consultation Plan, commensurate with the depth of consultation, for each potentially affected Aboriginal group to support EA and permitting processes with the following objectives and activities:

- Request introductory meetings and seek a point of contact to identify specific policies, protocols, or preferences for consultation;
- Notify, correspond, provide and disclose balanced Project information early and at key milestones (Valued Component selection, public comment opportunities) in a manner that is agreed upon by Aboriginal Groups;
- Hold meetings with community members and one-on-one leadership meetings to better understand Aboriginal Groups' interests and concerns and to solicit verbal and written feedback;
- Invite participation in site visits and Working Group meetings;
- Inform effects assessment analyses by gathering Traditional Knowledge/Traditional Land Use and ethnographic data (as approved by each Aboriginal group) and exchanging information;
- Identify potential Project impacts on Aboriginal rights and interests and opportunities to avoid, minimize or accommodate these impacts, and provide opportunities to review findings in key EA documents;
- Negotiate capacity funding and impact benefit agreements, as appropriate;
- Identify opportunities to enhance mutual economic and social benefits related to the Project (e.g., identify opportunities to participate in environmental studies; longer-term economic, employment, training and skills-building opportunities);
- Maintain a long-term and positive relationship with all potentially affected and interested Aboriginal Groups; and
- Provide additional opportunities to meet to address concerns as needed.

The draft Aboriginal Consultation Plan with proposed schedule detailing the activities above will be provided to each Aboriginal group for review and feedback.

9.2 Stakeholder and Community Engagement

The Proponent is committed to engaging with the public, stakeholder groups and government bodies interested in, or directly affected by the Project and has undertaken public consultation activities for the Project since 2012.

9.2.1 Public

The Proponent held an initial press conference in Vancouver in August 2012 to increase public awareness about the Project, and has maintained an active website to disseminate information about the Project (http://kitimatclean.ca/) since 2014. In an effort to understand broader public opinion on the topic of refineries and pipelines in BC, the Proponent has commissioned two polls (September 2012 and February 2013). The Proponent has sought to understand broader public opinion on the topic of refineries and pipelines in British Columbia, and has commissioned two polls (September 2012 and February 2013). The following comment on the polls is taken from the kitimatclean.ca website:

> *There have been three extensive BC polls completed over the past two years to gauge public reaction to the pipeline and refinery. Mustel completed a poll in March 2013 that had similar results to the other two:*
>
> - *The majority of B.C. residents agree that BC and Canada should add value to natural resources before exporting (86%), that it is better to refine bitumen within B.C. rather than offshore (76%), and there is general agreement with diversifying exports to find markets beyond the United States for Canada's petroleum products (70%).*
> - *If an environmentally sound method of transporting bitumen from Alberta to the refinery in BC can be found, support for the refinery proposal is 66%, opposition is 24% and 10% are unsure.*
> - *The main reasons for supporting the proposal include economic benefits for BC, and the creation of jobs within the province.*

- *The main reasons for opposing the proposal are general concerns for the environment but these concerns appear to be more related to the transport of bitumen to the refinery and climate change issues, rather than to the refinery or marine terminal itself.*
- *In summary, if environmental concerns can be addressed related to the transport of bitumen, there is strong support for the proposed refinery from all regions of the province. Even before hearing about the FT refinery design which will dramatically reduce greenhouse gases, two out of three support the concept.*[15]

Consultation activities undertaken with the public and stakeholder groups regarding the Project are summarized in Table 9-3.

Table 9-3: Public Consultation Activities Conducted to Date

Stakeholder Group	Date	Location	Activity
General public in Kitimat	May 2014	Kitimat	Presentation at Public Meeting
General public in Prince Rupert	October 2012	Prince Rupert	Presentation at Town Hall Meeting
BC Chamber of Commerce	March 2013	Vancouver	Presentation
Burns Lake & District Chamber of Commerce representative	March 2014	Vanderhoof	Preliminary discussion
Kelowna Chamber of Commerce	April 2014	Kelowna	Presentation
Terrace Chamber of Commerce	May 2014	Terrace	Presentation
Campbell River & District Chamber of Commerce	May 2014	Campbell River	Presentation
Camosun College	February 2015	Victoria	Presentation
Cordova Bay 55 Plus Association	February 2015	Victoria	Presentation
Canadian Club of Victoria	February 2015	Victoria	Presentation
Victoria Westshore Group	May 2015	Victoria	Presentation
Rotary Club of Surrey	November 2015	Surrey	Presentation
Rotary Club of Whiterock	November 2015	Whiterock	Presentation

[15] Kitimat Clean Website: http://kitimatclean.ca/the-bc-publics-attitude/

9.2.2 *Preliminary Public Feedback*

Public feedback to date has been positive, and centered around:

- the need for Canadian oil to access markets;
- recognition of the environmental benefits of shipping refined fuels rather than crude oil in tankers;
- the environmental benefits of the proposed Fischer-Tropsch refining process technology;
- taxation benefits derived from value-added industrial activity; and
- the need for long-term jobs and skills training in Northwest British Columbia.

Concerns have also been raised about the continued reliance on, and expansion of Alberta oil sands mining activities that may result from building a refinery in BC.

9.2.3 *Government Agencies*

Engagement with government agencies began in 2012, and is ongoing. Consultation activities undertaken with local, regional, and federal government agencies regarding the Project are summarized in Table 9-4.

Table 9-4: Government Agency Consultation Activities Conducted to Date

Government Agency	Date	Location	Activity
District Municipality of Kitimat	July 2012	Kitimat	Preliminary discussion with Mayor and Presentation to Kitimat Council
District Municipality of Kitimat	May 2014	Kitimat	Further discussions about Project with Kitimat Council
City of Terrace	July 2012	Terrace	Preliminary discussion with Mayor and Presentation to Terrace Council
District Municipality of Kitimat	December 2012	Victoria	Information sharing meeting with representatives
City of Terrace	November 2013	Terrace	Information sharing meeting with Mayor
BC Ministry of Environment	July 2012	By phone Victoria	Preliminary discussions
BC Ministry of Natural Gas Development	December 2012 and June 2014	By phone Victoria	Preliminary discussions

Government Agency	Date	Location	Activity
BC Ministry of Forests, Lands & Natural Resource Operations (MFLNRO)	February and March 2013	By phone Victoria	Preliminary discussions
BC Ministry of Aboriginal Relations & Reconciliation	November 2013 and February 2014	By phone Victoria	Preliminary discussions
BC Environmental Assessment Office	December 2012-Present	In person, by phone	Introduction of Project, preliminary and ongoing discussions about regulatory requirements
BC MFNLRO Major Projects Office	December 2012 - Present	In person, by phone	Introduction of Project, preliminary and ongoing discussions
Natural Resources Canada	November 2012	By phone Ottawa	Preliminary discussions
Government of Canada's Major Projects Management Office (MPMO)	March 2016	By phone Ottawa	Preliminary discussions
Canadian Environmental Assessment Agency (CEAA)	December 2012-Present	By phone	Introduction of Project, preliminary and ongoing discussions about regulatory requirements

The Proponent also presented to a number of Mayors of cities and municipalities across Northern British Columbia in Victoria in September 2012. Several meetings with federal representatives have also taken place over the last three years, including three meetings with Joe Oliver when he was Federal Minister of Natural Resources, meetings with the Conservative government's Prime Minister's Office and meetings with various MPs.

9.2.4 Industry Stakeholder Associations

The Proponent has had many meetings with Alberta oil producers, civil service and politicians, along with preliminary discussions about the proposed use of the CN rail line to transport bitumen to the Kitimat Valley.

9.2.5 Public Consultation Plan

The Proponent is committed to engaging with key public stakeholders that may be affected by or interested in this Project. All stakeholders that could be potentially impacted or interested in the project will be identified and assessed based on anticipated impacts, influence, and anticipated interest or concerns.

The objective of engagement and consultation with public and community stakeholders will be to provide information on the Project, undertake baseline data collection, complete impact assessments, understand concerns and priorities, incorporate this feedback into Project design and implementation, develop mitigation and management plans, and identify opportunities for local community benefits from Project construction and operation.

All public and community engagement and consultation activities will be conducted in accordance with the Public Participation Guide; A Guide for Meaningful Public Participation in Environmental Assessments under the Canadian Environmental Assessment Agency (May 2008) and Public Consultation Policy Regulation (BC Reg. 373/2002).

The objective of engagement and consultation with government and regulatory agencies will be to provide information about the Project, understand government and regulatory agency concerns and priorities, receive guidance on regulatory approvals required, submit regulatory approval applications, and ensure compliance with regulatory requirements throughout project construction and operation.

A preliminary list of stakeholders that will have an interest in the proposed Project is included in Table 9-5. This is not an exhaustive list and will be updated throughout subsequent phases of the Project.

Public and community stakeholders will likely include private and industrial landowners, industrial operators including Rio Tinto, land occupants, local business owners, local community organizations and interest groups, and the broader communities of Kitimat and Terrace.

Table 9-5: Potentially Interested Stakeholders

Category	Stakeholder
Local and Regional Government	• Regional District of Kitimat-Stikine • District Municipality of Kitimat • City of Terrace • Northern Health (Kitimat & Terrace) • Kitimat District Fire & Rescue Services Department

Category	Stakeholder
Provincial Government	• BC Ministry of Environment (BC MOE) • BC Environmental Assessment Office (BC EAO) • British Columbia Oil and Gas Commission (OGC) • BC Ministry of Transportation & Infrastructure (BC MOTI) • BC Ministry of Health (BC MOH) • BC Ministry of Forests, Lands, and Natural Resource Operations (BC FLNRO) • BC Ministry of Jobs, Tourism, and Skills Training & Responsible for Labour • BC Ministry of Aboriginal Relations & Reconciliation (BC MARR) • BC Hydro • BC Climate Change Secretariat.
Federal Government	• Canadian Environmental Assessment Agency (CEAA) • Environment Canada (EC) • Fisheries and Oceans Canada (DFO) • Natural Resources Canada (NRCan) • Transport Canada • Pacific Pilotage Authority • Health Canada
Economic Development Associations	• Kitimat Chamber of Commerce • Terrace Chamber of Commerce
Industry	• Rio Tinto • LNG Canada • Chevron • BC Hydro • CN Rail
Labour	• BC Federation of Labour • WorkSafe BC

Category	Stakeholder
Environment	• Skeena Wild Conservation Trust • Skeena Watershed Conservation Coalition • Pembina Institute • Tides Canada • Living Oceans • Northwest Institute for Bioregional Research
Tenure holders and licence holders in the Project area	• Surface land tenure and licence holders which may include mineral claims and active forest cut blocks holders • Commercial authorized resource users which may include commercial trail riders, outfitters, guides, trappers and hunters
Social Services, Health, and Education	• Northwest Community College • Kitimat Valley Institute • School District 82 (Coast Mountains)

10. Permitting

Prior to Project construction and operation, a number of permits, licences and approvals may be required in addition to the Environmental Assessment Certificate from the BC EAO, including those listed in Table 10-1.

Table 10-1: Provincial Permits, Licences and Approvals Required for the Project

Legislation	Permits, Licences and Approvals	Responsible Agency
Oil and Gas Activities Act	Facility Permit	British Columbia Oil and Gas Commission (BC OGC)
Oil and Gas Activities Act	Pipeline Permit	BC OGC
Heritage Conservation Act 1996 (Section 12)	Heritage Inspection permit	BC OGC/Archaeology Branch
Heritage Conservation Act 1996 (Section 12)	Heritage Alteration	BC OGC/Archaeology Branch
Forest Act 1996	Road Use Permit	BC OGC
Forest Act 1996	Master License to Cut	BC OGC
Water Sustainability Act 2014	Changes in and about a stream approval	BC OGC
Water Sustainability Act 2014	Short term use of water approval	BC OGC
Water Sustainability Act 2014	Water License	BC OGC
Land Act 1996 (Section 11, 14, 38, 39 and 40)	License of Occupation, Temporary Works Permit, Right of Way, Lease for Final Installation	BC OGC
Environmental Management Act 2003 (Section 14)	Waste Discharge Permits (air emissions, solid wastes and wastewater discharges)	BC OGC
Oil and Gas Waste Regulation under Environmental Management Act 2003	Approval for Introduction of Waste	BC OGC
Mines Act 1996	Quarry Permit	BC Ministry of Energy and Mines
Wildlife Act 1996	Wildlife Collection Permit	BC Ministry of Environment
Wildlife Act 1996	Fish Collection Permit	BC Ministry of Environment
Commercial Transportation Act 1996	Oversize/Overload Permit	BC Ministry of Transportation and Infrastructure
Drinking Water Protection Act 2003	Drinking Water System Construction Permit	BC Ministry of Health

Legislation	Permits, Licences and Approvals	Responsible Agency
Drinking Water Protection Act 2003	Drinking Water System Operations Permit	BC Ministry of Health
Public Health Act 2008	Industrial Camp Waste Authorizations	BC Ministry of Health / BC Ministry of Environment

10.1 Federal Permitting

In addition to an EA Decision Statement from CEAA, potential federal permits, licences and approvals required for the Project also include those identified in Table 10-2.

Table 10-2: Federal Permits, Licences and Approvals Required for Project Construction and Operation

Legislation	Permits, Licences and Approvals	Governing Agency
Fisheries Act 1985	S. 35(2) Authorization	Fisheries and Oceans Canada (DFO)
National Energy Board Act 1985	S.117 Export Licence	National Energy Board (NEB)
Navigation Protection Act 1985	Notification and Approval	Transport Canada (TC)
Explosives Act 1985	S. 7 Explosives Manufacture or Magazine Licence	Natural Resources Canada
Transportation of Dangerous Goods Act 2009	Transportation of Dangerous Goods Permit	Transport Canada

References

Aboriginal Affairs and Northern Development Canada (AANDC). (2015). First Nation Profiles. Available at: http://fnp-ppn.aadnc-aandc.gc.ca/fnp/Main/Search/FNMain.aspx?BAND_NUMBER=676&lang=eng. Accessed October 13 2015.

Anderson Caryn. The International Tanker Owners Pollution Federation Limited (ITOPF) (2001). Persistent vs non-peristent Oils: What you need to know. Available at :http://www.itopf.com/fileadmin/data/Documents/Papers/persistent.pdf

British Columbia. (2002). *Kalum Land and Resource Management Plan.* https://www.for.gov.bc.ca/tasb/slrp/lrmp/smithers/kalum_south/docs/April%20%202006%20Cabinet%20Approved%20Kalum%20LRMP%20_amended_.pdf/. Accessed September 11, 2015.

BC CDC (BC Conservation Data Centre). (2015a). BC Species and Ecosystems Explorer. http://a100.gov.bc.ca/pub/eswp/ Accessed October 14, 2015.

BC CDC (BC Conservation Data Centre). (2015b). CDC iMap. http://www.env.gov.bc.ca/atrisk/ims.html/ Accessed October 14, 2015.

BC Environmental Assessment Act. Available at: http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/00_02043_01/ Accessed September 15, 2015.

BC Environmental Assessment Office (2014). Assessment Report – LNG Canada Export Terminal Project.

BCEAA Reviewable Projects Regulation. (2002). Available at: http://www.bclaws.ca/Recon/document/ID/freeside/13_370_2002/. Includes amendments up to B.C. Reg. 59/2012, March 30, 2012. Accessed September 15, 2015.

BC Hydro. (2015) Terrace to Kitimat Transmission. Available at: https://www.bchydro.com/energy-in-bc/projects/tkt.html Accessed October 14, 2015.

BC MOE (BC Ministry of Environment). (2014). Kitimat Airshed Emissions Effects Assessment. Available at: http://www.bcairquality.ca/airsheds/docs/ESSA-Kitimat-Airshed-Report_20140425.pdf. Accessed March 1, 2015.

BC Treaty Commission. (2015). Available at: http://www.bctreaty.net/nations/haisla.php/. Accessed October 13 2015.

BC Water Sustainability Act. (2014). Available at: https://www.leg.bc.ca/Pages/BCLASS-Legacy.aspx#%2Fcontent%2Flegacy%2Fweb%2F40th2nd%2F3rd_read%2Fgov18-3.htm. Accessed February 28, 2016.

Canadian Council of Ministers of the Environment, (1994) Environmental Code of Practice for Aboveground Storage Tank Systems Containing Petroleum Products

Canadian Environmental Assessment Act 2012. (2012). Available at: http://laws-lois.justice.gc.ca/eng/acts/C-15.21/index.html/ Accessed September 15, 2015.

Canadian Environmental Assessment Agency. Guide to Preparing a Description of a Designated Project under the *Canadian Environmental Assessment Act, 2012*. (March, 2015). Available at: https://www.ceaa-acee.gc.ca/default.asp?lang=En&n=3CA9CEE5-1/.

CEAA, Regulations Designating Physical Activities. (2012). Available at: http://laws-lois.justice.gc.ca/eng/regulations/SOR-2012-147/page-1.html/ Accessed September 15, 2015.

COSEWIC (Committee on the Status of Endangered Wildlife in Canada). (2011). COSEWIC Assessment and Status Report on the Eulachon (Thaleichthys pacificus).

DFO (Fisheries and Oceans Canada). (2013). Measures to Avoid Causing Harm to Fish and Fish Habitat. Available at: http://www.dfo-mpo.gc.ca/pnw-ppe/measures-mesures/index-eng.html. Accessed February 28, 2016.

District of Kitimat. (2014). *Kitimat Community Profile.* http://www.kitimat.ca/assets/Municipal~Hall/PDFs/Community%20Profile%202014%20-%20Web%20Quality.pdf/. Accessed September 11, 2015.

District of Kitimat. (2016). *Kitimat Municipal Code.* http://www.kitimat.ca/EN/main/municipal/kitimat-municipal-code.html. Accessed February 28, 2015.

Enbridge Northern Gateway (2006). Enbridge Northern Gateway Project Description. Available at: http://www.ceaa.gc.ca/050/details-eng.cfm?evaluation=21799/. Accessed September 15, 2015.

Enbridge Northern Gateway (2012). TERMPOL Review Process Report on the Enbridge Northern Gateway Project. Available at: www.neb-one.gc.ca/fetch.asp?language=E&ID=A2Q4A7/. Accessed September 15, 2015.

FISS (Fish Information Summary System). Fish Inventories Data Queries. [Online] http://a100.gov.bc.ca/pub/fidq/welcome.do/ Accessed October 8, 2015.

Globe and Mail. (September 18, 2015). Lax Kw'alaams First Nation moves to veto LNG plan. Available at: http://www.theglobeandmail.com/report-on-business/industry-news/energy-and-resources/lax-kwalaams-first-nation-moves-to-veto-lng-plan/article26440805/. Accessed October 13 2015.

Golder Associates (1992). Supplementary Hydrogeological Investigation for a Planned Pulp and Paper Mill Dubose Industrial Site Kitimat/Terrace Corridor, B.C. Submitted to Orenda Forest Products Ltd. 262 25th St. West Vancouver, British Columbia.

Grassy Point. (2014). Grassy Point LNG Project Description. Available at: http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_project_home_422.html/. Accessed September 15, 2015.

Haisla First Nation. (2015). Available at: http://haisla.ca/community/the-band/. Accessed October 13 2015.

Hatch Ltd. (2014a). Kitimat Clean Refinery Project – Feasibility Study Capital Cost Estimate H347026-0000-92-349-0001

Hatch Ltd. (2014b). Kitimat Clean Refinery Project – Project Design Basis H347026-0000-05-109-0001.

iMapBC. 2015. Data BC Online Mapping Application. Province of British Columbia. Available at: http://maps.gov.bc.ca/ess/sv/imapbc/. Accessed March 3, 2016.

Kalum Quarry. (2015). Kalum Rock Quarry and Logistics Park. Available at: http://www.kalumquarry.com/. Accessed October 13, 2015.

Kitimat Clean Ltd. (2014). “Business Case Details.” Last modified December 29. http://kitimatclean.ca/business-case-details/. Accessed September 11, 2015.

Kitselas First Nation. (2015). Available at: http://www.kitselas.com/. Accessed October 13 2015.

Kitselas Department of Lands and Resources. (2014). Major Projects in Kitselas Traditional Territory. Available at: http://www.google.ca/url?sa=t&rct=j&q=&esrc=s&source=web&cd=4&cad=rja&uact=8&ved=0CDAQFjADahUKEwjC-NDm8L_IAhXBjw0KHdL1CFc&url=http%3A%2F%2Fwww.kitselas.com%2Fimages%2Fuploads%2Fdocs%2FKitselas_Major_Projects_booklet.pdf&usg=AFQjCNFbAOs5o4-WEXxo9vWl7FGlsCFizA . Accessed October 13, 2015.

Kitsumkalum First Nation. (2015). Available at: http://www.kitsumkalum.bc.ca/index.html . Accessed October 13 2015.

Land Information BC. *Kalum Land and Resource Management Plan* [map]. 2005. 1:1,000,000. “Kalum Land and Resource Management Plan”. Strategic Land and Resource Planning. https://www.for.gov.bc.ca/tasb/slrp/lrmp/smithers/kalum_south/maps/Map1_Ltr_Base.pdf/. Accessed September 11, 2015.

Lax Kw'alaams Band. (2015). Available at http://laxkwalaams.ca/. Accessed October 13 2015.

LNG Canada (2013). LNG Canada Export Terminal Project Description. Available at: http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_project_home_398.html/. Accessed September 15, 2015.

Pacific Northern Gas Ltd. (2015) Systems Map. Available at http://www.png.ca/systems-map/ Accessed October 13 2015

Regional District of Kitimat-Stikine (2015). Available at: http://www.rdks.bc.ca/. Accessed September 11, 2015.

Statistics Canada (2013a). Kitimat, DM, British Columbia (Code 5949005) (table). National Household Survey (NHS) Profile. 2011 National Household Survey. Statistics Canada Catalogue no. 99-004-XWE. Ottawa. Released September 11, 2013. http://www12.statcan.gc.ca/nhs-enm/2011/dp-pd/prof/index.cfm?Lang=E/. Accessed September 15, 2015.

Statistics Canada (2013b). Kitimat-Stikine, RD, British Columbia (Code 5949) (table). National Household Survey (NHS) Profile. 2011 National Household Survey. Statistics Canada Catalogue no. 99-004-XWE. Ottawa. Released September 11, 2013. http://www12.statcan.gc.ca/nhs-enm/2011/dp-pd/prof/index.cfm?Lang=E/. Accessed September 11, 2015.

Appendix A
Site Visit Photos

Site Visit Photographs

Photograph 1. Start of Wedeene FSR, looking north (Lat: 54.066156, Long: -128.691455)

Site Visit Photographs

Photograph 2. Bridge #1 along Wedeene FSR, looking north (Lat: 54.068068, Long: -128.690373)

Site Visit Photographs

Photograph 3. Bridge #2 along Wedeene FSR, looking north (Lat: 54.08105, Long: -128.67713)

Site Visit Photographs

Photograph 4. Unnamed Wetland along Wedeene FSR

Site Visit Photographs

Photograph 5. Bridge #3 along Wedeene FSR, looking north (Lat: 54.08105, Long:- 128.67713)

Site Visit Photographs

Photograph 6. Bridge #3 along Wedeene FSR, looking east towards CN Main Rail Line (Lat: 54.08105, Long:- 128.67713)

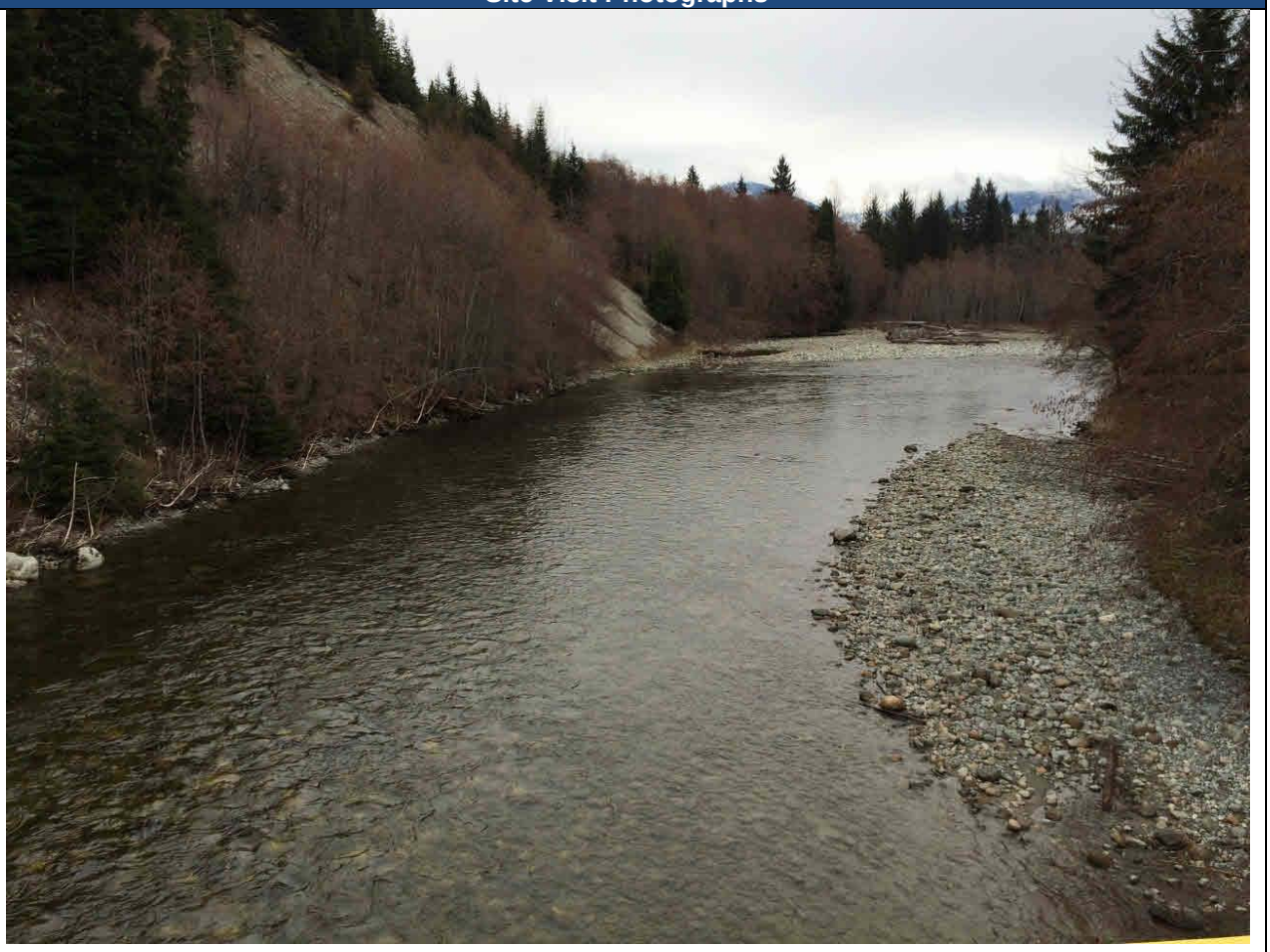
Site Visit Photographs

Photograph 7. Bridge #4 along Wedeene FSR, looking north (Lat: 54.13508, Long: -128.68301)

Site Visit Photographs

Photograph 8. Little Wedeene River, looking west on Bridge #4 (Lat: 54.13508, Long: -128.68301)

Site Visit Photographs



Photograph 9. Little Wedeene River, looking east on Bridge #4 (Lat: 54.13508, Long: -128.68301)

Site Visit Photographs

Photograph 10. Bridge #5 along Wedeene FSR, looking north (Lat: 54.14962, Long: -128.68553)

Site Visit Photographs

Photograph 11. On Bridge over Raley Creek, looking east (Lat: 54.180692, Long: -128.682419)

Site Visit Photographs

Photograph 12. Riparian Area East of Bridge over Raley Creek (Lat: 54.180692, Long: -128.682419)

Site Visit Photographs

Photograph 13. Proposed Marine Terminal Site, looking East across Douglas Channel (Lat: 53.944443, Long: -128.735744)

Site Visit Photographs

Photograph 14. Proposed Refinery Site, looking West on Wedeene FSR (Lat: 54.172879, Long: -128.686069)

Site Visit Photographs

Photograph 15. Proposed Refinery Site, looking Northwest on Wedeene FSR (Lat: 54.172879, Long: -128.686069)

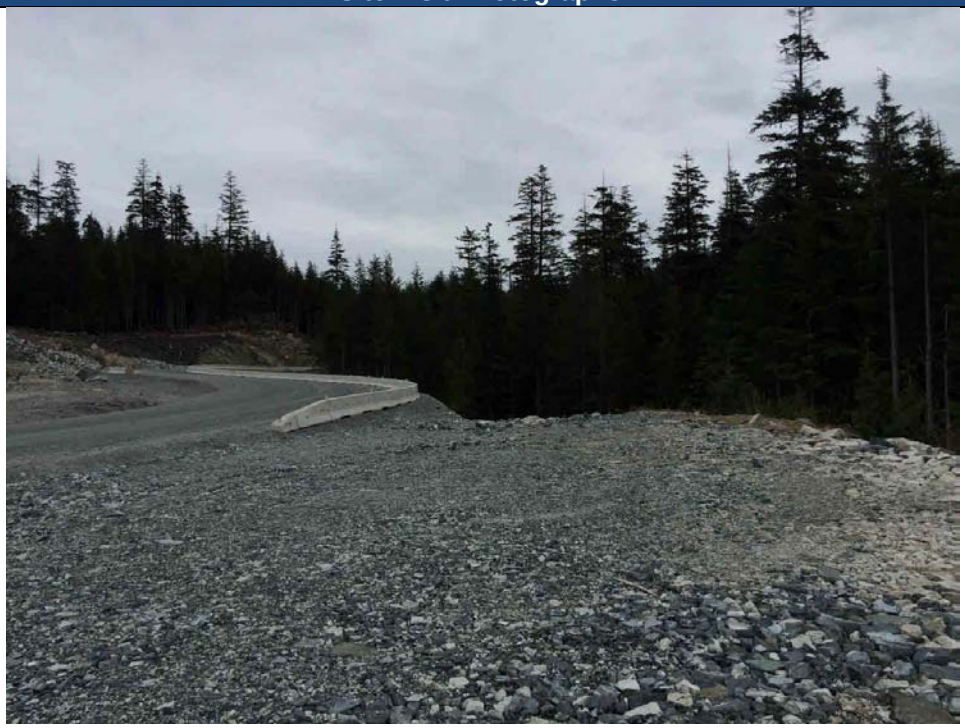
Site Visit Photographs

Photograph 16. Proposed Refinery Site, looking Northeast on Wedeene FSR (Lat: 54.172879, Long: -128.686069)

Site Visit Photographs

Photograph 17. Start of Bish FSR, looking south (Lat:54.00122, Long:-128.70121)

Site Visit Photographs



Photograph 18. Bish FSR, looking northeast (Lat: 53.944443, Long: -128.735744)