
British Columbia Environmental Assessment Office
and Canadian Environmental Assessment Agency

# Kitimat Clean Refinery Project Description

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Submitted by

HATCH

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# Report

# Project Description

## H347026-0000-07-236-0011

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| 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 |
| bpd | Barrels per 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 Hemlock |
| CWHvm1 | Coastal Western Hemlock Submontane variant of the Very Wet Maritime subzone |
| CWHws1 | Coastal Western Hemlock Submontane variant of the Very Wet Submaritime subzone |
| DAO | Deasphalted Oil |
| DFO | Fisheries and Oceans Canada |
| DL | District Lot |
| DWT | Deadweight Tonne |

| Abbreviations | |
|---|---|
| EA | Environmental Assessment |
| 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 | Kilometer |
| $Km^2$ | Square Kilometer |
| 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 | Meter |
| $m^3$ | Cubic Meter |
| $Mft^3$ | Million Cubic Feet |
| mm | Millimeter |
| MNBC | Métis Nation of British Columbia |
| MOE | Ministry of Environment |
| mtpa | Million tonnes per annum |

| Abbreviations | |
|---|---|
| MARR | Ministry of Aboriginal Relations and Reconciliation |
| MW | Megawatt |
| 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 |
| ppm | Parts per million |
| PNCIMA | Pacific North Coast Integrated Management Area |
| RDKS | Regional District of Kitimat-Stikine |
| ROW | Right of Way |
| SARA | Species at Risk Act |
| SCR | Selective Catalytic Reduction |
| SDA | Solvent Deasphalting Unit |

| Abbreviations | |
|---|---|
| SFU | Sulphur Forming Unit |
| SMR | Steam Methane Reforming Unit |
| $SO_2$ | Sulphur Dioxide |
| SOx | Sulphur oxides |
| SQCRD | Skeena-Queen Charlotte Regional District |
| SRU | Sulphur Recovery Unit |
| 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 |

| Glossary of Terms | |
|---|---|
| Air Separation Unit | Unit supplies oxygen and nitrogen requirements for the refinery and its associated components. Oxygen is used in the pitch gasifier and sulphur recovery units. |
| Atmospheric Distillation Unit (ADU) | Unit separates the feed (e.g., hydrocarbon) into naphtha, atmospheric gas oil and atmospheric residue. Once separated, the various hydrocarbons undergo further processing in order to be refined into end products. |
| Atmospheric Gas Oil (AGO) | Hydrocarbon separated from Atmospheric Distillation Unit. Further processing is required for it to be transformed into end products (e.g., diesel). |
| Amine Regeneration Unit (ARU) | Component of the Sulphur Recovery Unit. After absorption of sour gases in hydro processing units, the rich amine is regenerated in the Amine Regeneration Unit. Regenerated amine is recycled back to hydro processing units for sour gas removal. |
| Deasphalted Oil (DAO) | Deasphalted Oil is processed from Solvent Deasphalting Unit. It will be further processed to produce Liquefied Petroleum Gas (LPG), naphtha diesel and gas oil. |
| Distillate Hydrotreater | Unit is an integrated component of the Vacuum Gas Oil Hydrocracker. It desulfurizes distillate feed blend from the resid hydrocracker. |
| Fischer-Tropsch (FT) | Fischer-Tropsch synthesis collectively refers to processes for the conversion of synthesis gas to synthetic crude oil. |
| Heavy Vacuum Gas Oil (HVGO) | Intermediary hydrocarbon product from Vacuum Distillation Unit. It will be further processed to produce gasoline, diesel and jet fuel. |
| Light Vacuum Gas Oil (LVGO) | Lightest intermediary hydrocarbon product from the Vacuum Distillation Unit. It will be further processed to produce naphtha and diesel. |
| Selective Catalytic Reduction (SCR) | An advanced active emissions control technology system that utilizes a catalyst to primarily reduce NOx while simultaneously being able to reduce hydrocarbons, carbon monoxide and particulate matter. |
| Solvent Deasphalting Unit (SDA) | Processes hydrocarbon products to produce Deasphalted Oil. |
| Sulphur Forming Unit (SFU) | Converts recovered molten sulphur from Sulphur Recovery Unit into pellets. |
| Sulphur Recovery Unit | The unit consists of the Sour Water Stripping Unit, Amine Regeneration Unit, and Claus Sulphur Reaction Unit with Tail Gas Treatment Unit. |

| Glossary of Terms | |
|---|---|
| | Recovers over 99.9% of sulphur. |
| Steam Methane Reforming Unit (SMR) | Unit reforms natural gas into syngas in order to feed into the Fischer-Tropsch process and for other hydrogen requirements for the Refinery. |
| Sour Water Stripping Unit (SWS) | Component of the Sulphur Recovery Unit. Removes hydrogen sulphide and ammonia from sour water produced from Refinery components. |
| Syngas Sweetening | Removes hydrogen sulphide and ammonia from syngas. |
| Naphtha Hydro treatment Unit | Unit hydro treats naphtha feed blend from the resid hydrocracker to produce sulphur free naphtha suitable for further processing in other units of Naphtha Processing block to produce gasoline, propane and butane. |
| Non-hydrocarbon Storage Systems | Storage system for raw water, amine, sulphur, etc. |
| Pitch Gasification Unit | Unit converts intermediary product pitch from the Solvent Deasphalting Unit to produce syngas, which is a mixture of gases, primarily hydrogen and carbon monoxide. |
| Vacuum Distillation Unit (VDU) | Atmospheric residue (i.e., ADU bottom) is sent to the Vacuum Distillation Unit so that it is further separated into various hydrocarbon streams (e.g., light vacuum gas oil, heavy vacuum gas oil and vacuum residue) under reduced pressure. |
| Vacuum Gas Oil Hydrocracker | Heavy vacuum gas oil from Vacuum Distillation Unit and gas oil from the resid hydrocracker is further processed into light fuel products in the Vacuum Gas Oil Hydrocracker. The Hydrocracker increases the diesel cetane numbers, thereby reducing its ignition delay time, and also reduces sulphur and nitrogen contents in end products. |

# 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 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 yard, 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 kilometers (km) to the north of Kitimat, on provincial Crown land. 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 state-of-the-art technology designs for oil refining and processing, including Fischer-Tropsch (FT) synthesis to process up to 400,000 barrels (bbl) (63,600 cubic meters ($m^3$)) or 56,000 tonnes per day of bitumen.

Bitumen will be processed into fuel products, including gasoline, 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. Currently, China is adding approximately the same amount of refining capacity annually, as what the Project will produce. The refinery will supply just one year's growth in refined fuel consumption in a country like China. If the Project is not built in Canada, it is likely to be built in Asia. 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.

For public ease of understanding, the benefits to Canada and to the world of building a refinery in this fashion are summarized in section 1.2.

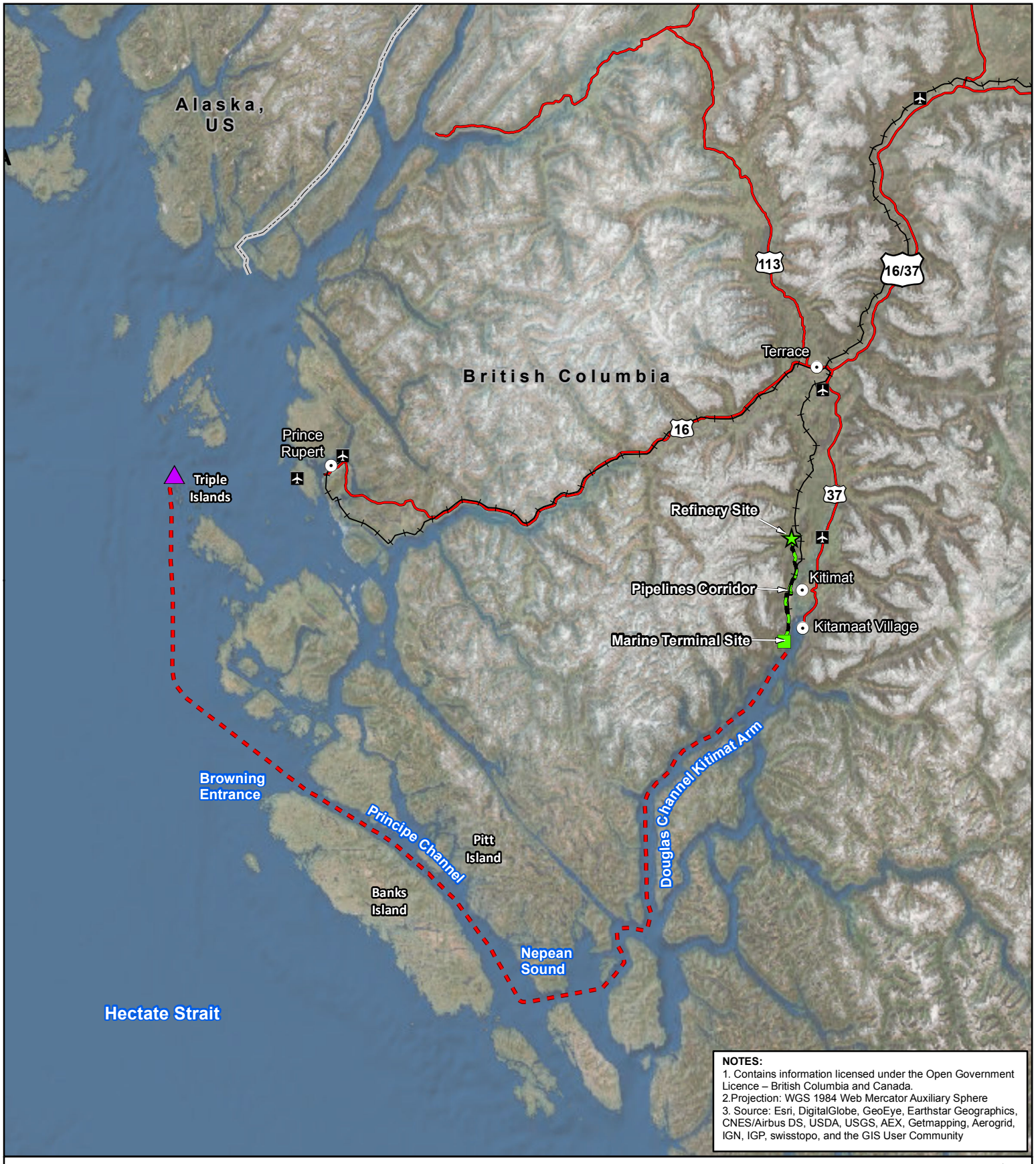


Figure 1-1
Kitimat Clean Ltd.
Kitimat Clean Refinery Project
**Regional Project Location**

## 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 compared to shipping diluted bitumen (ITOPF, 2001). |
| | • Kitimat Clean is spending $5 billion extra to reduce greenhouse gas (GHG) emissions (i.e., $CO_2$) by an estimated 22 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.<br>• The co-generation plants at the refinery will produce up to 540 MW of electricity from refinery gas products, Fischer-Tropsch tail gas and natural gas, 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 (e.g., nitrogen oxides, sulphur oxides, particulate matter) when the diesel is burned in cars and trucks, when compared to the refined fuels produced by other refineries. |
| | • 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.<br>• 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<br>◆ Estimated need for 6,000-7,000 workers over a 5 year construction period, creating an average of 35,000 person years of employment.<br>◆ Estimated need for 1,250 full time jobs during operations, with another 1,250 contract jobs to support operations and maintenance.<br>◆ Expected additional 2,500 full time jobs created in nearby petrochemical operations.<br>◆ 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.<br>• This world-scale refinery will also provide an opportunity for Canadians in the scientific, engineering and medical industries to further develop petrochemicals and manufacture new products from them. |

## 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. 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.<br>818 Broughton Street<br>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

### *1.3.3 Project Team*

This Project Description was prepared by the following Qualified Professionals:

| Team Member | Qualifications | Summary of experience |
|---|---|---|
| Mellissa Winfield-Lesk | M.Sc, A. Ag., | Project Director / Environmental Assessment Specialist; former senior regulator with the BC Ministry of Environment and Canadian Environmental Assessment Agency with 13 years of experience working with major resource development projects in the mining, oil and gas and infrastructure sectors subject to provincial and federal environmental assessment processes. |
| Indran Govender | M.Sc., EP | Environmental Advisor with more than 15 years international experience in the identification and description of applicable environmental standards and regulatory information including environmental approvals required for large scale energy and infrastructure projects; and conducting due-diligence reviews, environmental site screening, fatal flaw assessments, environmental assessments, and compiling environmental management plans for projects in the mining, energy and infrastructure sectors. |
| Luke Wang | BSc, BComm, R.P.Bio | Environmental Specialist with over 17 years of experience working with BC, Canadian, and international guidelines, standards, and best management practices for projects requiring constraints analyses, environmental assessments, permitting and due diligence reviews. Luke has deep, multi-disciplinary technical experience collecting and assessing data across environmental media including vegetation, wildlife, migratory birds, species at risk, fish and fish habitat, wetlands, and surface water quality. |
| Eleanor Gill | M.A. | Specialist in social impact assessment and management, community relations and stakeholder engagement, Aboriginal engagement, and cultural |

| Team Member | Qualifications | Summary of experience |
|---|---|---|
| | | mediation. She has experience working to international standards in stakeholder engagement and social performance set by the International Finance Corporation. Eleanor has developed and led stakeholder and Aboriginal engagement plans; social impact management plans; and social impact assessments for mining/metals, infrastructure, and energy projects. Eleanor has investigated social risks for due diligence projects, and has performed Equator Principles assessments and ongoing monitoring assignments. |
| Dennis Kim | B.Sc., EPt | Junior Environmental Specialist with 3 years' experience in environmental assessment & management, and environmental due diligence. He has also supported senior environmental professionals in environmental impact assessments, environmental compliance assessments, environmental management, site decommissioning supervision, and preparation of environmental management plans for various projects. |
| Chuck Rosner | P.Eng | Charles is a project manager/structural engineer with over 20 years of experience involving a variety of projects including port facilities, bridges, materials handling and industrial structures. His experience includes detailed structural design, seismic design and analysis, capital cost and budget estimation; report and proposal writing, drawing coordination and concept development. He has a knowledgeable background in applied mechanics and finite element methods, including finite element analysis work on several key projects. |
| Sandeep Dalvi | B. Eng., PEO | Sandeep is a process engineer with 23 years of experience in the Oil and Gas and fertilizer industry covering all facets of project development and facility operations. He has a strong background in the operations and troubleshooting of various process |

| Team Member | Qualifications | Summary of experience |
|---|---|---|
| | | units and equipment and a thorough understanding of pre-commissioning/commissioning and start-up activities. In process design and technology development, Sandeep works closely with the owners to understand objectives and develop technical scope in a value driven process. |
| Peter Bohmert | B.A.Sc., P.Eng | Peter is a Signaling Engineer with over 30 years' experience in railroad communications and signals engineering. He has a broad background in all aspects of C&S operations, and signal design. Peter has practiced skills in project management and solid practical experience in 'real world' railroading. Peter has successfully delivered a wide spectrum of projects, working with clients ranging from transit operations and major national freight railroads to local short lines. He has expertise in the design of crossing signal and rail traffic control systems, as well as the multi-jurisdictional regulatory issues involved. |
| Russel Delmar | B. Eng., P.Eng, PMP | Russel has over 26 years of international experience in the project, construction and engineering management of pipelines, tunnels, light rapid transit, railway, and heavy civil projects. Over the course of his career, Russel has led and managed large multi-disciplinary teams in the procurement and implementation phases of large complex projects, most recently managing pipeline projects in western Canada. Russel has worked closely with senior members on both the owner and contractor sides, providing strong leadership and project management capabilities throughout each phase in the successful delivery of these projects. |
| Lisa van Waterschoot | B.A.Sc., EIT | Water Resources Engineer-in-Training (EIT) with experience in water resource management within the context of municipal engineering and mining. Her experience in water management began as a co-op student with a groundwater modeling position at the |

| Team Member | Qualifications | Summary of experience |
|---|---|---|
| | | University of Guelph, and as an Environmental Field Technician for Baffinland Iron Mines Corporation. She has significant experience in hydraulic modeling for inundation mapping and worked on various aspects of mining projects. |

# 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 a Refinery facility with a processing capacity of approximately 400,000 barrels per day (63,600 $m^3$/day or 56,000 tonnes/day) of pure bitumen to produce approximately 460,000 barrels per day of value-added fuel products. The production capacity of the refinery will be approximately 20,400,000 tonnes of value-added fuel products per year. | Part 2 – Industrial Projects, Table 1 – Organic and Inorganic Chemical Industry;<br><br>2 Industrial Organic Chemical Industries not elsewhere classified<br><br>(1) A new manufacturing facility<br>(a) That has a production capacity of ≥ 100 000 tonnes/year. | 14. The construction, operation, decommissioning and abandonment of a new<br><br>(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 155 hectares. The marine facility will handle VLCCs with capacity of 250,000 DWT. Disturbance of approximately 2 hectares of the foreshore environment and a total (but not continuous) length of approximately 1 km of linear disturbance along the shoreline. The total length of the linear shoreline disturbance provided covers the locations of the vessel berth, utility berth and material offloading facility. | Part 8 – Transportation Projects, Table 14 Transportation Projects<br><br>4 Marine Port Facilities (other than Ferry Terminals)<br><br>(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<br><br>(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<br><br>(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 8,000,000 barrels (1,250,000 $m^3$) in volume. The tank farm will store energy resources capable of yielding approximately 16 PJ of energy by combustion. | Part 4 – Energy Projects, Table 8 Petroleum and Natural Gas Projects<br><br>1 Energy Storage Facilities<br><br>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. | 14. The construction, operation, decommissioning and abandonment of a new<br><br>(e) Petroleum storage facility with a storage capacity of 500 000 $m^3$ or more. |

| 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 540 MW. | Part 4 – Energy Projects, Table 7 – Electricity Projects;<br><br>1 Power Plants<br><br>(1) A new facility with a rated nameplate capacity of ≥ 50 MW of electricity that is<br><br>(b) A thermal electric power plant. | 2. The construction, operation, decommissioning and abandonment of<br><br>(a) A new fossil fuel-fired electrical generating facility with a production capacity of 200 MW or more. |
| Construction and operation of approximately 10 groundwater wells for the purposes of abstracting groundwater for make-up process water supply requirements, with extraction rate of 230 liters/second. | Part 5 – Water Management Project, Table 9 – Groundwater Extraction Project<br><br>(2) A new facility that<br><br>(a) Consists of one or more works for the extraction of groundwater to be used for the same project or where, in the reasonable opinion of the executive director, the works are so closely related they can be considered to form a single project,<br><br>(b) Is operated intermittently or continuously for ≥ 1 year, and<br><br>(c) Is designed to be operated so that groundwater is extracted at a rate of ≥ 75 liters/second. | |

Since the length of the electric transmission line for the Project is below 40 km, the refined fuels delivery pipeline is less than 40 km in length, and the railway is less than 20 km total in length, these components of the Project do not exceed provincial and federal environmental assessment (EA) thresholds. 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. Tie-ins of any third party facilities to the Project will also be the responsibility of the third-party.

## 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.

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

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. See section 9.1 for additional detail on consultation and engagement activities.

# 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 yard 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 on provincial Crown land. The Proponent is currently in discussions to obtain a lease under the *Lands Act,* and a permitting strategy is being developed for obtaining rights to access, occupy and build on the identified lands. 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 155 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.

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

- 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 - NAPHTHA HYDROHEATER/HEAVY NAPHTHA REFORMER/LIGHT NAPHTHA ISOMERIZATION
10 - VACUUM GAS OIL HYDROCRACKER INTEGRATED WITH DISTILLATE HYDROTREATER
11 - VACUUM BOTTOM RESID HYDROCRACKER INTEGRATED WITH SOLVENT DEASPHALTING UNIT
12 - FISCHER TROPSCH PRODUCT HYDROCARBONS
13 - FISHER TROPSCH
14 - SYNGAS CLEANING/SWEETENING (H2S/CO2/NH3)
15 - GASIFIER
16 - AIR SEPARATION UNIT
17 - STEAM METHANE REFORMERS
18 - LAYDOWN AREA
19 - LAYDOWN STAGING AREA
20 - COOLING WATER SYSTEM
21 - STEAM GENERATION (COMBINED TWO TRAIN AREA)
22 - POWER SUBSTATION (COMBINED TWO TRAIN AREA)
23 - SULPHUR BLOCK
24 - SUPLHUR PELLETIZING UNIT
25 - DIVERSION DITCH
26 - WASTEWATER TREATMENT PLANT
27 - WASTE INCINERATOR
28 - SANITARY SEWER
29 - OILY WATER POND
30 - BITUMEN UNLOADING FACILITY
31 - RAILWAY

## Marine Terminal Site

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

0 0.75 1.5 3 Km

NORTH

1:110,000

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

KITIMAT CLEAN

HATCH

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## 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. Plant components like vessels, drums, pumps and the heat exchangers can be combined to make up a single module that will be manufactured overseas and brought to site. Large components can be broken into sub-assembly packages and re-assembled on the site. In comparison, the stick build approach involves the transport of various materials through a number of loads to the site and then on-site construction of the various components. The modularized approach will result in a decreased lead, build, and down time for the Project. The estimated costs for construction and decommissioning of the Project, as well as the project annual operating costs for the Project are currently not available.

### *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 Application for an EA Certificate is anticipated to be submitted by the end of Q2 2017. The Proponent expects that EA approvals and permits for the Project will be obtained by the end of 2018, followed by the commencement of pre-construction activities. Construction of the Refinery will commence in Q1 2019 and is scheduled to take up to five years (2019-2023).

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 (2024). 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 milestones is provided in Figure 3-2.

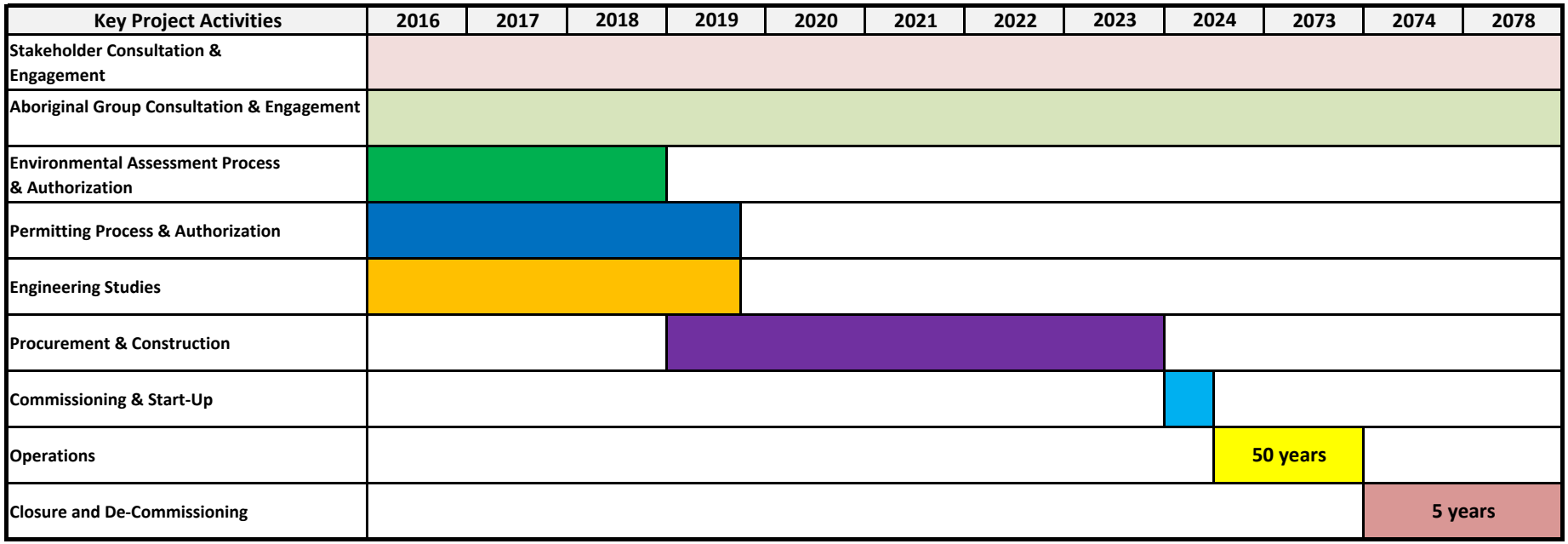




Figure 3-2
Project Schedule

# 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).

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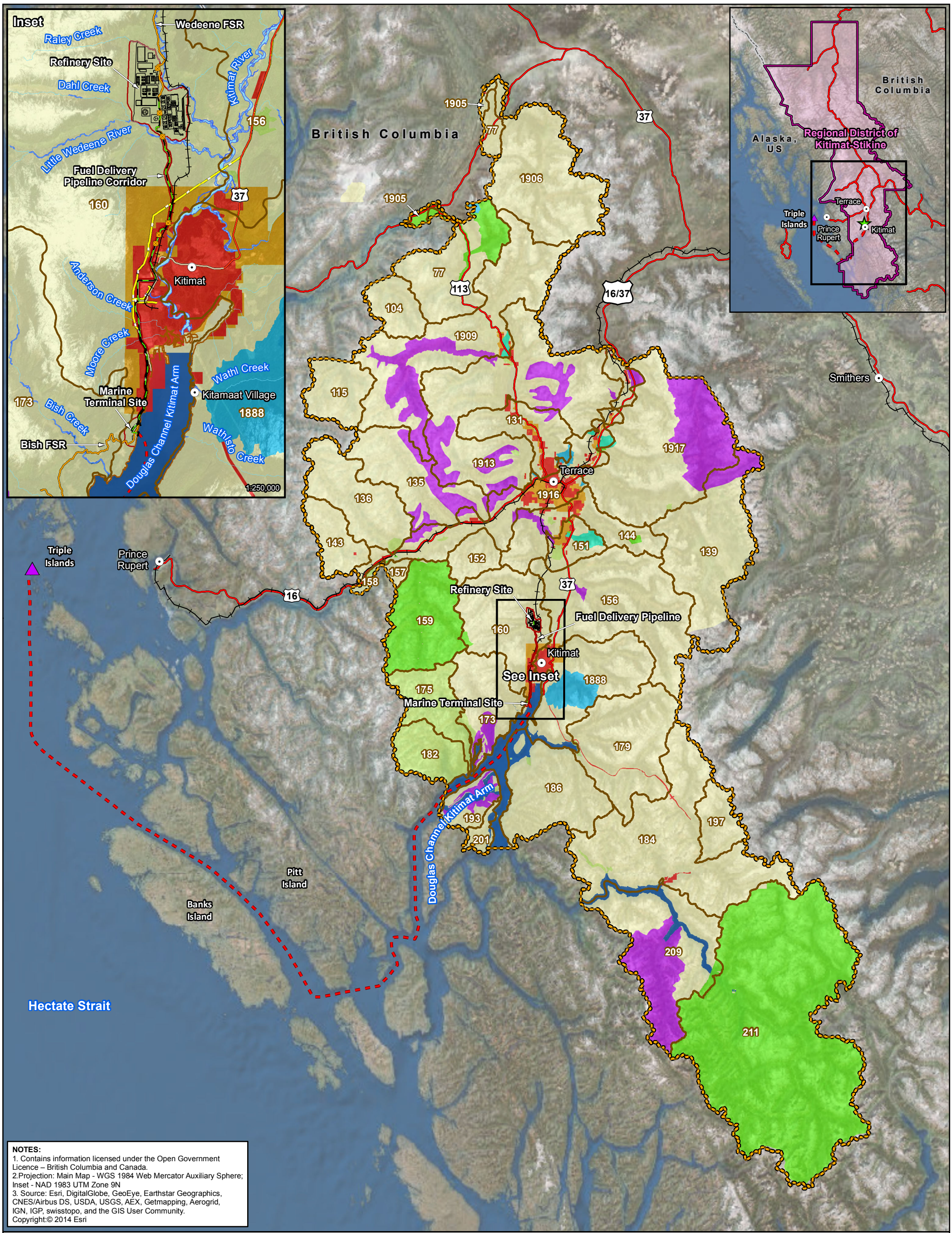


**NOTES:**
1. Contains information licensed under the Open Government Licence – British Columbia and Canada.
2.Projection: Main Map - WGS 1984 Web Mercator Auxiliary Sphere; Inset - NAD 1983 UTM Zone 9N
3. Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community.


- 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

1:250,000

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

**Kalum Land and Resource Management Planning Area**

KITIMAT CLEAN

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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, and there are 8 groundwater wells within the footprint of the Fuel Delivery Pipeline Corridor.

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

KITIMAT CLEAN
HATCH

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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

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

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**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

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## 4.1 Refinery Site

The proposed Refinery Site covers an area of 1,000 ha and is situated about 13 kilometers (km) to the north of Kitimat, on provincial Crown land (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 mineral tenures that overlap the Refinery Site are held by Pacific Empire Minerals Corp. In addition, Haward Peter Yearwood holds mineral tenures that are adjacent to but located beyond the Refinery Site Project footprint. The Refinery Site is accessed via the Wedeene FSR which requires widening and upgrades, including improvements to potentially 6 bridge crossings (Appendix A). The closest residence to the Refinery Site is a dwelling in the Cable Car neighborhood in the District of Kitimat which is approximately 4.8 km to the southeast.

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).

## 4.2 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). 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 closest residence to the Fuel Delivery Pipeline Corridor is a mobile park home which is approximately 1.2 km away to the east.

The Fuel Delivery Pipeline corridor crosses land where Sandhill Materials Inc. has a mineral tenure (tenure #601324). The pipeline corridor also overlaps mineral tenures held by Kerry Ning Leong. A mineral tenure held by William Charles Mould is located to the west and outside of the Fuel Delivery Pipeline Corridor footprint. There are three water licenses that occur along the current alignment of the Fuel Delivery Pipeline Corridor, and eight groundwater wells are located within the footprint of the Fuel Delivery Pipeline Corridor (Figure 7-2).

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.

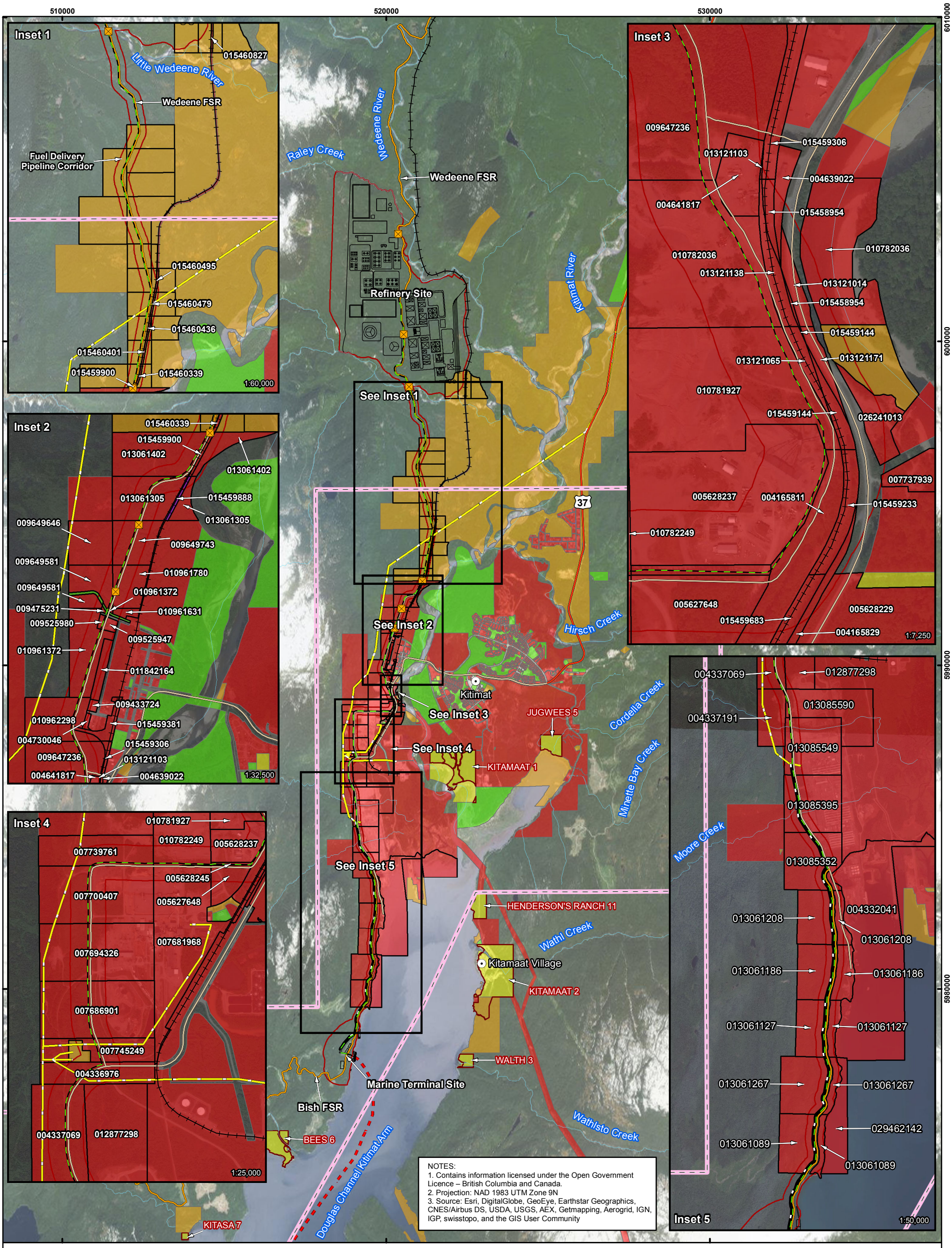


Figure 4-4
Kitimat Clean Ltd.
Kitimat Clean Refinery Project
**Land Ownership - Fuel Delivery Pipeline Corridor**

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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

Hirsch Creek

Kitimat

JUGWEES 5

Cordella Creek

KITAMAAT 1

Minette Bay Creek

Anderson 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

Marine Terminal Site

Fuel Delivery Pipeline Corridor

KITASA 7

Douglas Channel Kitimat Arm

KUASTE 8

1:30,000

1:30,000

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**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 GREEN

HATCH

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## 4.3 Marine Terminal Site

The 155 ha Marine Terminal Site will be located on the west side of Kitimat Arm, just north of Bish Cove, and across the channel from Kitamaat 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 closest residence to the Marine Terminal Site is a residence in Kitamaat Village approximately 3.65 km away to the east.

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.

## 4.4 Marine Shipping Route

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.

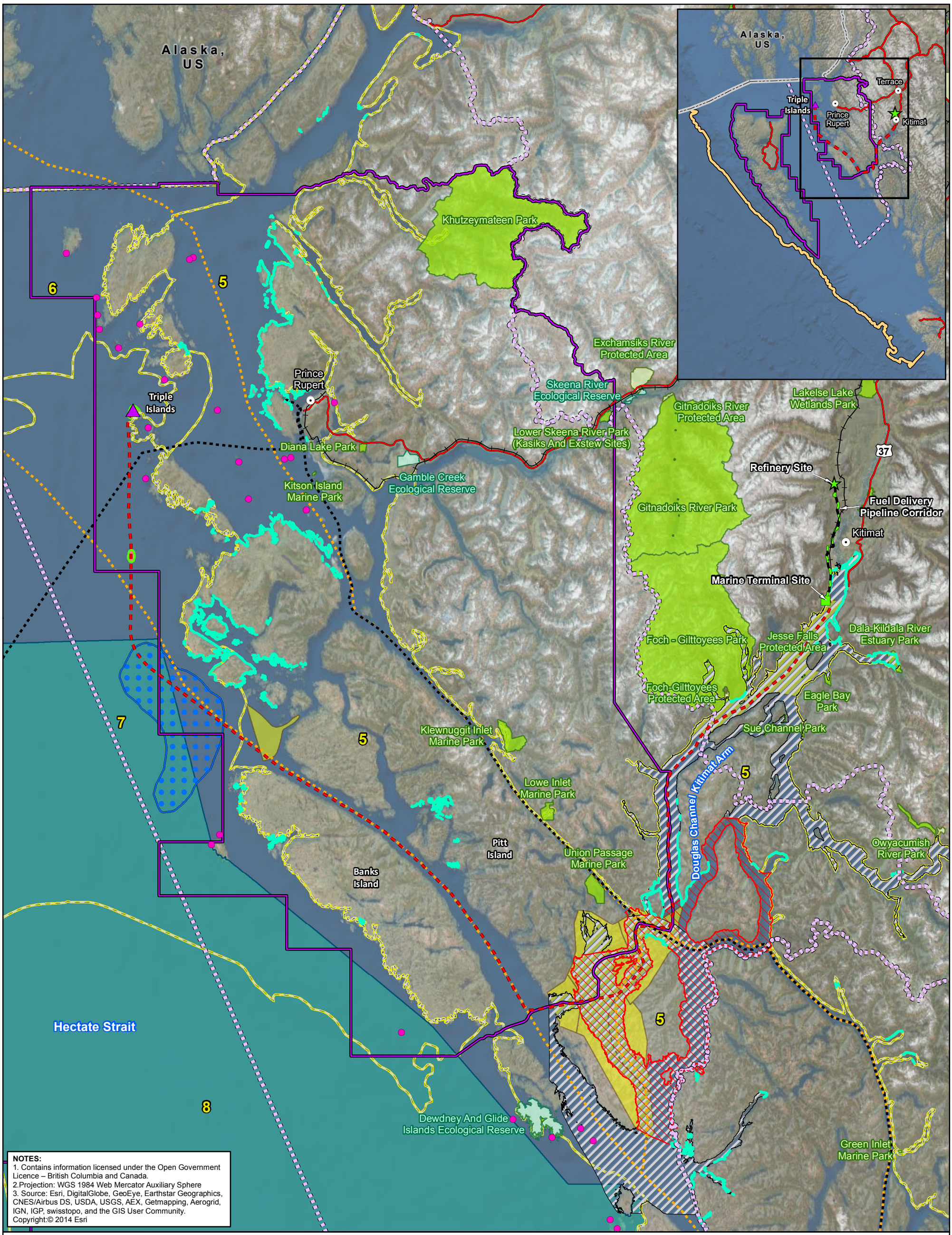
Ocean-going vessels up to 50,000 DWT (Deadweight Tonnes) have been navigating through the Douglas Channel to Kitimat since the 1950s. Shipping routes in the area are well known to the BC Coast Pilots Ltd. (BCCP). Vessels currently utilizing the Douglas Channel have dimensions up to 295 m in length, widths up to 32.5 m and draughts up to 12 m, with an average capacity of 65,000 DWT. In comparison, VLCCs have dimensions of up to 470 m in length, beams of up to 60 m and draughts of up to 20 m and have sizes ranging from 180,000 to 320,000 DWT. 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.

VLCC tanker shipping and associated marine vessel operation between the Marine Terminal Site and Triple Islands Pilotage Authority is proposed to be evaluated as part of the EA process. In addition, Kitimat Clean may participate in a voluntary TERMPOL assessment, which is separate to the EA process.

## 4.5 Federal Land

The closest federal land in proximity to the Refinery Site, Marine Terminal Site and Fuel Delivery Pipeline Corridor is approximately 8.6 km, 20 km and 37.6 km away respectively (Figure 4-3 and Figure 4-4). No federal land is required to support the undertaking of this Project.

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- 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

1:11,000,000

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

HATCH

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## 4.6 Regional Studies

### *4.6.1 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.

### *4.6.2 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.

### *4.6.3 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. |
| | Methanex/Cenovus Terminal | The Methanex/Cenovus site was sold to Shell in 2011 and was decommissioned. |
| | Moon Bay Marina | The lease was terminated for this recreational marina in June of 2010. Rio Tinto Alcan currently owns the property. |
| Present | MK Bay Marina | Marina with 140 berths located at the head of Douglas Channel. |
| | 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. |
| | 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. |
| | 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. |
| | 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. |
| | Pacific Trail 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 is 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
- Kitselas First Nation.

The Refinery Site is also located approximately 8.7km from the traditional territories of the Metlakatla First Nation, 29.7km from the Kitsumkalum First Nation, 37.2km from the Gitxa ala Nation and 15.9 km from the Gitga'at Nation. The Fuel Delivery Pipeline Corridor is also located approximately 15.1 km from the traditional territories of the Metlakatla First Nation, 36.1 km from the Kitsumkalum First Nation, 21.7 km from the Gitxa ala Nation and 9.7 km from the Gitga'at Nation. The Marine Terminal Site is located completely within the traditional territory of the Haisla Nation and approximately 13 km from the traditional territories of the Lax Kw'alaams First Nation, 55.4 km from the Kitsumkalum First Nation, 19.6 km from the Gitxa ala Nation, 13 km from the Kitselas First Nation, 8.1 km from the Gitga'at Nation, and 22.6 km from the Metlakatla 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 does overlap with the proposed Refinery Site.

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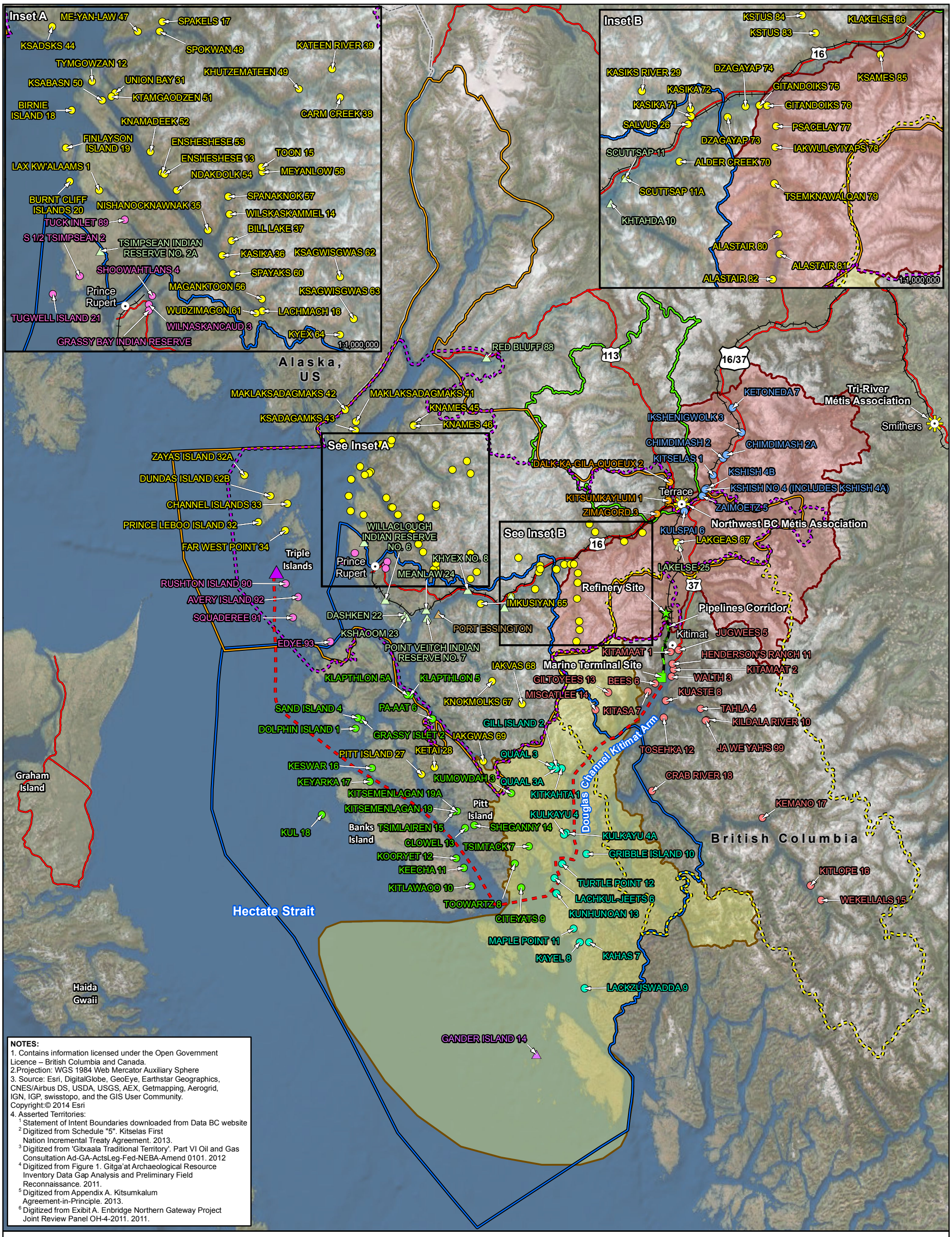


**NOTES:**

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

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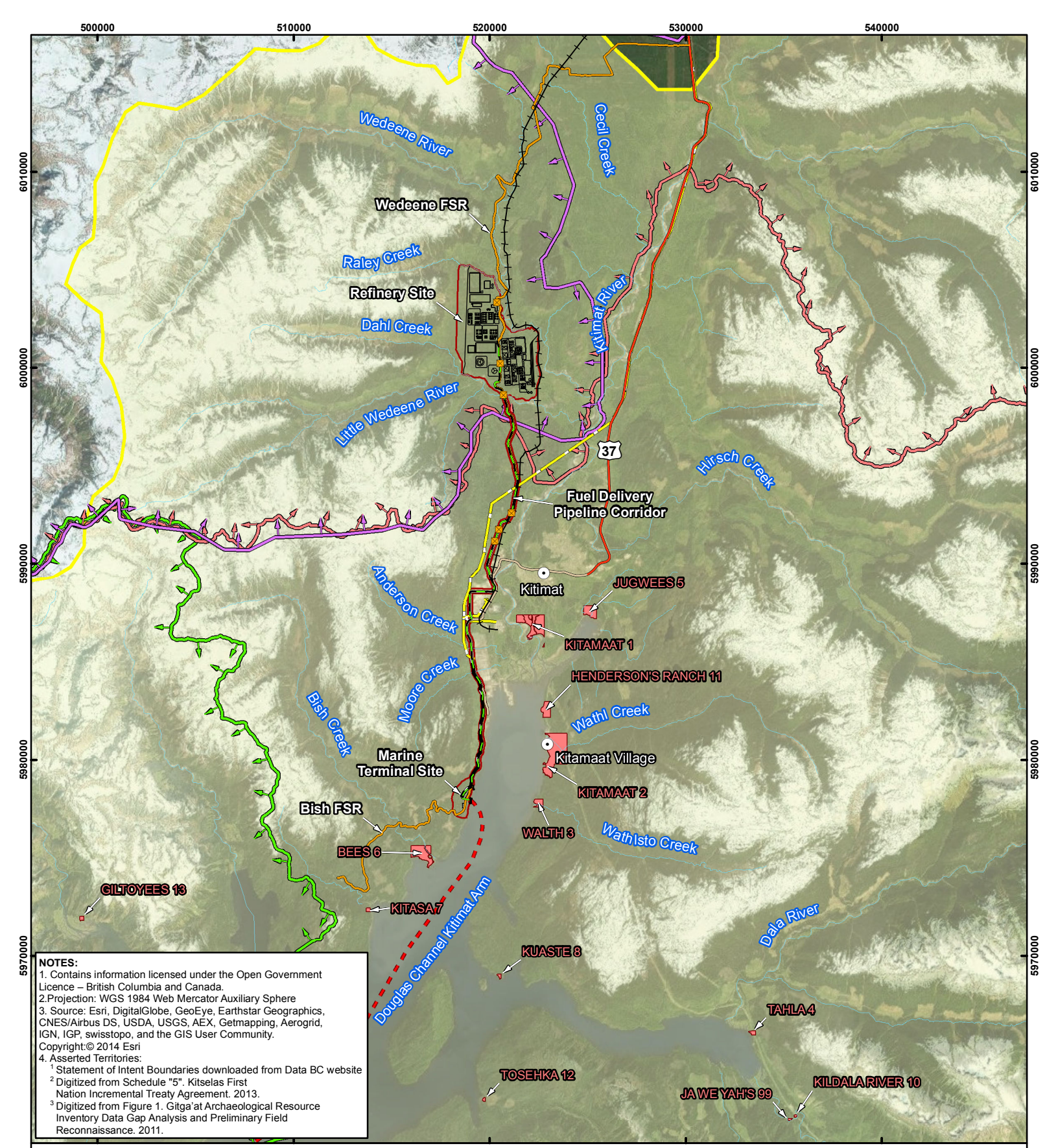


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2.Projection: WGS 1984 Web Mercator Auxiliary Sphere
3. Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community.
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4. 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
- Bridge
- Railway
- Forest Service Road
- Highway
- Road
- Existing Transmission Line

**Proposed Infrastructure**

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

0 2 4 8 Km

NORTH

1:250,000

Figure 5-2
Kitimat Clean Ltd.
Kitimat Clean Refinery Project
**Aboriginal Traditional Territories and Indian Reserves - Project Site**

HATCH

The Marine Terminal Site is located only within the asserted traditional territory of the Haisla Nation, however on-shore Project components will require long-term (although not permanent) access to, use of, and occupation within the asserted traditional territories of the Haisla Nation, Lax Kwa'laams First Nation and the Kitselas First Nation for the purposes of geotechnical investigation, construction, operations, and closure and de-commissioning activities of the Project.

In-water Project physical activities related to shipping will also require access to and use of the asserted traditional territories of the following Aboriginal groups (Figure 5-2):

- Gitxaala Nation
- Gitga'at Nation
- Kitsumkalum First Nation
- Metlakatla First Nation
- 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 kilometers 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 Haisla 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). The Refinery Site is located approximately 18.5km away from the Haisla Nation Incremental Treaty Agreement Lands with both the Marine Terminal Site and Fuel Delivery Pipeline Corridor located approximately 3km away from Incremental Treaty Agreement Lands.

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 apples, 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 prawn 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 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.

[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

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, mollusks 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.

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 access to traditional fishing grounds, effects on benthic and near shore

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

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).

## 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 distance of the Refinery Site, Marine Terminal Site and Fuel Delivery Pipeline Corridor from the Kitselas First Nation Proposed Treaty Lands is approximately 9.4km, 34.4km and 14.9 km respectively.

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

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

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).

### *5.3.2 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 distance of the proposed Refinery Site, Marine Terminal Site and Fuel Delivery Pipeline Corridor from the Kitsumkalum First Nation Proposed Treaty Agreement Lands is approximately 30.4km, 56km and 36.9 km respectively. 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

[6] http://www.kitsumkalum.bc.ca/aboutus.html
[7] http://kitsumkalumtreaty.com/
[8] http://www.bctreaty.net/nations/agreements/Kitsumkalum_AIP.pdf

- 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).

## 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 elders report that significant harvesting times occur from February to June and again in October through December (EAO, 2014).

Gitxaała Nation has extensive marine travel ways 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.
- 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 access 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.

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.
- 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

[9] http://www.gitgaat.net/contact/treatyoffice.htm
[10] http://www.bctreaty.net/nations/agreements/tsimshia_framewrk.pdf

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 by 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<br>• Unloading racks<br>• 4 tracks with a total maximum length of 12 km[11]<br>• Stack for discharge of scrubbed air. |
| Refinery Site | • Atmospheric Distillation Unit<br>• Vacuum Distillation Unit<br>• Resid Hydrocracker integrated with a Solvent Deasphalting Unit (SDA)<br>• Vacuum Gas Oil (VGO) Hydrocracker<br>• Distillate Hydrotreater<br>• Sulphur Recovery Unit<br>• Steam Methane Reformer<br>• Naphtha Hydrotreatment Unit<br>• Pitch Gasification Unit<br>• Syngas Sweetening<br>• Fischer-Tropsch with Mild Hydrocracker<br>• Air Separation Unit<br>• Flare System with 2 stacks per train<br>• Tank Farm (8 Bitumen Storage Tanks; 24 Intermediate Product Storage Tanks; 22 Processed Fuel Storage Tanks)<br>• Non-hydrocarbon Storage Systems (e.g., raw water, amine and sulphur)<br>• Twenty-six (26) smaller stacks in total throughout the refinery. |

[11] Since the rail yard will have less than seven yard tracks and a total track length less than 20 km, this Project component does not meet the thresholds for a designated physical activity under the Canadian Environmental Assessment Act, 2012, or BC Reviewable Projects Regulation.

| Project Component | Sub-Components |
|---|---|
| | • Supporting Infrastructure:<br>◆ Power Generation (Two co-generation plants, each with one gas turbine generator (GTGs) and two steam turbine generators) capable of generating up to 540 MW of electricity<br>◆ Two emissions stacks for the GTGs<br>◆ Transmission line (route TBD)<br>◆ Tail Gas and Fuel Gas System<br>◆ Boiler Feedwater (BFW) and Condensate System<br>◆ Cooling Water System<br>◆ Instrument Plant Air and Nitrogen System<br>◆ Firewater System<br>◆ Closed Blowdown System<br>◆ 10 Groundwater well(s)<br>◆ Surface Water Management Ponds and diversion structures<br>◆ Water Treatment Plant<br>◆ Waste incinerator<br>◆ Administration facilities, offices and parking<br>◆ Access road and up to 6 bridge upgrades; new site roads<br>◆ 6,000 to 7,000 person temporary construction work camp<br>◆ Laydown areas. |
| Fuel Delivery Pipelines | • 18” Diesel Pipeline<br>• 18” Jet Fuel Pipeline<br>• 18” Gasoline Pipeline. |

| Project Component | Sub-Components |
|---|---|
| Marine Terminal Facility | • 1 Deep water vessel berth comprising:<br>◆ Loading Platform with Gangway Tower<br>◆ Four breasting dolphins;<br>◆ Six mooring dolphins or shore moorings;<br>◆ Access Trestles and Catwalks<br>◆ Mooring Systems<br>• 1 utility berth<br>• 1 material off-loading facility<br>• Temporary laydown areas<br>• Dredge stockpile area<br>• Pipeline Pig launch facility<br>• Surge tank facilities<br>• Supporting Infrastructure:<br>◆ Administration facilities, offices and parking<br>◆ 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 six 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 total maximum length of tracks in the rail yard will be 12 km.

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 meters wide by 1,000 meters 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 day (bpd) of pure bitumen to produce approximately 460,000 barrels per day (bpd) of value added fuel products. The refinery will have two identical refinery processing trains with each train having 50 percent capacity (or 200,000 bpd). The Refinery will use world class, state-of-the-art processing technologies to produce petroleum products, including 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 day (bpd) of diesel fuel and jet fuel (of which 50,000 bpd will be ultra-low sulphur diesel)
- 119,000 bpd of gasoline
- 11,000 bpd of butane
- 9,000 bpd 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. This unit will utilize two emission stacks per processing train to vent waste gases from the fuel gas fired heaters.

### 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. This unit will utilize two emission stacks per processing train to vent waste gases from the fuel gas fired heaters.

### 6.2.3 *Distillate Hydrotreater and Vacuum Gas Oil Hydrocracker*

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. This unit will utilize two emission stacks per processing train to vent waste gases from the fuel gas fired heater.

### 6.2.4 *Pitch Gasification*

The residue from the Solvent Deasphalting Unit, 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. This unit will possess one stack for each train to vent waste gases from the fuel gas fired heaters.

### *6.2.6 Naphtha Processing Block*

The naphtha processing block will upgrade lower-value naphtha intermediate streams to produce high-quality naphtha product yields. The Naphtha Hydrotreater 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 increases 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. The naptha processing block will utilize three emission stacks per processing train to vent waste gases from the fuel gas fired heaters.

### *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. This unit will possess one incinerator stack on each train to vent emissions resulting from burning treated gas from the TGTU.

### *6.2.8 Steam Methane Reformer*

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. This unit will possess two stacks for each train to vent emissions resulting from flaring.

### *6.2.9 Air Separation Unit*

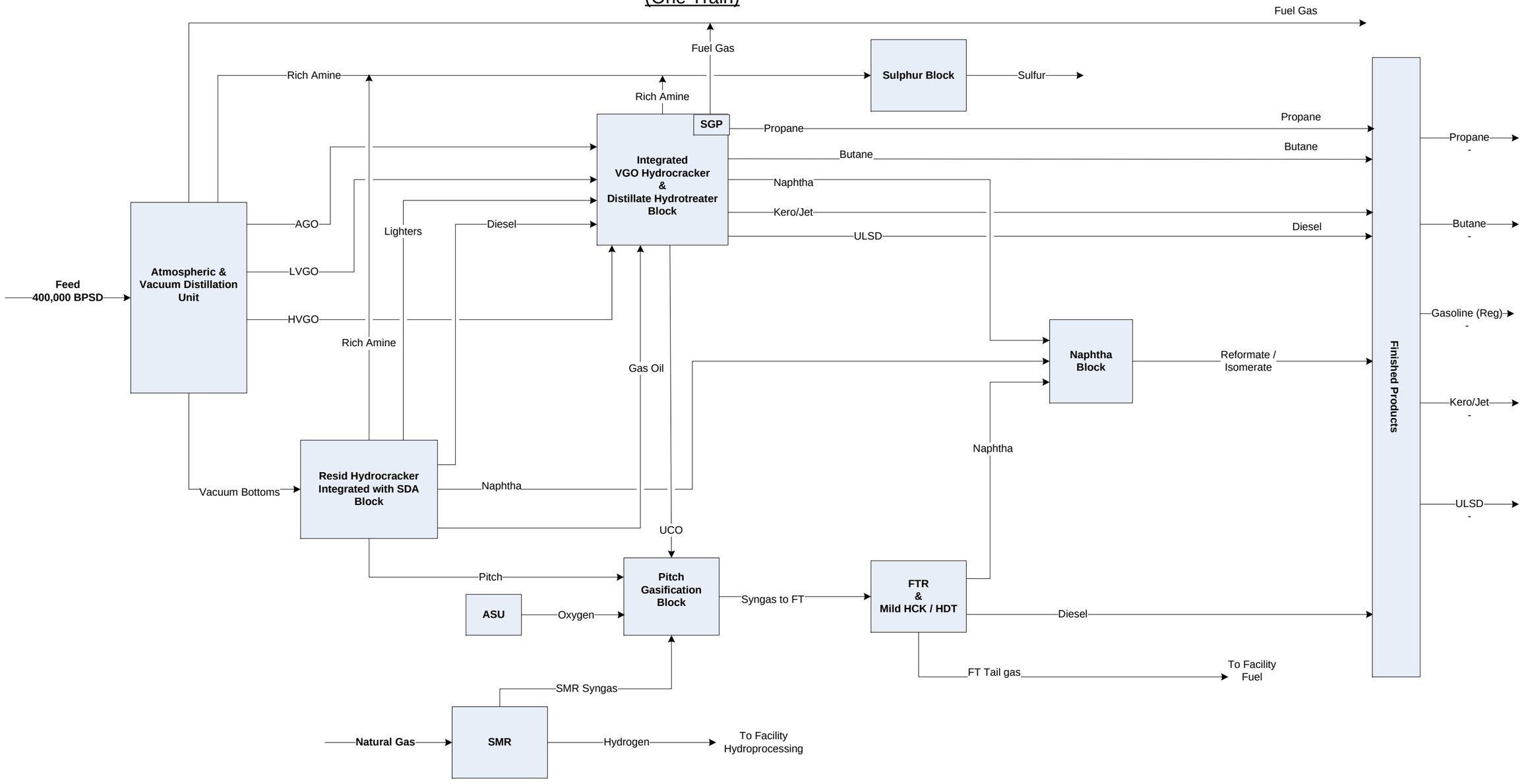
The air separation unit will supply oxygen and nitrogen to meet the Refinery requirements. Oxygen will be used in the pitch gasifier and sulphur recovery units, while nitrogen will be used for various blanketing and start-up requirements.

### *6.2.10 Flare Systems*

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

| DRAWING NO. | DRAWING TITLE |
|---|---|

REFERENCE DRAWINGS

| REV. | DESCRIPTION | DATE | DESIGN | CHKD | LEAD ENG | PROJ MNGR | CLIENT |
|---|---|---|---|---|---|---|---|
| A | ISSUED FOR USE | 11/14/2014 | D.P. | S.V. | S.V. | P.C.G. | |

REVISIONS

APPROVED BY:
PR.ENG./PR. TECH
NAME
SIGNATURE
REGISTRATION NUMBER
REVISION DATE
ORIGINAL DATE

HATCH™



| | |
|---|---|
| DESIGNED BY / DATE | DRAWN BY / DATE |
| CHECKED BY / DATE | DISCIP. ENGR. / DATE |
| PROJ. DES. COORD. / DATE | ENG. MGR. / DATE |
| PROJ. MGR. / DATE | |

KITIMAT CLEAN REFINERY PROJECT

OVERALL PROCESS SCHEME
BLOCK FLOW DIAGRAM

| SCALE | DWG. NO. | REV. |
|---|---|---|
| NTS OR AS NOTED | xxxxxxx-XXX-XX-XXX-XXXX | - |

H347026-0000-07-236-0011

Figure 6-1
Block Flow Diagram

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### 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 vapor 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 | |
| | TOTAL | 54 | | | | |

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 vapor recovery systems to capture hydrocarbon emissions which will be sent to the Refinery for processing.

Intermediate products from the refining processes will be temporarily 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 vapor 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 vapor recovery systems. In total, the Tank Farm will consist of 54 tanks. The actual number of tanks may change slightly based on detailed design.

### 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 each powered by one gas turbine generator; each co-gen plant is capable of generating up to 120 megawatts (MW) power at ISO ambient conditions; and
- Each co-gen plant has two steam turbine generators, with each generator 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 stormwater or groundwater in the vicinity of the Refinery Site, using approximately 10 groundwater wells to abstract 230 liters/second on a continuous basis during the Operations phase (the location of the well sites are yet to be confirmed). Groundwater abstraction would be stopped if not required. 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 287 kV transmission line, which will be approximately 12 km[12], 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,

[12] Since the new line will be less than 500 kV and < than 40 km in a new right of way, this Project component is below the thresholds identified in the Reviewable Projects Regulation under the BC Environmental Assessment Act.

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 18 inch 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. The length of the pipelines will be approximately 23 km, well below the length of 40 km required to exceed BC Environmental Assessment Act Reviewable Projects Regulation thresholds. 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.

## 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 comprised 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

- 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
- 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 Pigs 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 gas in the form of carbon dioxide ($CO_2$), 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 26 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 partially 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 two Surface Water Management Ponds which will also be used to make-up process water requirements. The amount of water that will be diverted from the Refinery Site is estimated to be approximately 3,728,447 $m^3$ from two sub-catchments; 1,366,786 $m^3$ from the Raley Creek sub-catchment, and 1,988,239 $m^3$ from the Dahl Creek sub-catchment[13]. There will be two storm water management ponds (SWMPs) on site with the north pond receiving surface flow from the Raley Creek sub-catchment and the south pond receiving surface flow from the Dahl Creek sub-catchment (Figure 3-1). Each SWMP will have an emergency spillway in case of over-topping. The emergency spillway on the North Stormwater Management Pond will be released to Raley Creek while the

[13] The total amount of water being diverted from a natural waterbody and potentially released back into natural waterbodies is well below the designated activity threshold of 10,000,000 $m^3$/year under the Canadian Environmental Assessment Act, 2012 and the Reviewable Projects Regulation under the BC Environmental Assessment Act.

emergency spillway on the South Stormwater Management Pond will be released to Little Wedeene River. Any runoff flowing beneath oil bearing equipment will be separated as oily runoff and will pass through an oil water separator prior to being conveyed to the Oily Water Pond. The Oily Water Pond will act as a holding pond where water will be tested for oil and grease before being released to the north SWMP.

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 Blasted and Dredged Material*

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 n-PAG material will be re-used for construction purposes.

### *6.5.5 Hazardous Waste*

Potential sources of hazardous waste from the refinery include hydrocarbon contaminated soil, medical waste from the onsite medical clinic, wastewater treatment plant sludge, batteries, and paints. Hazardous waste will be appropriately transported, stored, and disposed of in accordance with the Hazardous Waste Regulation under the *Environmental Management Act*; the *Transportation of Dangerous Goods Act*; and the Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations under the *Canadian*

*Environmental Protection Act.* 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 and de-commissioning (includes reclamation). The sequence of activities for each of the phases of the Project is outlined below.

### *6.6.1 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, labor 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, site grading, dredging, clearing and grubbing, and salvage and storage of topsoil and subsoil as summarized in Table 6-4.

**Table 6-4: 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 Plan (including de-commissioning, reclamation and 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. |
| **Drilling and Mapping Soil Horizons** | Drilling and mapping of soil horizons to understand site specific soil profile (e.g., soil type, thickness). These activities may be performed concurrently with the geotechnical assessment. |
| **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 30,000$m^3$) 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
  - 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), and 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
  - 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 equipment
  - Installation of piping and electrical infrastructure
  - Pre-commissioning.
- Removal of construction facilities and infrastructure where not required in the future
- 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.

### *6.6.2 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 Processing 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.
  - 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
  - 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, Vapor recovery system, Gas & Fire Protection System, 10 groundwater wells, waste water treatment, etc.

### *6.6.3 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.
  - 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
  - Waste management and disposal.

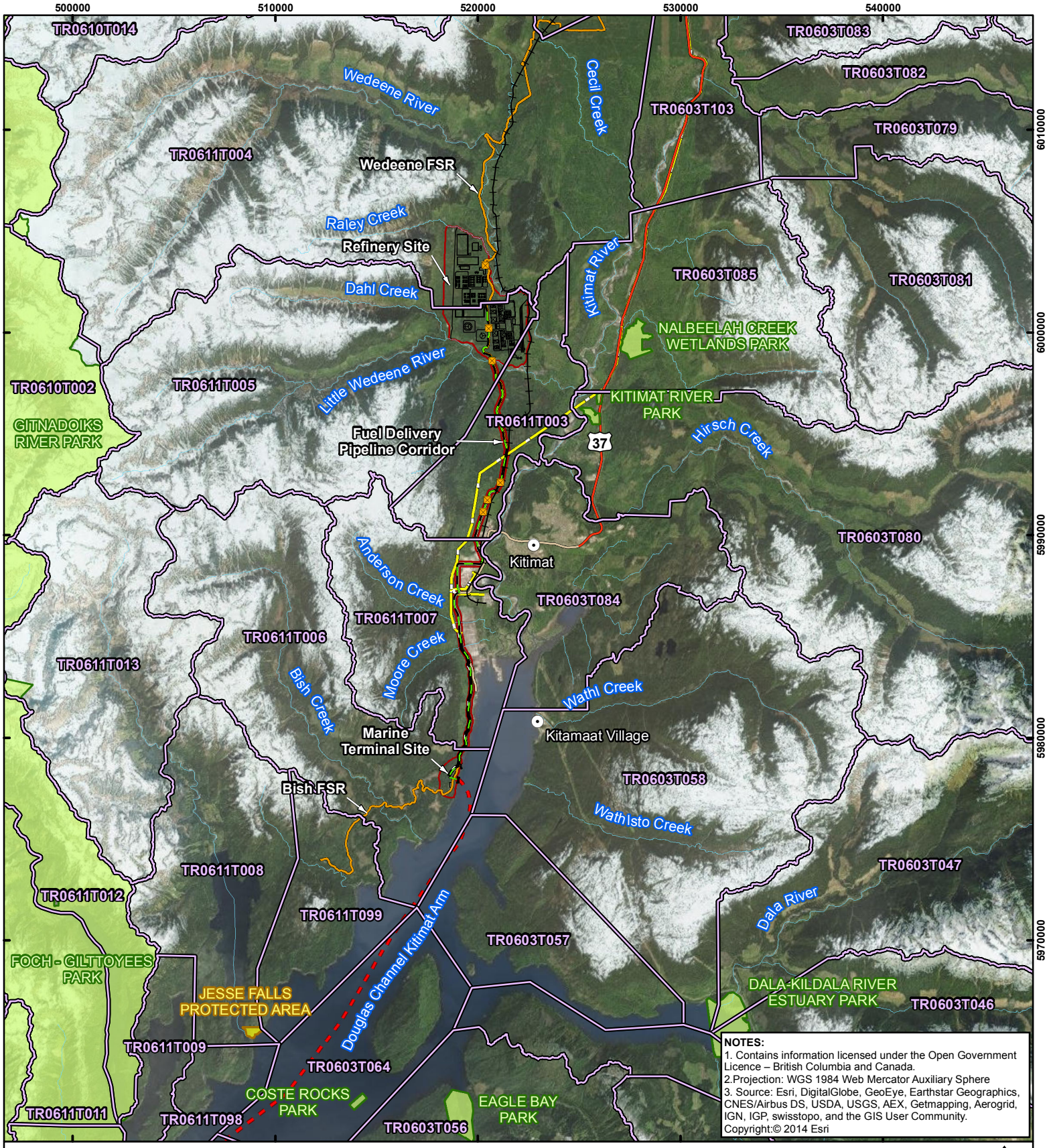
### *6.6.4 Closure and Decommissioning Phase*

Where possible, throughout the construction and operations phases, progressive reclamation activities will occur. A Closure 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).




**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.


- Trapline Area
- Protected Area
- Provincial Park
- Community
- Bridge
- Railway
- Forest Service Road
- Highway
- Road
- Existing Transmission Line

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

0 2 4 8 Km
NORTH
1:250,000

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

KITIMAT CLEAN
HATCH

## 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)[14] can be poor in the airshed. There are five ambient air quality monitoring stations within a 50 km radius of the Project monitoring different pollutants (e.g., particulate matter ($PM_{2.5}$), sulphur dioxide ($SO_2$)) and seven meteorological stations (Figure 7-2).

## 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 (Figure 7-2). The Refinery Site is situated within the Wedeene River and Little Wedeene River watersheds, with a number of sub-catchments, including Raley Creek, Dahl Creek, Bowbyes Creek, and Iron Mine Creek sub-catchments. The Project 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

[14] Criteria Air Contaminants consist of particulate matter, sulphur oxides, nitrogen oxides, volatile organic compounds, carbon monoxide, and ammonia (see http://www.bcairquality.ca/101/common-pollutants.html).

Salmon; Rainbow Trout; and Dolly Varden, while the Wedeene River also supports Sockeye Salmon (FISS 2015).

520000
530000
540000
6000000
5990000
5980000

Wedeene River Watershed
Cecil Creek Watershed
Deception Creek Watershed
Wedeene River
Raley Creek
See Inset 1
Wedeene FSR
Refinery Site
Iron Mine Creek
Kitimat River
Dahl Creek
Nalbeelah Creek Watershed
Little Wedeene River
Little Wedeene River Watershed
Bowbyes Creek
37
Kitimat Whitesail
Hirsch Creek
Riverlodge
Kitimat
Kitimat Townsite
Pine Creek Watershed
Hirsch Creek Watershed
Anderson Creek
Cordella Creek
Cordella Creek Watershed
See Inset 2
Anderson Creek Watershed
Kitimat Haul Road
Minette Bay Creek
Kitimat Rio Tinto Alcan Plant
Minette Bay Creek Watershed
Moore Creek Watershed
Moore Creek
Kitimat Yacht Club
Bolton Creek Watershed
Wathl Creek Watershed
Morrison Creek Watershed
Wathl Creek
Kitamaat Village
Kitimat Haisla Village
Bish Creek
Bish Creek Watershed
Marine Terminal Site
Bish FSR
Wathlsto Creek
Wathlsto Creek Watershed
Douglas Channel Kitimat Arm
Emsley Creek Watershed

Inset 1
Raley Creek Sub-Watershed
Deception Creek Watershed
Wedeene FSR
Raley Creek
Wedeene River Watershed
Wedeene River
Iron Mine Creek Sub-Watershed
Dahl Creek Sub-Watershed
Dahl Creek
Little Wedeene River Watershed
Little Wedeene River
Fuel Delivery Pipeline Corridor
Bowbyes Creek
Bowbyes Creek Sub-Watershed
1:60,000

Inset 2
58314
58315
108356
58313
107802
58311
61371
61373
1:17,500

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

**Watershed**
- Anderson Creek
- Bish Creek
- Cecil Creek
- Cordella Creek
- Dala River
- Deception Creek
- Emsley Creek
- Hirsch Creek
- Little Wedeene River
- Minette Bay Creek
- Moore Creek
- Morrison Creek
- Nalbeelah Creek
- Pine Creek
- Wathl Creek
- Wathlsto Creek
- Wedeene River
- Kitimat River

- Meteorology Station
- Air Quality Station
- Groundwater Well
- 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
**Watersheds, Groundwater Wells, Air Quality and Meteorological Stations in the Project Area**

KITIMAT CLEAN
HATCH

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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[15] | COSEWIC[16] | 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 | Humpback | Blue | Special | Threatened | Douglas Channel |

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

[16] *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)

| Scientific Name | English Name | BC[15] | COSEWIC[16] | SARA | Location |
|---|---|---|---|---|---|
| Novaeangliae | Whale | | Concern | | |
| Orcinus orca | Northern Resident Killer Whale | Red | Threatened | Threatened | Douglas Channel |

## 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, 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 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, and 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 7-3). 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)
- 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 0.5 1 2 Km

NORTH

1:110,000

Figure 7-3
Kitimat Clean Ltd.
Kitimat Clean Refinery Project
**Terrestrial Environmental Setting in the Project Area**

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### 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 7-3). 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)
- 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 7-3).

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)
- 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. Potential marbled murrelet critical habitat and proposed grizzly bear critical habitat is distributed widely across the Project area, including across the Refinery Site (Figure 7-4). The Refinery Site and the northern portion of the Fuel Delivery Pipeline Corridor overlaps with moose Ungulate Winter Range (u6-009) (Figure 7-5). Mountain goat ungulate winter range occurs west of 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[17] | COSEWIC[18] | 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 |

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

[18] 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)

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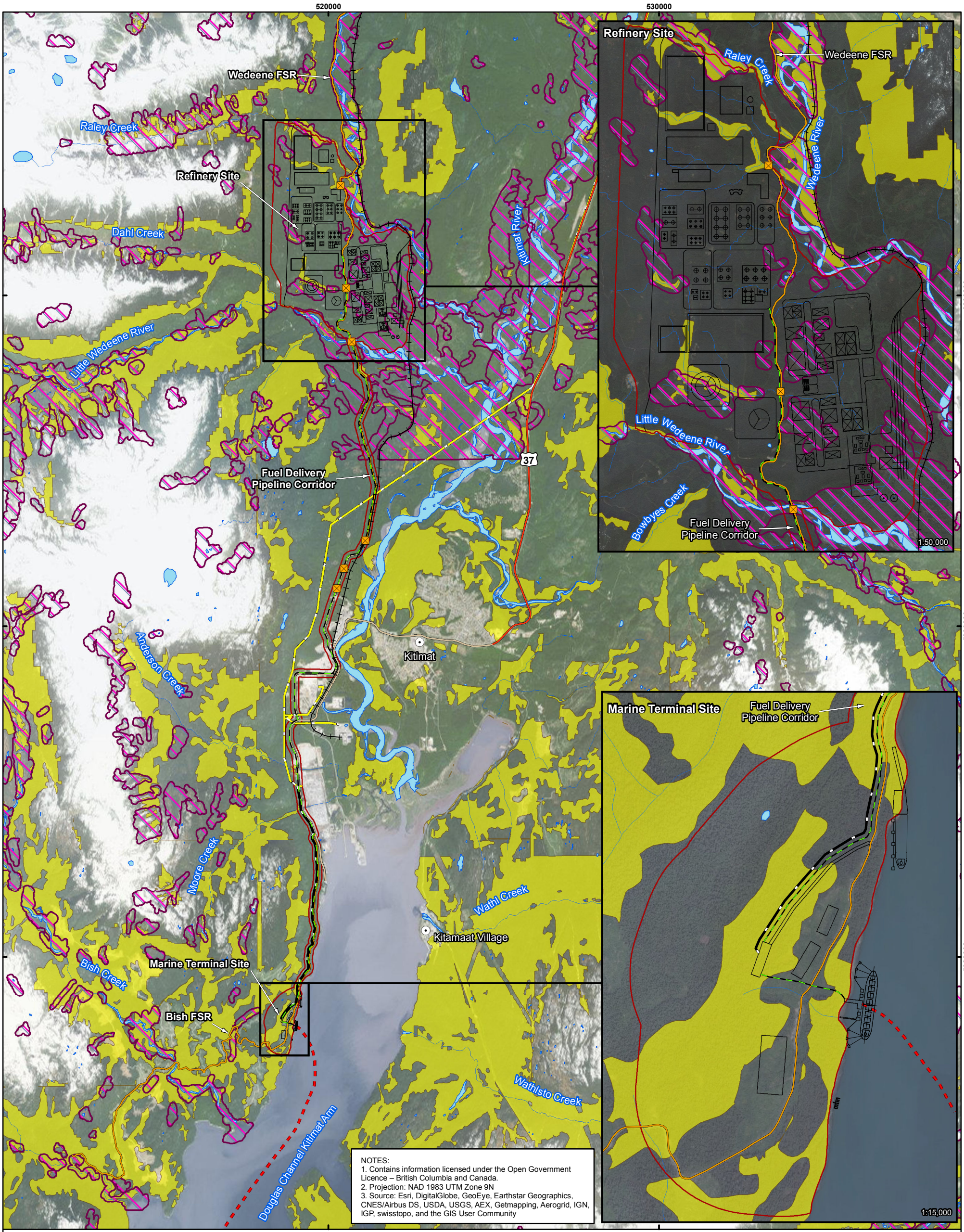


Proposed Grizzly Bear Habitat
Potential Critical Habitat for Marbled Murrelet
Waterbody
Watercourse

Community
Bridge
Railway
Forest Service Road
Highway
Road
Existing Transmission Line

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

0 0.5 1 2 Km

NORTH

1:110,000

Figure 7-4
Kitimat Clean Ltd.
Kitimat Clean Refinery Project
**Proposed Grizzly Bear and Potential Marbled Murrelet Habitat in the Project Area**

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520000
530000
6000000
5990000
5980000
Wedeene FSR
Raley Creek
Refinery Site
Dahl Creek
Little Wedeene River
Kitimat River
Fuel Delivery Pipeline Corridor
37
Anderson Creek
Kitimat
Moore Creek
Wathl Creek
Kitamaat Village
Bish Creek
Marine Terminal Site
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

**Ungulate Winter Range**
- Moose (M-ALAL)
- Mountain Goat (M-ORAM)
- Waterbody
- 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 7-5
Kitimat Clean Ltd.
Kitimat Clean Refinery Project
**Ungulate Winter Range in the Project Area**

KITIMAT CLEAN

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# 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), sulphur oxides ($SO_x$), nitrogen oxides ($NO_x$) 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 $CO_2$, CO, volatile organic compounds (VOCs), $SO_x$, $NO_x$, ammonia ($NH_4$), $PM_{10}$, $PM_{2.5}$, and fugitive emissions (hydrocarbons and dust). Other pollutants (e.g., heavy metals, air toxics, persistent organic pollutants) are not anticipated to be generated by the refinery. Fugitive methane emissions will be appropriately managed during Operations.

The major emission sources of $CO_2$, $SO_x$ and $NO_x$ in the refinery 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 26 smaller stacks throughout the refinery to vent waste gases from process units using fired heaters to generate heat by burning fuel gas. These stacks will be located in the DRU furnace, VDU furnace, integrated resid hydrocracker, integrated VGO/DHT hydrocracker, NHT, light naphtha isomerization, heavy naphtha reformer, fischer- tropsch and mild hydrocracker, hydrogen generation SMR block, and pitch gasifier units.

$SO_x$ 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 Selective Catalytic Reduction (SCR) technology with specific catalysts to further reduce NOx and CO emissions. The SCR process however requires precise control of the ammonia injection rate as an insufficient injection rate could result in unacceptably low NOx conversions while an injection rate which is too high may result in the release of undesirable ammonia to the atmosphere. These ammonia emissions from SCR systems are known as ammonia slip and the maximum permitted $NH_3$ slip in stationary applications is usually specified around 5-10 ppm $NH_3$. These concentrations of ammonia are generally undetectable by the human nose. In addition, ammonia slip may also be controlled by a guard catalyst (oxidation catalyst) installed downstream of the SCR catalyst.

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 vapor recovery systems. Pumps and compressor seal designs that provide multiple seals and barriers, the use of low emission packages for valves, and vapor 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 (GHG) emissions from the Refinery are primarily as a by-product of the manufacturing of hydrogen and from the fired heaters. The GHG emissions will primarily be comprised of $CO_2$ (approximately 99%) with very small amounts of methane ($CH_4$) and nitrous oxide ($N_2O$). Hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs) and sulphur hexafluoride (SF6) are not anticipated to be generated by the refinery. 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 10.9 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
- Integrating power generation with hydrogen manufacture to minimize fuel needs.

In total, construction phase $CO_{2e}$ emissions from land clearing, site preparation and instrumentation installations activities associated with the establishment of the refinery site, fuel delivery pipeline corridor, marine terminal site and marine shipping activities is estimated at 200,000 tonnes $CO_{2e}$. During operations, the total $CO_{2e}$ emissions are estimated to be at 11.1 million tonnes per annum resulting from the refinery site and marine shipping activities, including the VLCC carriers and tugboats. Physical activities at the Marine Terminal Site will emit CACs and $CO_2$, principally from loading and maneuvering activities of ships and tugboats at the terminal, using main engines and auxiliary engines. Fugitive emissions of methane may also be released during the operations phases; however this will be limited and appropriately managed. 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. Air emissions from VLCCs along the shipping route

will include $NO_X$, $SO_2$ and $CO_2$. The loading, unloading and ballasting of the VLCCs will also result in limited fugitive emissions of VOCs. 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

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. In addition to the treated water that will be used for the refinery processes, the remaining balance of water requirements for the refinery will be made up from available groundwater and stormwater resources.. Approximately 840 $m^3$/hr. (125,000 bpd or 230 liters/second) of groundwater during Operations will be needed, which will be abstracted using an estimated 10 groundwater wells located in the Refinery Site (location to be determined). Each water well or borehole will consist of a shaft bored into the ground and installation of a vertical pipe (casing) and well screen to prevent the borehole from collapsing. The casing also helps prevent surface contaminants from entering the borehole and protects any installed pump from drawing in sand and sediment. Groundwater abstractions will drawdown available groundwater resources in the Project area, although there are no other groundwater users in the immediate vicinity of the Refinery Site. Groundwater abstraction would be stopped if not required.

Approximately half-way along and within the footprint of the Fuel Delivery Pipeline Corridor, there are 8 existing groundwater wells (Figure 7-2), which will need to be avoided with appropriate setback distances during construction activities.

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 the Closure and Decommissioning Phase. Drainages will be re-aligned to follow the natural drainage pathway during reclamation activities.

The amount of water that will be diverted from the Refinery Site is estimated to be approximately 3,728,447 $m^3$ from two sub-catchments; 1,366,786 $m^3$ from the Raley Creek sub-catchment, and 1,988,239 $m^3$ from the Dahl Creek sub-catchment. There will be two storm water management ponds (SWMPs) on site with the north pond receiving surface flow

from the Raley Creek sub-catchment and the south pond receiving surface flow from the Dahl Creek sub-catchment. Each SWMP will have an emergency spillway in case of over-topping. The emergency spillway on the North Stormwater Management Pond will be released to Raley Creek while the emergency spillway on the South Stormwater Management Pond will be released to Little Wedeene River. Any runoff flowing beneath oil bearing equipment will be separated as oily runoff and will pass through an oil water separator prior to being conveyed to the Oily Water Pond. The Oily Water Pond will act as a holding pond where water will be tested for oil and grease before being released to the north SWMP.

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)
- 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 have 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 is expected to be beneficial and is described above in Section 1.2. Adverse economic effects may result from:

- Effects of changes to labor 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
- 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
- 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
- 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 |

| Categories | Potential Indirect Effects on Aboriginal People |
|---|---|
| | industrial interests in the Project area<br>• Potential effects to current use of, or access to, lands and resources for traditional purposes<br>• Demographic changes on local community networks and culture<br>• 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<br>• Potential effects on quality of country foods as a result of air emissions, soil and lake acidification<br>• Potential effects on availability of country food resources due to habitat loss, alteration, sensory disturbance, and serious harm to fish habitat<br>• Safety hazards caused by Project construction and operation. |
| Physical and Cultural Heritage | • Potential modification, damage, or loss of archaeological, spiritual, or cultural heritage features or practices<br>• Potential modification, damage, or loss of any structure, site, or thing that is of historical, archaeological, paleontological or architectural significance (e.g., Culturally Modified Trees). |
| Traditional and Cultural Activities | • Potential for reduced availability, loss of, or access restrictions to marine, terrestrial, wildlife or fish resources currently used for traditional harvesting, hunting, or fishing purposes in the Project Site or along shipping lane<br>• Potential changes to or loss of access to asserted traditional land use areas in the Project Site or along shipping lane. |

## 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 foreseeable future projects occur or are planned in the Project area. 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. Although the Project is not situated on federal land, the Project will contribute a total of approximately 11.1 million tonnes of $CO_{2e}$ to the Kitimat airshed, which will contribute to Canada's national greenhouse gas (GHG) emissions annually during operations.

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. Direct engagement with representatives of the Lax Kw'alaams First Nation, Kitsumkalum First Nation, Gitga'at Nation, and Métis Nation of BC has not yet been undertaken but is planned to start in the near future, following the activities outlined in section 9.1.2. 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<br>Fax: 250-632-2840<br>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<br>Fax: 250-625-3246<br>Email: linda_admin@laxband.com | Linda Simon, Administration, Lax Kw'alaams Band |
| Metlakatla First Nation | PO Box 459, Prince Rupert, BC V8J 3R2 | Telephone: 250-628-3234<br>Fax: 250-628-2905<br>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<br>Fax: 250-635-5335<br>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<br>Fax: 250-635-4622<br>Email: kitsumkalum@citywest.ca | Steve Roberts, Band Manager |

| Aboriginal Group | Address | Phone/Fax/Email | Contact Person |
|---|---|---|---|
| Gitxaala Nation | PO Box 149, Kitkatla, BC, BC V0V 1C0 | Telephone: 250-848-2214<br>Fax: 250-848-2238<br>Email: contact@gitxaalanation.com | N/A |
| Gitga'at Nation | 445 Hayimiisaxaa Way, Hartley Bay, BC VOV 1A0 | Telephone: 250-841-2500<br>Fax: 250-841-2541<br>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<br>Fax: 778-571-9402<br>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, face to face meeting | October 2012 | Preliminary meeting to introduce the Project and receive feedback |
| Haisla Nation | Haisla Nation public meeting for broader membership | Kitimat, face to face meeting | 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 | email | December 2015 | Provision of draft Project Description for review and preliminary comments (none received to date) |
| Kitselas First Nation | Kitselas First Nation representatives | Terrace, face to face meeting | July 2010 | Preliminary meeting to introduce the Project and receive feedback |
| Kitselas First Nation | Representatives, including Councilors and negotiators | Kitselas Band Office, face to face meeting | November 2012 | Proposed Refinery Site location discussions |
| Kitselas First Nation | Representatives, including Councilors and negotiators | Victoria, face to face meeting | January 2013 | Proposed Refinery Site location discussions |

| Aboriginal Group | Participants | Location | Date | Discussion |
|---|---|---|---|---|
| Kitselas First Nation | Representatives, including Councilors and negotiators | Kitimat and Victoria, face to face meeting | July 2013 | Proposed Refinery Site location discussions |
| Kitselas First Nation | Representatives, including Councilors and negotiators | Kitimat, face to face meeting | November 2013 | Proposed Refinery Site location discussions. |
| Kitselas First Nation | Representatives, including Councilors and negotiators | Vancouver and Victoria, face to face meeting | January 2015 | Proposed Refinery Site location discussions |
| Kitselas First Nation | Representatives, including Councilors 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, face to face meeting | March 2013 | Preliminary meeting to introduce the Project and receive feedback |
| Metlakatla First Nation | Meeting with Chief | Face to face meeting, Victoria | July 2015 | Preliminary meeting to introduce the Project and receive feedback; discussed potential for jobs; advantages of shipping refined fuels vs. dilbit, and the need for training programs |

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 Kitselas and Haisla First Nations representatives, 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.

None of the representatives of Aboriginal groups that the Proponent has engaged with have raised objections to the Project and no environmental concerns and issues have been raised by any Aboriginal groups to date.

### *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
- 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 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.*[19]

In addition to the two public meetings in Kitimat and Prince Rupert, the Proponent has engaged a number of local and regional stakeholder groups in NW BC and the lower mainland (e.g., Rotary Clubs, Chambers of Commerce etc.). These meetings were intended to introduce the Project and to establish preliminary relationships with interested parties. More in-depth public stakeholder engagement will occur during the next phase of the EA process as per regulatory requirements. Consultation with private and industrial landowners and tenure and license holders in the Project area has not yet occurred but will be initiated during the next phase of the EA process.

Consultation activities undertaken with the public and stakeholder groups regarding the Project are summarized in Table 9-3. Attendance at these meetings was not tracked.

**Table 9-3: Public Consultation Activities Conducted to Date**

| Stakeholder Group | Date | Location (and Means of Consultation) | Activity / Discussion | Hosted by |
|---|---|---|---|---|
| General public in Kitimat | May 2014 | Kitimat (In person) | Presentation to introduce the Project at Public Meeting | Kitimat Municipality / The Chamber of Commerce |
| General public in Prince Rupert | October 2012 | Prince Rupert (In person) | Presentation to introduce the Project at Town Hall Meeting | D. Black |
| BC Chamber of Commerce | March 2013 | Vancouver (In person) | Presentation to introduce the Project. | BC Chamber of Commerce |
| Burns Lake & District | March 2014 | Vanderhoof (In | Preliminary | Burns Lake & |

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

| Stakeholder Group | Date | Location (and Means of Consultation) | Activity / Discussion | Hosted by |
|---|---|---|---|---|
| Chamber of Commerce representative | | person) | discussion on the Project | District Chamber of Commerce representative |
| Kelowna Chamber of Commerce | April 2014 | Kelowna (In person) | Presentation to introduce the Project. | Kelowna Chamber of Commerce |
| Terrace Chamber of Commerce | May 2014 | Terrace (In person) | Presentation to introduce the Project. | Terrace Chamber of Commerce |
| Campbell River & District Chamber of Commerce | May 2014 | Campbell River (In person) | Presentation to introduce the Project. | Campbell River & District Chamber of Commerce |
| Camosun College | February 2015 | Victoria (In person) | Presentation to introduce the Project. | Camosun College |
| Cordova Bay 55 Plus Association | February 2015 | Victoria (In person) | Presentation to introduce the Project. | Cordova Bay 55 Plus Association |
| Canadian Club of Victoria | February 2015 | Victoria (In person) | Presentation to introduce the Project. | Canadian Club of Victoria |
| Victoria Westshore Group | May 2015 | Victoria (In person) | Presentation to introduce the Project. | Victoria Westshore Group |
| Rotary Club of Surrey | November 2015 | Surrey (In person) | Presentation to introduce the Project. | Rotary Club of Surrey |
| Rotary Club of Whiterock | November 2015 | Whiterock (In person) | Presentation to introduce the Project. | Rotary Club of Whiterock |

### *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

- 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. These topics and issues were discussed at both local and regional meetings.

### *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 (and Means of Engagement) | Activity |
|---|---|---|---|
| District Municipality of Kitimat | July 2012 | Kitimat (In person) | Preliminary discussion with Mayor and Presentation to Kitimat Council |
| District Municipality of Kitimat | May 2014 | Kitimat (In person) | Further discussions about Project with Kitimat Council |
| City of Terrace | July 2012 | Terrace (In person) | Preliminary discussion with Mayor and Presentation to Terrace Council |
| District Municipality of Kitimat | December 2012 | Victoria (face-to-face) | Information sharing meeting with representatives |
| City of Terrace | November 2013 | Terrace (face-to-face) | Information sharing meeting with Mayor |
| BC Ministry of Environment | July 2012 | By phone Victoria | Preliminary discussions introducing the Project |
| BC Ministry of Natural Gas Development | December 2012 and June 2014 | By phone Victoria | Preliminary discussions introducing the Project |
| BC Ministry of Forests, Lands & Natural Resource Operations (MFLNRO) | February and March 2013 | By phone Victoria | Preliminary discussions introducing the Project |
| BC Ministry of Aboriginal Relations & Reconciliation | November 2013 and February 2014 | By phone Victoria | Preliminary discussions introducing the Project |

| Government Agency | Date | Location (and Means of Engagement) | Activity |
|---|---|---|---|
| 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<br>Ottawa | Preliminary discussions introducing the Project |
| Government of Canada's Major Projects Management Office (MPMO) | March 2016 | By phone<br>Ottawa | Preliminary discussions introducing the Project |
| 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 in person as well as via teleconference 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).

### *9.2.6 Government Engagement*

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.

### *9.2.7 Stakeholder Engagement Activities*

Key stakeholder engagement activities that the Proponent intends to undertake include:

- Identification of stakeholders that will have an interest in the proposed Project
- Development of a stakeholder database and issues tracking table
- Development of stakeholder engagement plan, with specific stakeholders, engagement activities, responsibilities, schedule, and resources identified
- Implementation of stakeholder engagement plan, including compiling records of engagement.

Likely means of engagement with stakeholders and stakeholder groups will include: face-to-face meetings; open houses; stakeholder forums; newsletters; electronic communication; briefings; workshops; open space meetings; and website communication.

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<br>• District Municipality of Kitimat<br>• City of Terrace<br>• Northern Health (Kitimat & Terrace)<br>• Kitimat District Fire & Rescue Services Department<br>• Skeena-Queen Charlotte Regional District. |
| Provincial Government | • BC Ministry of Environment (BC MOE)<br>• BC Environmental Assessment Office (BC EAO)<br>• British Columbia Oil and Gas Commission (OGC)<br>• BC Ministry of Transportation & Infrastructure (BC MOTI)<br>• BC Ministry of Health (BC MOH)<br>• BC Ministry of Forests, Lands, and Natural Resource Operations (BC FLNRO)<br>• BC Ministry of Jobs, Tourism, and Skills Training & Responsible for Labor<br>• BC Ministry of Aboriginal Relations & Reconciliation (BC MARR)<br>• BC Hydro. |
| Federal Government | • Canadian Environmental Assessment Agency (CEAA)<br>• Environment Canada (EC)<br>• Fisheries and Oceans Canada (DFO)<br>• Natural Resources Canada (NRCan)<br>• Transport Canada<br>• Pacific Pilotage Authority<br>• Health Canada. |
| Economic Development Associations | • Kitimat Chamber of Commerce<br>• Terrace Chamber of Commerce |

| Category | Stakeholder |
|---|---|
| Industry | • Rio Tinto<br>• LNG Canada<br>• Chevron<br>• BC Hydro<br>• CN Rail. |
| Labor | • BC Federation of Labor<br>• WorkSafeBC. |
| Environment | • Skeena Wild Conservation Trust<br>• Skeena Watershed Conservation Coalition<br>• Pembina Institute<br>• Tides Canada<br>• Living Oceans<br>• Northwest Institute for Bioregional Research. |
| Tenure holders and license holders in the Project area | • Surface land tenure and license holders which may include mineral claims and active forest cut blocks holders<br>• Commercial authorized resource users which may include commercial trail riders, outfitters, guides, trappers and hunters. |
| Social Services, Health, and Education | • Northwest Community College<br>• Kitimat Valley Institute<br>• School District 82 (Coast Mountains). |

# 10. Permitting

## 10.1 Provincial Permitting

Prior to Project construction and operation, a number of permits, licenses and approvals may be required in addition to the Environmental Assessment Certificate from the BC EAO, including those listed in Table 10-1. No permit applications have currently been sought for the Project; a permitting strategy will be developed to obtain the rights to access, use and occupy the Project Site.

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

| Legislation | Permits, Licenses 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) | 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 |

| Legislation | Permits, Licenses and Approvals | Responsible Agency |
|---|---|---|
| *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 |
| *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 |

## 10.2 Federal Permitting

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

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

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

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# Appendix A
# Site Visit Photos

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## 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)

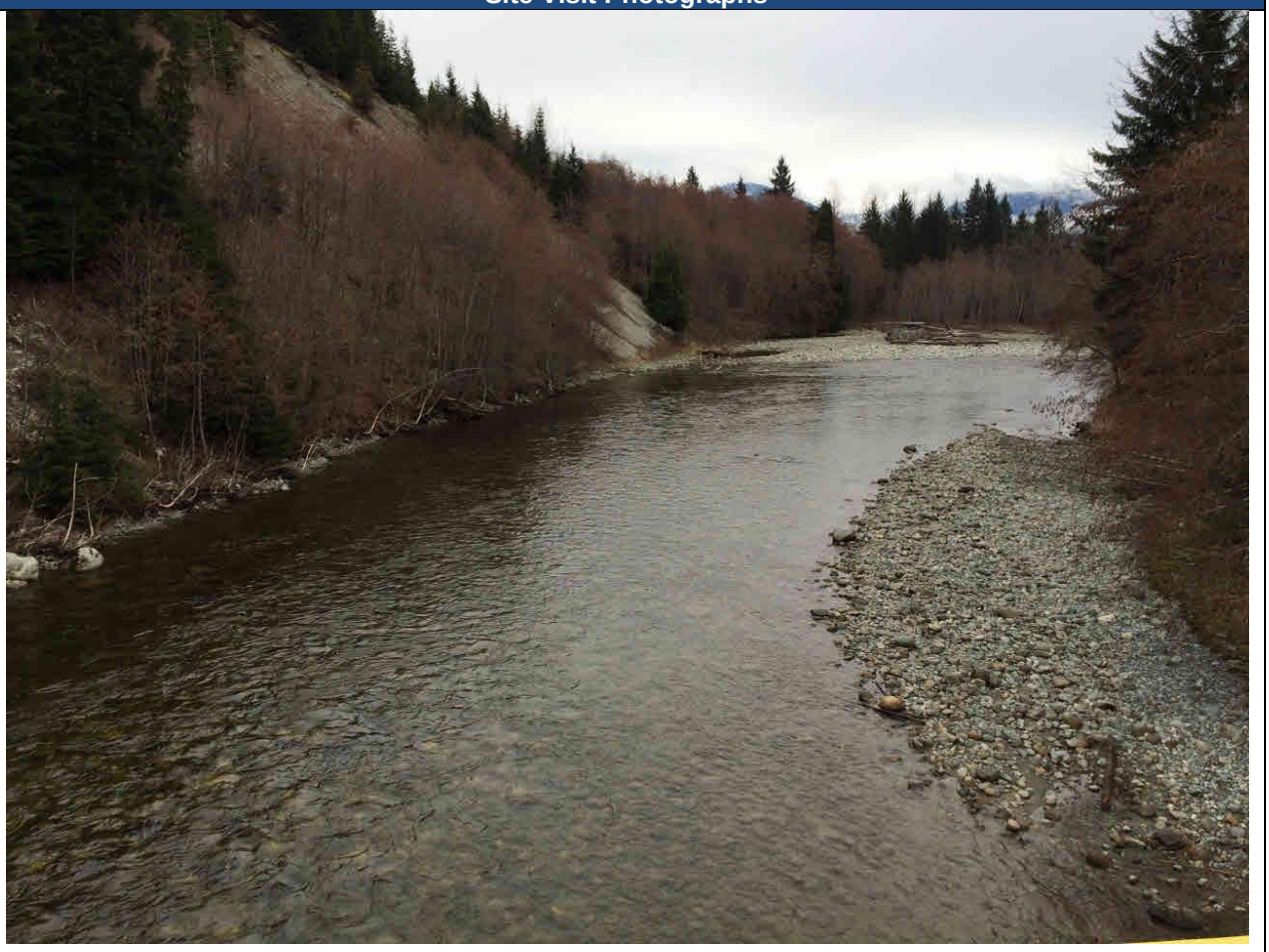
## Site Visit Photographs

**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)

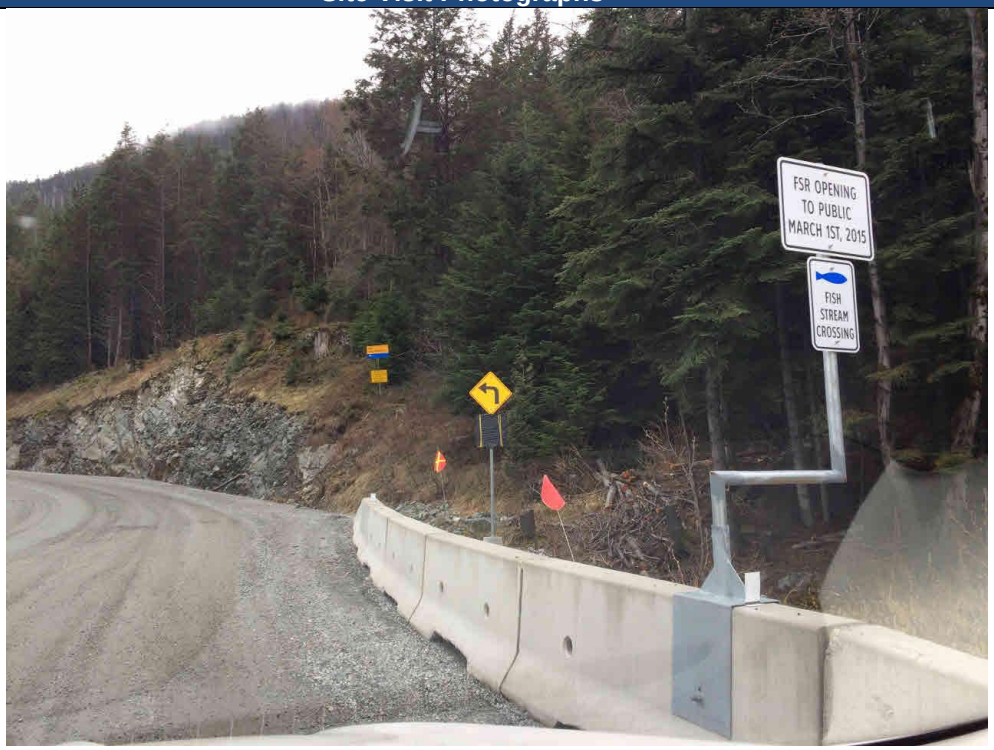
## Site Visit Photographs

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

**Site Visit Photographs**

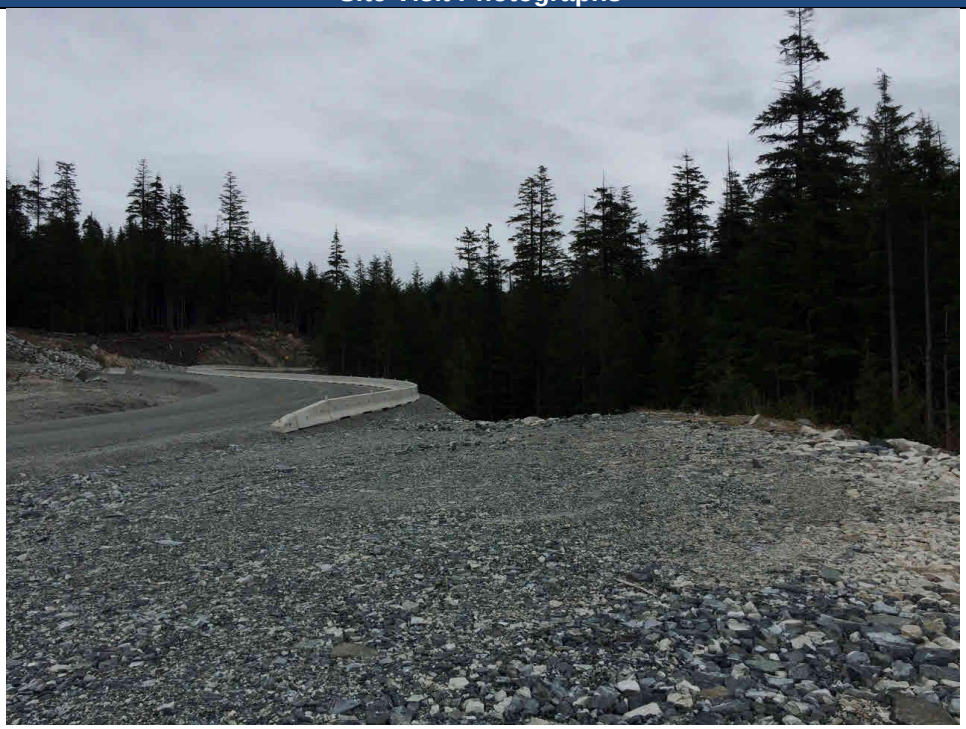
**Photograph 16.** Proposed Refinery Site, looking Northeast on Wedeene FSR (Lat: 54.172879, Long: -128.686069)

## 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)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