Woodfibre LNG

Application for an Environmental Assessment Certificate

Executive Summary

January 2015

Woodfibre LNG Limited
1020 – 1075 W Georgia St.
Vancouver, BC V6E 3C9

Woodfibre LNG

TABLE OF CONTENTS

EXECUTIVE SUMMARY **1**

E1. PURPOSE OF THE APPLICATION **1**

E2. DESCRIPTION OF PROPOSED PROJECT **1**

E2.1 PROJECT OVERVIEW 1

E2.2 PROPONENT DESCRIPTION 2

E2.3 FEDERAL AND PROVINCIAL SCOPE 2

E2.4 PROJECT LOCATION 3

E2.5 LAND USE 3

E2.6 PROJECT COMPONENTS 5

E2.7 ALTERNATIVES CONSIDERED 7

E2.7.1 Site Locations 7

E2.7.2 Shipping Routes within Howe Sound 8

E2.7.3 Site Layout 8

E2.7.4 Construction Methods 9

E2.7.5 Energy Supply 9

E2.7.6 Cooling Technology 10

E2.8 PROJECT BENEFITS 10

E2.9 APPLICABLE PERMITS 12

E3. ASSESSMENT PROCESS **14**

E3.1 PROVINCIAL AND FEDERAL FRAMEWORK 14

E3.2 PRE-APPLICATION PROCESS AND CONSULTATION 14

E3.3 APPLICATION REVIEW AND ON-GOING CONSULTATION 17

E4. ASSESSMENT METHODS **17**

E4.1 COMPONENTS AND INDICATORS 17

E4.2 ASSESSMENT BOUNDARIES 24

E4.3 EXISTING CONDITIONS 25

E4.4 EFFECTS ASSESSMENT METHODS 25

E4.5 FOLLOW-UP AND COMPLIANCE MONITORING 27

E5. ASSESSMENT OF POTENTIAL ENVIRONMENTAL EFFECTS **27**

E5.1 ENVIRONMENTAL BACKGROUND 27

E5.2 ATMOSPHERIC ENVIRONMENT (AIR QUALITY) (VC) 27

E5.3 GREENHOUSE GAS MANAGEMENT (VC) 29

E5.4 Atmospheric Sound (IC) 30
E5.5 Light (IC) 30
E5.6 Geotechnical and Natural Hazards (IC) 31
E5.7 Site Contamination (IC) 32
E5.8 Surface Water Quality (IC) 34
E5.9 Surface Water Quantity (IC) 34
E5.10 Marine Water Quality (IC) 36
E5.11 Vegetation Communities (VC) 37
E5.12 Avifauna (VC) 39
E5.13 At-risk Bat Species (VC) 40
E5.14 Amphibians (VC) 41
E5.15 Freshwater Fish and Fish Habitat (VC) 43
E5.16 Marine Benthic Habitat (VC) 44
E5.17 Marine Birds (VC) 45
E5.18 Forage Fish and Other Fish (VC) 46
E5.19 Marine Mammals (VC) 47
E6. ASSESSMENT OF POTENTIAL ECONOMIC EFFECTS 49
E6.1 Economic Background 49
E6.2 Labour Market (VC) 49
E6.3 Sustainable Economy (VC) 50
E7. ASSESSMENT OF POTENTIAL SOCIAL EFFECTS 51
E7.1 Background 51
E7.2 Infrastructure and Community Services (VC) 51
E7.2.1 Housing and Accommodation 51
E7.2.2 Community Infrastructure and Services 52
E7.2.3 Emergency Services 52
E7.3 Marine Transport (VC) 53
E7.4 Land and Resource Use (VC) 54
E7.5 Visual Quality (VC) 56
E7.6 Current Use of Lands and Resources for Traditional Purposes (VC) 57
E8. ASSESSMENT OF POTENTIAL HERITAGE EFFECTS 58
E8.1 Palaeontological Resources 59
E8.2 Archaeological Resources 60

E8.3 HISTORICAL RESOURCES 61
E9. HEALTH ASSESSMENT 61
E9.1 COMMUNITY HEALTH AND WELL-BEING (VC) 62
E9.2 HUMAN HEALTH RISK ASSESSMENT (VC) 63
E10. CHANGES TO THE ENVIRONMENT AND EFFECTS OF CHANGES TO THE ENVIRONMENT64
E11. ACCIDENTS AND MALFUNCTIONS 66
E12. EFFECTS OF THE ENVIRONMENT ON THE PROJECT 68
E13. ABORIGINAL GROUPS 69
E13.1 INFORMATION REQUIREMENTS 69
E13.2 ABORIGINAL INTERESTS 70
E13.3 STATUTORY REQUIREMENTS UNDER *CEAA 2012* SECTION 5 72
E13.4 OTHER MATTERS OF CONCERN TO ABORIGINAL GROUPS 72
E13.5 SUMMARY OF ABORIGINAL GROUPS INFORMATION REQUIREMENTS 72
E14. SUMMARY OF PUBLIC CONSULTATION 73
E15. SUMMARY OF PROJECT CUMULATIVE AND RESIDUAL EFFECTS 73
E16. SUMMARY OF MITIGATION MEASURES 73
E17. SUMMARY OF PROPOSED ENVIRONMENTAL AND OPERATION MANAGEMENT PLANS AND FOLLOW-UP PROGRAMS 73
E17.1 COMPLIANCE REPORTING 76
E17.2 ENVIRONMENTAL MANAGEMENT TEAM 77
E18. CONCLUSIONS RESULTING FROM THE ASSESSMENT 78

List of Tables

Table E-1 Federal and Provincial Milestones for Environmental Assessment 15
Table E-2 Intermediate Components, Valued Components, Potential Effects, and Parameters 18
Table E-3 Summary of Potential Changes to the Environment 65
Table E-4 Summary of Construction, Operation, and Decommissioning Environmental Management Plans 74
Table E-5 Summary of Monitoring and Follow-up Programs 76

List of Figures

Figure E-1 Site Layout 6

EXECUTIVE SUMMARY

E1. PURPOSE OF THE APPLICATION

Woodfibre LNG Limited (WLNG or Proponent) is proposing the development and operation of a liquefied natural gas (LNG) production facility with marine storage and off-loading at the former Woodfibre Pulp and Paper Mill site (Project site) near Squamish, British Columbia (BC).

This Application for an Environmental Assessment Certificate (Application) is prepared to present the information required to provide for an Environmental Assessment (EA) under the British Columbia *Environmental Assessment Act*, SBC 2002, c. 43 (BC*EAA*) and the *Canadian Environmental Assessment Act*, *2012*, SC 2012, c. 19, s. 52 (*CEAA 2012*). The Application fulfills the requirements for a decision under BC*EAA* and *CEAA 2012*.

E2. DESCRIPTION OF PROPOSED PROJECT

E2.1 PROJECT OVERVIEW

The Project comprises the construction and operation of a processing and liquefaction facility to produce approximately 2.1 million metric tonnes (MMT) per annum of LNG, with associated storage capacity of 250,000 m^3 and export infrastructure. Natural gas will be supplied to the facility from western Canadian market hubs through expansion by FortisBC of the existing gas transmission system. The Project will be powered by electricity provided by BC Hydro, thereby reducing air quality concerns and generating fewer greenhouse gas (GHG) emissions. Liquefied natural gas will be loaded onto marine carriers for export to global markets. Estimated carrier frequency is approximately 40 carriers annually, or three to four monthly. The LNG plant design life is 25 years; however, this may be extended through regular maintenance and component replacement.

The Project is located at an existing industrial site with a deep-water harbour having an existing electric power and gas supply. It is advantageously located to enable shipment of LNG to international markets through existing marine shipping and navigation channels to the Pacific Ocean via Howe Sound.

All Project-related information in this summary and Application is based on the pre-front end engineering design (pre-FEED) for the Project. The Project design is ongoing; components and layout will be refined as the Project design phase progresses.

E2.2 PROPONENT DESCRIPTION

The Project Proponent is Woodfibre LNG Limited, a Canadian company incorporated in the Province of BC, with offices in Vancouver, BC, Squamish, BC, and Calgary, Alberta. Woodfibre LNG Limited is wholly owned by Pacific Oil & Gas Limited, an energy company within the RGE group of companies, headquartered in Singapore. The Woodfibre LNG Project website is www.woodfibrelng.ca. Primary contacts are as follows:

Mr. Anthony (AG) Gelotti
President (CEO Equivalent)
Woodfibre LNG Limited
Suite 1020, 1075 West Georgia Street
Vancouver, BC V6E 3C9
Telephone: 1.604.620.7883
Email: anthony_gelotti@wlng.ca

Mr. Byng Giraud
Vice President, Corporate Affairs (Primary Contact)
Woodfibre LNG Limited
Suite 1020, 1075 West Georgia Street
Vancouver, BC V6E 3C9
Telephone: 1.604.620.7883
Email: byng_giraud@wlng.ca

E2.3 FEDERAL AND PROVINCIAL SCOPE

The BC Environmental Assessment Office (EAO) issued an order under section 10 of the BC*EAA* on November 27, 2013 that the Proponent must apply for an EAC. The Project has also triggered an EA under *CEAA 2012* and is undergoing a substituted EA Review, as described in more detail below (**Section E2.1 Provincial and Federal Framework)**. This Application has been developed pursuant to the *Application Information Requirements* (AIR)*,* approved on November 24, 2014. The Application also complies with the requirements of the section 11 Order issued on March 21, 2014, the three section 13 Orders amending the section 11 Order on June 3, 2014, June 24, 2014 and November 6, 2014. The Project requires an EAC before provincial agencies can issue permits or the Proponent can start construction.

Pursuant to the section 11 Order, the Project scope comprises the following onsite and offsite temporary construction support components, process components, and non-process components and activities:

- an LNG production facility (natural gas receiving and LNG production) that at full build-out will have a maximum production capacity of 2.415 MMT of LNG per year
- a permanently moored LNG floating storage and offloading unit (FSO), having a capacity of between 170,000 and 250,000 m^3
- a single marine mooring facility for one LNG off-take (export) marine carrier, having a maximum capacity of 180,000 m^3 (deadweight tonnage of 85,000 tonnes)
- supporting marine infrastructure and facilities consisting of a private passenger ferry terminal for site access, and marine LNG and materials offloading facility

- supporting land-based infrastructure and facilities consisting of an electric substation, a helicopter pad, land-based site administration and safety facilities; chemical, refrigerant and fuel storage; a site for temporary construction facilities; and upgrades and construction of haul roads between laydown, construction, and storage areas as needed
- upgrading and maintenance of the site, facilities and infrastructure necessary for the construction, operation, maintenance, and decommissioning of the LNG facility and associated activities
- offsite components and activities include the operation of LNG carriers and other supporting marine traffic in Howe Sound within designated shipping zones

E2.4 PROJECT LOCATION

The Project area is located on the northwestern shore of Howe Sound approximately 7 km west-southwest of the urban centre of Squamish, BC within the District of Squamish municipal boundaries (**Figure E-1**). The Project area is situated at UTM coordinates Zone 10, 481759 m easting and 5501600 m northing. Access to the site is by air or water only; there is no road access.

The Project facilities will be located at the former Woodfibre Pulp and Paper Mill site, a fee simple industrially zoned, brownfield site having deep-water marine access and more than 100 years of industrial use. The Project area is situated on a combination of the fee simple land parcels (totalling 86 ha) owned by Western Forest Products (WFP), and provincial Crown land parcels in the form of a foreshore lease. In addition to the fee simple and Crown land, the Project area includes a portion of a provincial Crown land district lot located to the west of the private parcels, as well as surveyed and un-surveyed submerged Crown land.

In January 2013, WLNG entered into an agreement to purchase the Woodfibre property from WFP. The Proponent will be required to obtain tenure of the additional Crown land (both upland and submerged) under the *Land Act*, RSBC 1996, c. 245.

The Project area is not located on or near any federal lands or reserves, will not rely on federal financial funding, and is not within waters or lands administered by the Canada Port Authority.

E2.5 LAND USE

The Project is located on fee simple land parcels and provincial Crown land (and submerged land). Woodfibre entered into a sales and purchase agreement with WFP for the Woodfibre property in January 2013. Five fee simple parcels will be transferred. The provincial crown land parcel includes the foreshore lease granted by the Province of BC dated October 4, 1986, Lease No. 233113, identified as District Lots 5095 and 7286, Group 1, New Westminster District.

In addition to the fee simple and Crown land to be transferred from WFP, the Project area includes a portion of District Lot 1337, which is provincial Crown land located to the west of the private parcels, as well as surveyed and un-surveyed submerged land. The Proponent will be required to obtain tenure under the *Land Act* for the additional Crown land (both upland and submerged) that will be required for the Project.

Industrial activity on the Woodfibre property started in the early 1900s with the erection of a small saw mill. In the 1950s, the site also accommodated a small community of company homes, churches, and a school for the mill's 750 employees. In March 2006, WFP closed the Woodfibre Pulp and Paper Mill and sold most of the manufacturing assets of the mill. Since that time, access to the Woodfibre property has been limited.

At present, land uses on and in the vicinity of the Project area consist of the following:

- A hydroelectric generating station operated by WFP having a capacity of approximately 1.7 megawatts (MW) through the use of water licences on Mill Creek and Woodfibre Creek (which runs along the south edge of the Project area).
- Linear utility rights-of-way, two of which are held by BC Hydro for transmission lines and one by FortisBC for a natural gas pipeline. All cross the northern portion of the property. FortisBC is proposing to construct a 24-inch natural gas pipeline (Eagle Mountain – Woodfibre Pipeline Expansion Project) along the existing natural gas right-of-way to connect the Project to existing FortisBC facilities in Metro Vancouver.
- Timber harvesting has taken place in Woodfibre Creek and Mill Creek watersheds since 1970, and forestry activities continue today through existing and planned operating areas managed by licencees of the Soo Timber Supply Area. Access to the areas has been by water and forestry roads extending from the Woodfibre property through contractual arrangement with WFP.
- Mineral and oil and gas tenures and reserves in the vicinity of the Project area include placer mining tenures for Woodfibre and Mill creeks, a mineral claim that overlaps the northern portion of the Woodfibre property, several mineral reserves held by the province, including for the Westcoast Pipeline and Cheekye-Dunsmuir transmission line, as well as a coal reserve underlying the seabed of Howe Sound.
- Western Forest Products currently holds eight water licences on Mill and Woodfibre creeks. Of these, two are within the scope of the Project. Woodfibre LNG Limited will apply to change the water licence holder (i.e., assign the water licences) upon transfer of the fee simple land.
- A single trapline tenure is located on Crown land adjacent to the Woodfibre property. Common historical captures included marten, weasel, and beaver; however, there has been no harvest recorded since 2002.
- The Project area is within a 964,680 ha guide outfitting tenure used mainly for hunts of black bear and elk, but also black-tailed deer, mountain goat, and cougar.
- Outdoor recreational activities in the vicinity of the Project area include hunting, backcountry hiking and camping, freshwater and saltwater fishing, kiteboarding and windsurfing, and recreational boating. Cancellation in 2006 of the ferry that served the mill, and corresponding closure of land access to the site have constrained these activities.

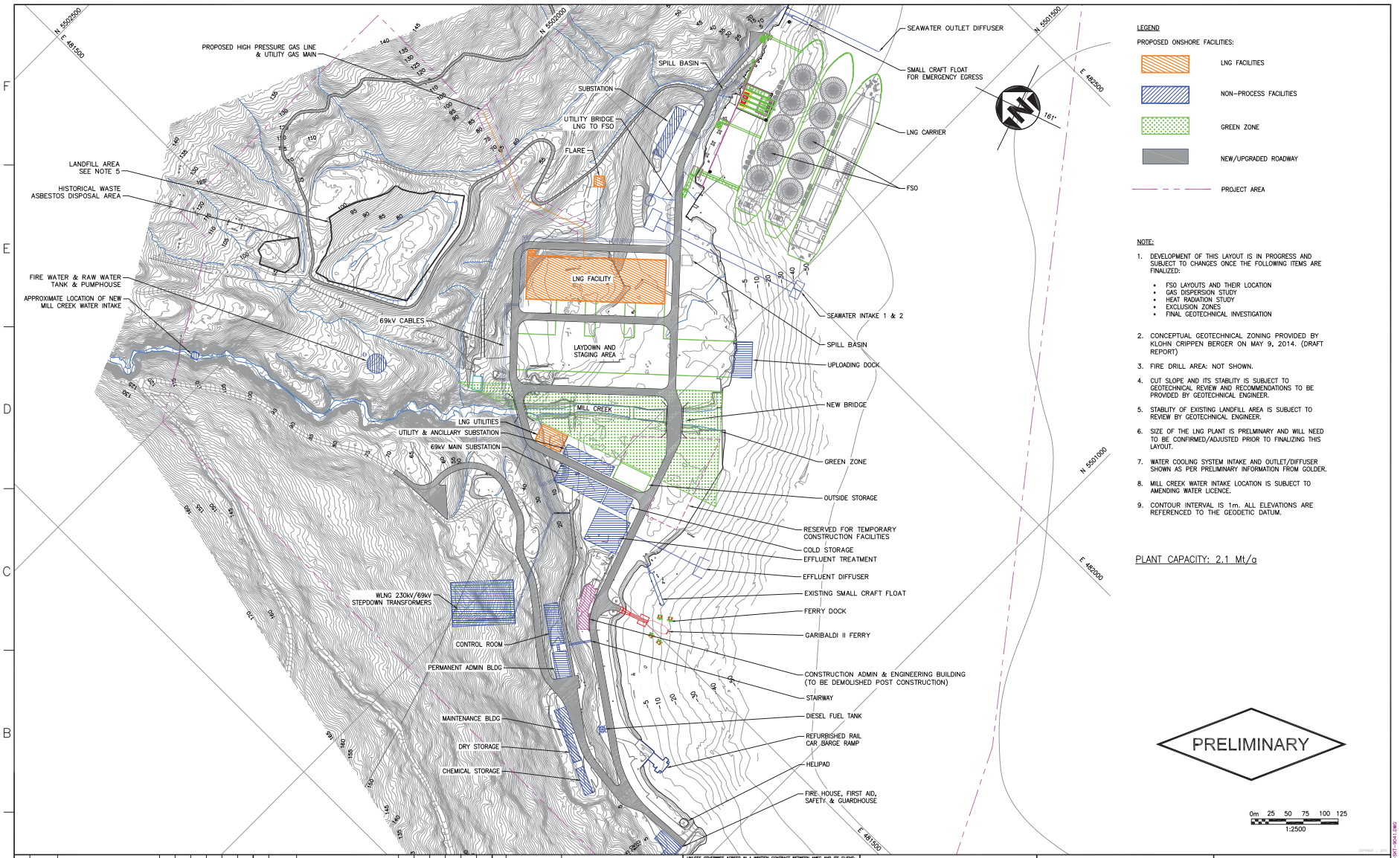
- Hunting activities occur in the backcountry at elevations above the Woodfibre property; access is by helicopter. Hunting is not permitted on the Woodfibre property.
- Freshwater fishing occurs on Henriette Lake, Sylvia Lake, and Woodfibre Lake, all located upstream of the Woodfibre property.
- Three old-growth forest management areas are situated near the Project site: one to the south and two to the northwest.
- The nearest provincial park is Murrin Provincial Park, approximately 4 km to the east and directly across Howe Sound from the Woodfibre property. Also on the east side of Howe Sound are Shannon Falls Provincial Park and Stawamus Chief Provincial Park.
- Skwelwil'em Squamish Estuary Wildlife Management Area is situated 4 km to the east of the Woodfibre property, at the head of Howe Sound.
- The Project area is included within the federal Recovery Strategy for marbled murrelet, and several wildlife habitat areas are in the vicinity, including one for spotted owl and four for marbled murrelet.

E2.6 PROJECT COMPONENTS

The LNG facility includes two parallel 1.05 MMT per annum liquefaction trains and common facilities for acid gas removal, dehydration, LNG handling, refrigerant make-up, boil-off gas compression, process utilities, and auxiliary common facilities. The LNG will be sent from the liquefaction section of the plant to the FSO. The LNG will then be transferred from the FSO to LNG marine carriers for transport to international markets. The Project components include the following:

- **Temporary construction support components** that support delivery, storage and marshaling of materials during construction; employee canteens; services such as field offices, washrooms, and tool containers. These facilities are typically removed after construction is complete.
- **Process components** comprise gas pre-treatment and LNG processing; LNG storage and offloading including mooring and marine terminal for carriers. Prefabricated modules for the LNG facility, including the FSO, will be transported by barge from their manufacture location and placed on the prepared foundation at the Project site.
- **Non-process components** include all facilities permanently installed for the duration of the Project life cycle to support the safe operation of the plant and terminal facilities (i.e., infrastructure and components for storage, electrical substation, passenger ferry, and site administration).

Figure E-1 depicts the Project site layout and current component configuration. As Project development progresses, Project components and their locations may be further refined based on the FEED program as well as on-going consultation with Aboriginal groups, the public consultation program, and regulatory engagement. The configuration shown in **Figure E-1** and equipment sizing final designs may change slightly.



LEGEND

PROPOSED ONSHORE FACILITIES:

- LNG FACILITIES
- NON-PROCESS FACILITIES
- GREEN ZONE
- NEW/UPGRADED ROADWAY
- PROJECT AREA

NOTE:

1. DEVELOPMENT OF THIS LAYOUT IS IN PROGRESS AND SUBJECT TO CHANGES ONCE THE FOLLOWING ITEMS ARE FINALIZED:
   - FSO LAYOUTS AND THEIR LOCATION
   - GAS DISPERSION STUDY
   - HEAT RADIATION STUDY
   - EXCLUSION ZONES
   - FINAL GEOTECHNICAL INVESTIGATION
2. CONCEPTUAL GEOTECHNICAL ZONING PROVIDED BY KLOHN CRIPPEN BERGER ON MAY 9, 2014. (DRAFT REPORT)
3. FIRE DRILL AREA: NOT SHOWN.
4. CUT SLOPE AND ITS STABLITY IS SUBJECT TO GEOTECHNICAL REVIEW AND RECOMMENDATIONS TO BE PROVIDED BY GEOTECHNICAL ENGINEER.
5. STABLITY OF EXISTING LANDFILL AREA IS SUBJECT TO REVIEW BY GEOTECHNICAL ENGINEER.
6. SIZE OF THE LNG PLANT IS PRELMINARY AND WILL NEED TO BE CONFIRMED/ADJUSTED PRIOR TO FINALIZING THIS LAYOUT.
7. WATER COOLING SYSTEM INTAKE AND OUTLET/DIFFUSER SHOWN AS PER PRELIMINARY INFORMATION FROM GOLDER.
8. MILL CREEK WATER INTAKE LOCATION IS SUBJECT TO AMENDING WATER LICENCE.
9. CONTOUR INTERVAL IS 1m. ALL ELEVATIONS ARE REFERENCED TO THE GEODETIC DATUM.

PLANT CAPACITY: 2.1 Mt/a

PRELIMINARY

0m 25 50 75 100 125
1:2500

REV	DDMMMYY	REVISION / ISSUE DESCRIPTION	DRN	CHK	APP	APP	APP	APP
A	24JUN14	ISSUED FOR REVIEW	MK					

REF	NUMBER	TITLE
-	REFERENCES	

STAMP/SEAL

APPROVED FOR CONSTRUCTION

CLIENT PROJECT MGR. DEPARTMENT MGR. PROJECT MGR.

PROJECT PHASE

PROJECT NO.	ACTIVITY NO.		BY	DDMMMYY
176258		DES	P.B.	24JUN14
SCALE	PACKAGE CODE	DRN	M.K.	24JUN14
1:2500		CHK		
		APP		

Woodfibre LNG

amec

SUBJECT

CIVIL
PLAN
GENERAL ARRANGEMENT

AREA

CLIENT DWG. NO. FIGURE E-1

DRAWING NO. 176258-2000-DD10-SKT-9041 REV. A

SAVED: 24-Jun-14 2:29 PM PLOTTED: 24-Jun-14 3:03 PM USER: KRAMER, MARK H

DGN FILE: P:\CAD\CIVIL\MISC\176258-2000-DD10-SKT-9041.DWG

E2.7 ALTERNATIVES CONSIDERED

In accordance with the *CEAA 2012,* Section 19(1)(g) requirement, several means of undertaking the Project were considered related to six key Project alternative decisions: site location, shipping route within Howe Sound, Project component configuration (land-based vs. marine), construction methods (modular vs. ground-up), energy supply (electrical power vs. gas power), and cooling technology (water vs. air cooling).

To identify a preferred alternative, five criteria specific to each decision and applicable regulations and industrial codes were used to determine general effects: technical suitability; economic feasibility (e.g., proximity to existing gas infrastructure); environmental effects, including (if applicable) changes to migratory birds, changes outside of BC or Canada, changes to fish and fish habitat or to aquatic species as defined in subsection (1) of the *Species at Risk Act (SARA)*, SC 2002, c. 29, and changes to items or sites of cultural and heritage significance; change the environment on federal lands, another province, or outside of Canada; Aboriginal interests; and public interests (socio-economic, health, visual quality, and design legislation and industrial standards).

Primary industry and safety-related standards that have been incorporated into Project design and that were considered in evaluating Project alternatives include the following:

- Canadian Standards Association (CSA) Z276 Liquefied Natural Gas — Production, Storage, and Handling standard. This standard establishes essential requirements and minimum standards for the design, installation, and safe operation of LNG facilities.
- *LNG Facility Regulation* under the *Oil and Gas Activities Act*, SBC 2008, c. 36 which regulates LNG facilities within BC.

E2.7.1 Site Locations

The initial search for suitable Project locations focused on sites suitable for a large-scale LNG facility and potential for future expansion. Locations on the east and west coasts of North America were considered and screened against a comprehensive suite of criteria. This preliminary search yielded 19 potential locations.

As the Proponent's business model evolved, the search was reframed for a smaller-scale facility with existing industrial infrastructure that could be reused and proximity to an existing gas source. Based on updated site requirements, five potential locations were identified that met many requirements of the Project, but only two were considered economically and technically feasible: the Woodfibre property and the Terminal Forest Products site at Langdale, BC. Both are located on the western shoreline of Howe Sound on existing industrial sites with docking facilities and nearby labour markets. The other sites were rejected because they are located too far from existing gas sources and would require construction of a new pipeline to feed the facility.

The Terminal Forest Products site and Woodfibre property were compared based on public safety, visual quality, proximity to existing natural gas infrastructure, protection of aquatic resources, surface water availability, and suitability for construction activities, a marine terminal, and marine navigation. The results of the evaluation led WLNG to determine that the Woodfibre property is a better alternative than the Terminal Forest Products site for the following reasons:

- CSA Z276 and the *LNG Facility Regulation* require LNG terminals to be surrounded by a control zone to protect public safety. Specific training is required to enter the control zone. A control zone is more easily established and monitored at the Woodfibre property; the Terminal Forest Products site is easily accessed by road, is adjacent to residential properties, and within 3 km of the town of Langdale.
- The Woodfibre property requires a shorter natural gas pipeline upgrade.
- Due to the long history of previous industrial use, the Woodfibre property contains lower value aquatic habitat; at the Terminal Forest Products site there is high value salmonid habitat, a fish hatchery, and a large area of estuarine fish habitat.
- The Woodfibre property offers better surface water availability through existing water licences for industrial uses; the Terminal Forest Products site has a potentially limited water supply.
- Due to basin and shoreline shape, the Woodfibre property requires a shorter jetty to the FSO and marine terminal.

E2.7.2 Shipping Routes within Howe Sound

Liquefied natural gas carriers will navigate from the Woodfibre deep-water port through the established commercial vessel shipping routes in Howe Sound to the Strait of Georgia and out to the Pacific Ocean. Two routes within Howe Sound were considered: east route (follows Queen Charlotte Channel east of Bowen Island), or west route (follows Collingwood Channel west of Bowen Island). Both are technically and economically feasible, and are aligned with the Technical Review Process of Marine Terminal Systems and Transhipment Sites (TERMPOL) framework. Because all other factors are considered equal, the east route was selected as it is more direct. The LNG carrier shipping route will be refined during the TERMPOL review.

E2.7.3 Site Layout

The unique orientation and situation of the Woodfibre site allows for several alternatives in Project layout. Three general configurations were considered: place the LNG facility and FSO on land, on water, or a combination on land and water. Consideration was also given to which side of Mill Creek, which roughly divides the site in half east and west (see **Figure E-1**), to situate the LNG facility components.

The criteria used to evaluate the various site layout options were safety, environmental effects, public interest, and Project economics. While all alternatives were deemed economically feasible, some were limited by geotechnical conditions. Based on these criteria, and safety and regulatory considerations, the following site layout was selected:

- **LNG storage** – Water-based, north of Mill Creek, to take advantage of favourable geotechnical conditions and shorter cryogenic lines that would be needed between the plant and FSO.
- **LNG facility and other process components** – Land-based, north of Mill Creek, to minimize the potential effects of underwater noise on marine fauna, due to geotechnical and spacing constraints, and because Mill Creek offers a natural separation between the process areas and administrative and supporting activities.
- **Non-process components** – Land-based, south of Mill Creek.

E2.7.4 Construction Methods

Two construction methods were considered: building the facilities onsite, and pre-fabricating modules offsite. Traditionally, LNG plants have been custom-built on a project site using basic materials and a large construction labour workforce. More recently, developers have shifted from custom onsite construction to building liquefaction plant modules that are fabricated offsite in specialized facilities and then assembled onsite (an approach known as modularization).

The criteria used to assess the two alternatives included environmental, socio-economic and public safety, quality and economic considerations. Based on the considerations, WLNG determined that modular construction is preferable for the following reasons:

- smaller onsite footprint because modular construction does not require as much laydown and materials storage space
- fewer barge trips to and from the Woodfibre site to deliver materials and remove waste
- modules are tested in the manufacturing facility and any deficiencies addressed prior to shipment
- fabrication of modules can occur concurrently with site preparation and foundation construction, which expedites the schedule
- local labour can be used for onsite construction, including supporting infrastructure, foundations, and marine structures
- LNG modules can be fabricated by a highly-skilled manufacturing labour force with relevant experience and expertise

E2.7.5 Energy Supply

The Project will have a normal operating power requirement of approximately 140 MW, the majority of which will be used by the LNG facility. Power can be supplied to the LNG facility either through gas drive or electric drive. The criteria used to assess these two alternative energy supplies included

environmental, public safety, and economic feasibility. Because of public concerns regarding air quality and the additional emissions that would be associated with using natural gas drive, WLNG elected to adopt the electric drive concept, in which all equipment will be powered by electricity from the BC Hydro grid.

E2.7.6 Cooling Technology

Liquefaction of natural gas requires a large cooling capacity. For this Project, four cooling media were considered: air, evaporation, freshwater from local streams, and seawater from Howe Sound. Within some of these media alternatives are several different method options. In selecting a preferred cooling method, WLNG considered environmental effects, regulatory issues, and capital and operating cost considerations (e.g., maintenance, reliability, energy efficiency). After comparing the options and alternatives, seawater cooling was identified as the preferred choice for the Project because it offers higher efficiency than air cooling, a lower potential for noise, and lower potential for visual effects.

E2.8 PROJECT BENEFITS

The Project includes several opportunities for the District of Squamish and surrounding communities to realize economic, environmental, and social benefits. The estimates of economic impacts presented in this Application should be viewed as preliminary in nature and are based on expenditure projections developed by WLNG. The economic impacts generated by the construction and annual operation of the Project were estimated using an input-output methodology and economic multipliers published by Statistics Canada.

Construction and operation of the Project is expected to generate economic impacts through direct expenditures by WLNG on goods and services, creation of employment opportunities, and generation of tax revenues for local, provincial, and federal governments. According to preliminary estimates, total construction expenditures are expected to be approximately $619.6 million. Approximately $341.0 million of construction expenditures are expected to be incurred in the regional assessment area (RAA) (i.e., province of BC), representing about 55 percent of the total, and approximately $262.6 million of construction expenditures are expected to be incurred in the local assessment area (LAA) (i.e., Squamish, Whistler, Squamish-Lillooet Regional District Electoral Area D, Squamish First Nation communities and Metro Vancouver), representing about 42% of total construction expenditures. Annual operating expenditures are expected to be approximately $541.7 million.

Annual operation of the Project is expected to create direct employment for 102 full-time equivalents in the RAA, with average annual labour income of about $100,392. Based on Statistics Canada's provincial input-output multipliers, suppliers of the Project, such as suppliers of natural gas and electricity, are estimated to create indirect employment of about 2,002 full-time equivalents in the RAA, with average annual labour income of about $86,956.

Decommissioning costs for the facility are estimated at $50 to $60 million. The majority of these costs would be attributed to spending in the LAA through the engagement of local service providers in the construction trades, engineering, and disposal / waste management services.

Woodfibre LNG Limited will be responsible to pay taxes as required in relation to the Project. Sources of government revenue associated with construction and operations of the Project include property tax, GST, PST, personal income tax, corporate income tax and indirect taxes on production. Aggregate direct, indirect and induced taxes generated by the construction of the Project in the LAA are estimated at $87.5 million in tax revenue for all three levels of government, including $10.0 million in municipal taxes. Aggregate direct, indirect, and induced taxes generated by the annual operation of Project in the LAA are estimated at $86.5 million in tax revenue for all three levels of government, including $4.2 million in municipal taxes. For the RAA, total annual tax impacts for all three levels of government are estimated at $111.9 million for construction and $209.4 million during operations,

The Project will also create environmental benefits. Woodfibre LNG Limited's purchase of the Project property is contingent on remediation of the site by WFP and the subsequent issuance of a risk-based Certificate of Compliance (COC) by the BC Ministry of Environment (MOE), confirming that WFP has cleaned up the site to provincial standards for acceptable contaminant levels and imposing conditions on the property owner to maintain that standard. Two COCs were received by WFP on December 22, 2014 for the Project site. To receive this COC, WFP remediated contaminated upland soils, dredged and properly disposed of contaminated woodchips and sediment from the shoreline, and contained and closed the historical on-site asbestos disposal area. Woodfibre LNG Limited intends to perform additional remediation and ecosystem restoration in the Project area once the property sale is complete. Plans for additional remediation include the removal of approximately 3,000 existing creosote-coated piles from the waterfront in the Project area, the creation of a Green Zone around Mill Creek, and the containment and closure of the on-site landfill. This work will be carried out in partnership with the local Streamkeepers society and other relevant groups where suitable, so that local conservation and restoration targets can be met.

Woodfibre LNG Limited is dedicated to providing legacy benefits for the communities in Howe Sound in the areas of sport, arts, culture, and heritage. Community investments have included active engagement of community groups and financial support to their community focused events. It is WLNG's intention to continue supporting local community groups with annual funding contributions. With the development of the Project, WLNG will be developing a structured community development and grant program whereby community groups will have the opportunity to apply for funding requests that meet the funding criteria goals and objectives.

E2.9 APPLICABLE PERMITS

Rather than apply for concurrent permitting under BC's *Concurrent Approval Regulation*, WLNG is pursuing synchronous permitting offered by the Oil and Gas Commission (OGC). Under synchronous permitting, the EAO and OGC will seek to involve each other in Aboriginal consultations, meetings with Project proponents, and project working groups (established by the EAO), and will share information for these purposes. The objectives of concurrent and synchronous permitting are essentially the same (permit issuance shortly after EAC issuance). They are different in that under synchronous permitting there are no legislated timelines. Under the *Concurrent Approval Regulation,* within 75 days of the date on which the proponent's application for an environmental assessment certificate is accepted for review, the permitting ministry must notify the proponent and the EAO in writing of any additional information that the ministry anticipates it will require from the proponent in order to complete its review and consideration. Synchronous permitting provides more flexibility than concurrent permitting because without regulated timelines, the permitting agency has more than 75 days to notify WLNG of its information requirements, yet still provides an opportunity for expeditious issuance of permits.

In addition to the provincial and federal EA processes already described, several other permits, approvals, and authorizations are anticipated following issuance of the EAC. This list, below, will be refined as the Project design and discussions with regulators advance.

Provincial

- LNG Facility Permit under the *LNG Facility Regulation* of the BC *Oil and Gas Activities Act,* including Leave to Commence Construction, and Leave to Operate.
- Waste discharge permits under section 14 of the *Environmental Management Act*, SBC 2003, c. 53, for water discharges and air emissions.
- In accordance with the *Water Act*, RSBC 1996, c. 483. WLNG will apply to the Ministry of Forests, Lands and Natural Resource Operations to change the holder and purpose of the two water licences that are within the scope of the Project (described in **Section E2.5 Land Use**).
- In accordance with the *Water Act* (section 26), WLNG will apply to have the permit over Crown land currently held by WFP (to maintain and operate works authorized under a water licence, as well as to cut and remove any timber that is necessary to permit construction of the works), transferred at the same time as the water licences.
- Woodfibre LNG Limited will work with the BC Safety Authority under the *Alternative Safety Approaches Regulation* of the *Safety Standards Act* SBC, 2003, c. 39 to ensure Project components covered by the *Safety Standards Act* meet legislated requirements. It is anticipated that WLNG will be required to submit a Safety Management Plan for some aspects of the Project. Review and approval of that plan by the BC Safety Authority will be required prior to construction.
- Following transfer of the fee simple land, WLNG will apply to have the Crown land lease (described in **Section E2.5 Land Use**) assigned from WFP to WLNG and the purpose of the lease updated.

- A permit will be acquired for investigative work under the *Heritage Conservation Act*, RSBC 1996, c. 187.
- If a heritage site is identified as part of the archaeological impact assessment and effects to this site cannot be avoided, another permit will be required pursuant to section 12 of the *Heritage Conservation Act* for proposed alterations of identified heritage site(s).
- If wildlife or fish salvages are required, *Wildlife Act,* RSBC 1996, c. 488 permits will be required to allow capture and relocation of wildlife prior to commencement of construction.
- If a nest protected under section 34 of the *Wildlife Act* is located during construction that cannot be avoided, a permit will be required to remove the nest
- Notifications under section 9 of the *Water Act* will be required for the new clear-span bridges planned for Mill Creek.
- As soon as practicable after the permanent cessation of Project operation, compliance with section 19 of the *Environmental Protection and Management Regulation*.
- In accordance with section 21 of the *LNG Facility Regulation*, removal of all facility structures, including the LNG facility and FSO from the Project area.

Federal

- In March 2014, the Government of Canada announced final approval of WLNG's export permit (Licence GL-304) that allows the export of LNG from the Project.
- It is not yet known whether Project construction or operation will require an authorization under the *Fisheries Act*, RSC 1985, c. F-14. Prior to construction of the Project, WLNG will work with a qualified environmental professional to determine whether the Project will cause serious harm to fish. Woodfibre LNG Limited may also choose to submit a request for review to DFO if there is uncertainty regarding whether an authorization under the *Fisheries Act* will be required.
- If monitoring programs are required for species listed under the *Species at Risk Act*, SC 2002, c. 29, a permit may be required to undertake that monitoring.
- Under the *Navigation Protection Act*, RSC 11985, c. N22, a notice of proposed work will be submitted to Transport Canada for review and determination regarding whether the works to be constructed in Howe Sound (e.g., the FSO jetty) will substantially interfere with navigation in Howe Sound. If the works are deemed to do so, WLNG will request an approval.
- Woodfibre LNG Limited will be required to obtain permits for construction of the flare stack and erection of other tall structures from NAV Canada (for aeronautical safety mapping), and Transport Canada (for marking and lighting the flare stack, and use of tall cranes which may at times require aeronautical obstruction clearance).

Local and Other Jurisdictions

- Development permit, building permit(s), and any others required by the District of Squamish
- A Temporary Noise Exemption Permit under District of Squamish noise bylaw No. 2312, to perform construction activity on a limited basis during the nighttime period when required

- Prior to undertaking work within 30 m of Mill Creek or Woodfibre Creek, WLNG will engage a qualified environmental professional to conduct and submit an assessment report in accordance with the *Riparian Area Regulation* of the *Fish Protection Act*, SBC 1997, c. 21. This regulation is administered by local government (the District of Squamish and Squamish Lillooet Regional District).
- Under the *Drinking Water Protection Act*, SBC 2001, c.9 permits will be required from Vancouver Coastal Health related to the potable water system to be constructed as part of the Project.
- Woodfibre LNG Limited will obtain a permit from the Squamish Nation prior to commencing the Archaeology Impact Assessment

E3. ASSESSMENT PROCESS

E3.1 PROVINCIAL AND FEDERAL FRAMEWORK

The Project requires a provincial EA pursuant to BC*EAA* because it exceeds the trigger for energy storage facilities in the *Reviewable Projects Regulation*, Part 4, Table 8, which is "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".

The Project is also subject to a federal EA under *CEAA 2012* because the Project activities exceed thresholds in *CEAA 2012 Regulations Designating Physical Activities* schedule section 14(d). Specifically, the Project includes the construction, operation, and decommissioning of a new facility for the liquefaction, storage, or regasification of LNG, with an LNG processing capacity of 3,000 metric tonnes per day or more, or a LNG storage capacity of 55,000 metric tonnes or more.

The Project has been approved for substitution under the Memorandum of Understanding dated February 19, 2014 between the Canadian Environmental Assessment Agency (CEA Agency) and the EAO. The provincial review will satisfy all conditions outlined in the Substitution Decision document for the scope of the Project and the scope of the assessment, including meeting all information requirements outlined in *CEAA 2012*, specifically subsection 19(1) factors and environmental effects as defined in section 5 of *CEAA 2012*. The Application summarizes how all subsection 5(1), 5(2), and 19(1) requirements of *CEAA 2012* have been considered as part of the assessment for the purposes of substitution.

E3.2 PRE-APPLICATION PROCESS AND CONSULTATION

On the basis of the federal Minister's approval of the EAO's requested substitution, the EAO is leading the Project's two-phase process (a Pre-Application review phase followed by a 180-day Application review phase) to review the Proponent's Application under both the BC*EAA* and *CEAA 2012*. Key federal and provincial milestones prior to submission of the EA Application are provided in **Table E-1**.

Following issuance of the section 10 Order (see **Table E-1**), the EAO invited federal, provincial, and local government agencies and Aboriginal groups to participate in the review as members of its technical working group. These members participated in the Pre-Application review. An Issues Tracking Table that documents the issues and concerns raised by the working group members posted to the EAO's e-PIC website (http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_project_home_408.html), along with all other documents submitted as part of the EA process.

Table E-1 Federal and Provincial Milestones for Environmental Assessment

Document	Government Level	Date
Proponent submits Project Description	Provincial/Federal	November 27, 2013
EAO issues Order under section 10(1)(c) of the BC*EAA*	Provincial	November 27, 2013
EAO issues letter to the CEA Agency requesting substitution	Provincial/Federal	November 27, 2013
Proponent submits summary of the Project Description of a Designated Project	Federal	December 6, 2013
CEA Agency issues news release – Public Comments Invited on a Summary of the Project Description and Request for Substitution	Federal	December 17, 2013
CEA Agency invites public comments on Summary of the Project Description and Request for Substitution	Federal	December 17, 2013
CEA Agency releases Notice of Environmental Assessment Determination	Federal	January 31, 2014
CEA Agency releases Notice of Commencement of an Environmental Assessment	Federal	February 3, 2014
CEA Agency issues Substitution Decision	Federal	February 19, 2014
EAO issues section 11 Order for the Project	Provincial	March 21, 2014
EAO working group meeting	Provincial	May 12, 2014
EAO issues section 13 Order for the Project to provide the *Valued Components Selection* document for public consultation.	Provincial	June 3, 2014
Public Comment Period	Provincial	June 12 – July 27, 2014
Open House – Squamish	Provincial	June 18, 2014
Valued Component Selection document public comment period extends to July 27, 2014	Provincial	June 20, 2014
EAO issues section 13 Order for the Project to change the name of the Proponent to Woodfibre LNG Limited.	Provincial	June 24, 2014
EAO issues section 13 Order for the identification of Aboriginal Interests and Aboriginal Consultation requirements to exclude the Squamish Nation; a separate report is to be provided during the Application Review stage	Provincial	November 6, 2014
EAO approves *Application Information Requirements*	Provincial	November 24, 2014

The Proponent began engaging with Aboriginal groups in early 2013. The Proponent has worked with Aboriginal groups to obtain information regarding current and traditional Aboriginal use of the Project site and surrounding area.

Squamish Nation participated in the EA process through the EAO working group to gather information about the Project, but will be conducting a separate Squamish Nation-led environmental assessment process to determine and consider the impact of the Project on Squamish Nation Aboriginal Interests. In accordance with the section 13 order, information shared and issues raised during that process are not reported in the Application.

The Proponent began discussions with the Tsleil-Waututh Nation in early 2014, following the issuance of the initial EAO section 11 order, which prescribed consultation with the Tsleil-Waututh Nation on marine issues. The Tsleil-Waututh Nation has chosen to participate in the EA process through the EAO working group, and has provided comments on Proponent-produced documentation, including the initial Aboriginal Groups Consultation Plan and the draft *Application Information Requirements*. On December 16, 2014, the Proponent and the Tsleil-Waututh Nation signed a Memorandum of Understanding that provides capacity funding for the Tsleil-Waututh Nation to participate in engagement activities with WLNG and FortisBC. The agreement includes a commitment by the Tsleil-Waututh Nation to present traditional land use information and traditional ecological knowledge information in the form of a Tsleil-Waututh Knowledge Study.

The Proponent has undertaken additional meetings with the Musqueam First Nation, whose traditional territories are near the marine areas under consideration in the EA. To date, the Proponent has presented to representatives of the Musqueam Nation twice and has also presented at the Marine Traffic and Tanker Safety Summit hosted by the Musqueam Nation.

In May 2013, the Proponent began meeting with key stakeholders in the District of Squamish and Howe Sound to introduce the Project and to obtain early input regarding interests, issues, and concerns. Since that time, representatives of the Proponent have met with more than 30 local organisations, including local governments, non-profits, businesses, charities, sporting groups, and others.

EAO-led consultation focussed on soliciting comments regarding the *Valued Component Selection Document* and the updated Project Description. Approximately 1,300 public comments were received through the EAO during the formal public comment period during Pre-Application phase consultation. The Proponent prepared responses to all written comments received as part of the formal public comment period. Responses are included in a Public Consultation Report prepared by the Proponent for the EAO within the time limits established by the EAO in the section 11 Order. The report also includes a summary of the open houses, including copies of the advertisements, open house, and any written comments, questions, and responses.

Key issues raised focused on financial matters, potential safety issues, employment and the consideration of the specific aspects of the potential effects of the Project on environmental and socio-economic assessments. Comments identified a concern for the environmental effects of the Project related to air quality, marine water quality, noise, light and direct and indirect effects on terrestrial and marine species and communities. Socio-economic effects of concern included effects to tourism, interactions with marine transport for tourism and recreational vessels, outdoor recreation, and real estate values. Effects to public health as a result of accidents and malfunctions at the Project facility and during LNG transport were also included as a primary concern.

E3.3 APPLICATION REVIEW AND ON-GOING CONSULTATION

The EAO will set the dates of the public comment period for review of the Application in consultation with the Proponent, and is expected to require an open house or open houses to occur during the public comment period. If required, the open houses will present the results of the EA and provide information on how and to whom interested members of the public, local communities, and other interested parties or stakeholders can provide comments on the Application. Written comments, issues, and concerns regarding the Project will be submitted to the EAO, who will provide them to WLNG for issues recording, tracking, and response.

Based on invitations from the EAO to attend working group meetings, WLNG will continue to engage with government agencies throughout the Application review phase by participating in ongoing working group meetings as required. Woodfibre LNG Limited will also prepare and submit tables to the EAO, tracking working group comments resulting from their review of the Application and any supporting materials and WLNG responses to those comments. Woodfibre LNG Limited will share information with individual agencies as required

Woodfibre LNG Limited intends to continue consultation activities throughout development of the Project, including after statutory permitting and licensing decisions are made. The Proponent will continue to work with the public, stakeholders, and the government to resolve issues and ensure greater involvement from all members of the community.

E4. ASSESSMENT METHODS

E4.1 COMPONENTS AND INDICATORS

The Application focuses on valued components (VC) that could be most affected by the Project and as identified through input from regulators, Aboriginal groups, the public, and other stakeholders.

The cause-and-effect linkage between a project and a VC is referred to as an effect pathway, which typically comprises one or more physical media, such as water or air, through which an effect is transmitted to a receptor, such as wildlife or people. An effect pathway may also include different components of natural or socio-economic systems upon which receptors such as people or wildlife depend. Components *along* the pathway through which the effect is transmitted are referred to as intermediate components (ICs) for the purpose of this assessment.

The VCs have undergone an assessment for potential adverse effects as a result of the Project; ICs have undergone an evaluation of potential changes as a result of the Project. For ICs, the term *change* is used instead of effect because an assessment of the significance of effects is not conducted for ICs. This helps differentiate between the analysis of ICs and VCs.

The ICs and VCs identified for the Project, potential residual adverse effects of the Project on VCs, and indicators used to assess the extent of effects (or changes) are presented in **Table E-2** for each of the five pillars that require assessment under BC*EAA*.

Table E-2 Intermediate Components, Valued Components, Potential Effects, and Parameters

Component	Potential Adverse Residual Effects (VCs only)	Parameters Used for the Assessment
Environment Pillar		
Intermediate Components		
Atmospheric Sound	N/A	Change in ambient sound in proximity to the Project site: • overall day A-weighted sound levels ($L_{eq,day}$, dBA) • overall night A-weighted sound levels ($L_{eq,night}$, dBA) • A-weighted day-night sound levels (L_{dn}, dBA) • percent highly annoyed (%HA) • difference in low frequency noise, i.e., between A-weighted and C-weighted sound levels
Light	N/A	• light trespass (lux) • sky glow
Geotechnical and Natural Hazards	N/A	• Tsunamis generated as a result of landslide and/or earthquake activity, could damage Project facilities • Earthquakes – earthquake-related ground movements (including landslides and rockfalls), liquefaction, and ground surface ruptures that may damage Project facilities • Terrain stability – an increase in the potential for unstable conditions to arise from Project activity (e.g., landslides, avalanches, debris flows, debris floods)
Site Contamination	N/A	• Effects to freshwater or marine water quality and sediment quality • Effects to human health • Effects to freshwater and marine flora and fauna
Surface Water Quality	N/A	• Water turbidity in water courses • pH in Mill Creek
Surface Water Quantity	N/A	• Typical low flows • Extreme low flows • 200-year return period peak flows

Component	Potential Adverse Residual Effects (VCs only)	Parameters Used for the Assessment
Marine Water Quality	N/A	• Suspended sediment and turbidity • Temperature, residual chlorine • Concentration of nutrients, metals, hydrocarbons, mercaptans, amines, and other biological and chemical contaminants of potential concern • Dissolved oxygen, pH, salinity • Concentrations of dioxins, furans, and polychlorinated biphenyls
Valued Components		
Atmospheric Environment (Air Quality)	NO_2, (1 hour 24-hour) NO_2, annual SO_2, 1 hour SO_2, (3 hour, 24-hour) SO_2, annual CO, (1 hour, 8-hour) TSP (24-hour, annual) PM_{10}, 24-hour $PM_{2.5}$, (24-hour, annual)	• NO_2, SO_2, CO, TSP, PM_{10}, and $PM_{2.5}$ (concentrations of Criteria Air Contaminants (CACs))
Greenhouse Gas Management	• contribution of Project GHG emissions to provincial, federal targets • contribution of Project GHG emissions to climate change	• Project GHG emissions
Vegetation Communities	• loss of extent of vegetation communities • introduction and proliferation of invasive species	• change in extent and composition of vegetation communities, including native plant communities and sensitive (e.g., old forests, riparian areas, wetlands) or important (e.g., mature forest) ecosystems • change in extent and distribution of invasive plants
Avifauna • Platform and cavity-nesting birds • Passerines and Columbiformes	• loss of habitat • change in mortality • net effects to bald eagle and osprey; net effects to western screech-owl • net effects to band-tailed pigeon, barn swallow and olive-sided flycatcher	• change in habitat availability • change in ambient noise and artificial light • change in abundance from baseline conditions
At-risk Bat Species	• direct habitat loss • indirect habitat loss (sensory disturbance) • change in mortality	• change in habitat availability • change in ambient noise and artificial light • change in abundance
Amphibians	• habitat loss • change in mortality	• change in total area of available breeding and living habitat • change in water quality in amphibian breeding habitat • change in abundance and distribution from baseline conditions

Component	Potential Adverse Residual Effects (VCs only)	Parameters Used for the Assessment
Freshwater Fish and Fish Habitat	• fish habitat loss • change in fish mortality • reduced food and nutrient content of habitat	• mortality of fish, fish presence/absence, condition, or abundance • quality and quantity of fish habitats, habitat availability, spawning, rearing, foraging, holding habitats • change in freshwater flows, change in riparian habitat, change in benthic composition and density
Marine Benthic Habitat • Marine Sediment	• potential change in sediment quality due to seabed disturbance and contamination during marine construction • potential change in sediment quality from removal of existing creosote (wood) pilings • remobilization of legacy contaminants from the sea bottom caused by ship propeller scour	• change in sediment composition/contamination of marine sediment • change in benthic community
• Marine Benthic Communities	• potential change in habitat quality from removal of existing creosote (wood) pilings • potential direct loss of habitat • mortality from impingement and entrainment in seawater intake • potential introduction of invasive species from ballast water exchange during shipping	
Marine Birds	• loss or degradation of nesting or foraging habitat • injury or mortality due to Project activities	• loss or degradation of nesting or foraging habitat • Injury or mortality due to Project activities or accidents • Behavioural response
Forage Fish and Other Fish (Marine)	• potential change in habitat quality from various sources and resultant mortality • potential loss of habitat (construction and demolition of infrastructure, and shading of marine vegetation) • potential mortality and behavioural changes from underwater noise • potential mortality due to release of cementitious material during cast-in-place works	• change in habitat quantity • change in habitat quality • mortality • change in fish abundance and distribution • change in fish behaviour

Component	Potential Adverse Residual Effects (VCs only)	Parameters Used for the Assessment
Marine Mammals	• potential injury as a result of underwater noise due to pile-driving activities • changes in behavior due to underwater noise	• change in habitat quality • changes in behaviour • harm (physical injury or mortality)
Economic Pillar		
Labour Market	• no potential Project-related adverse residual effects predicted	• number of workers by occupation, industry affiliation and region of residence. • participation and unemployment rates • Difference between unemployment rate and natural rate of unemployment • labour income • industrial training opportunities
Sustainable Economy • Regional Economic Development • Marine Commercial Use • Local Government Finances	• displacement of marine-based tourism activities	• goods and services contracting revenues • induced output • distribution of employment across industries (economic diversity) • consistency of Project with existing economic development plans or strategies of government (qualitative) • catch and value statistics for the commercial and sport fishing seafood harvesting industries • number of commercial anglers and seafood harvesters • tourism features, amenities and sites • tourism activities and visitor and use levels (including seasonal nature of activities) • access related to tourism locations and activities and • environmental conditions (e.g., noise and visual) in areas used for tourism activities • municipal and regional government expenditures on specific programs and services • municipal and regional government revenue from payments in lieu of taxes and property taxes.
Social Pillar		
Infrastructure and Community Services • Housing and Accommodation • Community Infrastructure • Emergency Services	• increased demand on housing and long-term temporary accommodation through increased population associated with the Project operation workforce • increased demand of traffic services due to commuting workforce • increased demand for emergency services due to on-site emergencies	• number of workers • occupancy and vacancy rates • housing and occupancy costs • housing stock and temporary accommodation inventory • health and social services • education services • community services • emergency services

Component	Potential Adverse Residual Effects (VCs only)	Parameters Used for the Assessment
Marine Transport	• interference with navigation from Project-related infrastructure • interference with commercial, transport, fisheries, recreational activities and tourism	• proposed LNG carrier route in Howe Sound • expected number of LNG carriers calling at the Project per year • proportion of navigable channel affected by construction and operation of marine infrastructure • location of fisheries • marine recreational and tourism activities, destinations, and access routes overlapping with Project infrastructure and shipping routes
Land and Resource Use	• guide outfitting access • forestry access • outdoor recreation access and displacement	• provincial and local government land use designations • conformance of Project with existing land use plans, strategies, and policies of government (qualitative) • designated parks and protected areas • access to parks and protected areas • environmental conditions in parks and protected areas • trapping and guide outfitting tenures • access to trapping and guide outfitting areas and access routes • trapping and guide-outfitting wildlife harvesting • linear infrastructure tenures and ROWs • access to linear infrastructure • energy and mineral tenures • access to energy and mineral tenures • energy and mineral development activity • forestry tenures • access to forestry tenures • forestry activity (levels of harvesting) • hunting and fishing activities, location and use levels • access related to recreational and tourist harvesting of terrestrial and marine resources • recreational and tourist harvesting of terrestrial wildlife and marine resources • environmental conditions in areas used for recreational and tourist harvesting of terrestrial wildlife and marine resources • productivity of recreational and tourist harvested marine resources • recreation features, amenities and sites • recreation activities, location and use levels • access related to recreational locations and activities • environmental conditions in areas used for other recreational activities

Component	Potential Adverse Residual Effects (VCs only)	Parameters Used for the Assessment
Visual Quality	• change in visual quality	• visibility of Project components from selected receptor sites • predicted scenic values of proposed Project site and the existing landscape from selected receptor sites
Current Use of Lands and Resources for Traditional Purposes	• no potential Project-related adverse residual effects to the current use VC are predicted	• change in access to marine environment and resources • change in sensory disturbances during activity • change in the amount and quality of resources (including marine harvest resources)
Heritage Pillar		
Heritage Resources • Historical Resources • Archaeological Resources • Palaeontological Resources	• changes to palaeontological site integrity • changes to palaeontological site access • changes to archaeological site integrity • changes to archaeological site access • changes to historical site integrity	• areas of high palaeontological potential • areas of archaeological potential • areas where structures of possible historic significance remain
Health Pillar		
Public Health • Community Health and Well-Being • Human Health Risk Assessment (HHRA)	• accidents and mortality • drug and alcohol use • community connectedness • dibenzo(a,h)anthracene • all other contaminants of potential concern included in the HHRA	**Community Health and Well-Being** • labour income; participation and unemployment rates • prevalence of low income • distribution of income • industrial training opportunities • education completion rates • Home Price Index • median shelter costs • rental housing demand • housing affordability and crowding • smoking rates • alcohol consumption rates • drug related death and substance use rates • BC stats socio-economic indices • community organizations • sense of belonging • life satisfaction • mortality rates • cause of death • health facilities and services • health maintenance and disease prevention services

Component	Potential Adverse Residual Effects (VCs only)	Parameters Used for the Assessment
		• criminal Code offences and crime rates • recreation and tourism features, amenities, and sites; use levels; access related to recreational and tourism locations and activities; environmental conditions in areas of use for other recreational and tourism activities • physical activity level • indoor recreational activities • arts and culture organizations **HHRA** • comparison of air, water and country food quality measurements and predictions (if applicable) to the applicable environmental quality guidelines or standards to identify contaminants of potential concern • human health risk estimates for operable exposure pathway and contaminants of potential concern and receptors of potential concern • risk estimates will be compared to acceptable risk levels determined by Health Canada and MOE

E4.2 ASSESSMENT BOUNDARIES

Spatial assessment boundaries were identified for each VC based on the spatial characteristics of the Project and the VC as well as the areas within which interactions between the VC and Project, and effects are expected to occur. Areas that were established for each IC and VC are described in the Effects Summary sections below, and according to the following definitions as set out in the *AIR:*

- **Project area –** Encompasses the land and land covered by water that will be occupied by the Project components and activities.
- **LAA –** The area including and surrounding the Project area where there is a reasonable potential for the Project or Project-related activities to interact with and potentially have an adverse effect on a VC during each Project phase and in the event of accidents and malfunctions. The LAAs vary depending on VC.
- **RAA –** Provides the regional context for the assessment of potential Project-related effects within the LAA for each VC. In most cases, the RAA also encompasses the area in which the residual adverse effects of the Project on the VC are likely to combine with the effects of other projects and activities to result in a cumulative effect on the VC.

Temporal assessment boundaries encompass the periods during which the Project is expected to interact with ICs and VCs via effects pathways. Based on the existing Project schedule, the temporal boundaries for the Project are as follows:

- construction: 18 to 24 months
- pperation: minimum of 25 years after completion of construction
- decommissioning and abandonment: approximately 12 months at the end of the Project life

Administrative boundaries for each IC and VC are those that have been designated by various regulatory authorities within the LAA or RAA for a specific VC or IC; for example, local government zoning or Provincial protected area designations.

Technical boundaries for each IC and VC refer to the limitations in the ability to predict the effects of the Project. Examples might be constraints to study area access for safety reasons, or constraints associated with modelling. Such boundaries do not apply to every component.

E4.3 EXISTING CONDITIONS

Existing (or baseline) conditions have been described for each IC and VC to establish the setting for the assessment of Project-related effects. Existing conditions are described at an overview level for the RAA, and to a level of detail for the LAA of each IC and VC sufficient to enable potential Project-VC interactions to be identified, understood, and assessed.

E4.4 EFFECTS ASSESSMENT METHODS

The section 11 Order defines the scope, procedures, and methods for the assessment of the Project, including the construction and operation components and activities. Consistent with the AIR, which sets out the methodological steps required for undertaking the assessment, the effects assessment was carried out through the following steps:

- Identify key issues and associated VCs and ICs relevant to the Project and the Project EA.
- Establish assessment boundaries for each IC and VC to define the scope or limits of the assessment (spatial, temporal, administrative, or technical).
- Consider the regulatory and policy setting, key issues, measurable indicators, and significance thresholds, as well as information availability and limitations.
- Describe existing conditions in the local and regional study areas based on existing information, information collected by the Proponent, and available Aboriginal traditional knowledge and traditional use information that may be made available by First Nations. Existing conditions includes past and present projects and activities that may interact with components.

- Assess Project-related effects as follows:
  - identify potential interactions between Project activities and the VCs, including potential environmental effects identified in sections 5(1)(a), 5(1)(b) 5(2)(a) and 5(2)(b) of *CEAA 2012*
  - identify mitigation for potential effects.
  - characterize residual effects for VCs in a manner consistent with EAO procedures and published guidelines. Where residual effects exist, identify their context, extent (geographic or otherwise), magnitude, frequency, duration, and reversibility. (Note: potential adverse effects were not evaluated for ICs)
  - describe the likelihood of predicted residual effects
  - determine the significance of predicted residual effects (negligible, not-significant, or significant effects)
  - discuss the predicted confidence and risk of the predicted residual effects
- Assess cumulative effects as follows:
  - identify past, present, and reasonably foreseeable projects or activities that would be likely to interact in a cumulative fashion with predicted residual Project-related effects.
  - determine the potential for the Project-related residual effects to interact with the residual effects of other projects and activities.
  - determine the significance of the cumulative residual effects, where necessary, in a similar fashion to determination of Project-related effects significance.
- Identify follow-up and monitoring, if required

In addition, under *CEAA 2012* paragraph 5(1)(c) and the CEA Agency memorandum of understanding with the EAO, the Application assesses the effects (occurring in Canada) to Aboriginal peoples of any changes the Project may cause to the environment on the following factors:

- health and socio-economic conditions
- physical and cultural heritage
- the current use of lands and resources for traditional purposes
- any structure, site, or thing that is of historical, archaeological, paleontological, or architectural significance

These factors are considered as a component of the assessment of effects that fall under the five pillars identified by EAO environment (i.e., environmental, economic, social, heritage, and health).

Potential Project-related issues were identified through a scoping process that involved a desktop review of publicly available information, as well as discussions with scientists, technical experts, Aboriginal groups, and with representatives of regulatory agencies, academia, and non-government organizations.

E4.5 FOLLOW-UP AND COMPLIANCE MONITORING

Follow-up and compliance monitoring programs to verify the accuracy of the assessment conclusions are briefly described in **Section E17 Summary of Proposed Environmental and Operation Management Plans and Follow-up Programs**.

E5. ASSESSMENT OF POTENTIAL ENVIRONMENTAL EFFECTS

E5.1 ENVIRONMENTAL BACKGROUND

The land surrounding the Project consists mainly of steep, mountainous terrain typical of the windward face of the Coast Mountains of BC, and exhibits varying ecological conditions mainly influenced by elevation and a moist maritime climate. On its south side, the Project area is bounded by the deep marine fjord of Howe Sound.

The Project area has undergone more than a century of industrial use, having been developed and operated as part of the former Woodfibre Pulp and Paper Mill since 1912. There has also been extensive logging in and adjacent to the Project area. The Mill Creek watershed in particular exhibits cutblocks along both sides of the creek, although large cutblocks occur near Woodfibre Creek as well. In the latter half of the 20th century, during historical operations of the mill, the native mature forest and riparian vegetation of the flat, lower-elevation portion of the Project area was cleared, and much of this was replaced with clean fill. Although the mill was decommissioned in 2006, this prior use continues to influence the existing atmospheric, geophysical, terrestrial, aquatic, and marine environments surrounding the Project.

E5.2 ATMOSPHERIC ENVIRONMENT (AIR QUALITY) (VC)

The Project-related effects assessment of the atmospheric environment focuses on contaminants that are expected to be emitted from the Project, for which relevant air quality criteria exist, and which are generally accepted as indicative of changing air quality. Air Quality has been selected as a VC because air emissions from the Project, including Project-related shipping activities, have the potential to affect air quality within the LAA and RAA (see below). These emissions are managed by the federal and provincial government, as well as local jurisdictions, through regulatory limits.

The Project has the potential to emit other compounds for which no regulatory criteria are available. These compounds are important for the assessment of predicted Project-related effects on human health. The relevant air quality criteria and standards used for assessing Project-related air quality effects include BC objectives, and federal objectives where provincial guidelines are not available.

The air quality LAA is a 20-km x 20-km area centred on the Project area and within which the greatest changes to air quality are expected as a result of Project-related effects. The RAA is a 50-km x 40-km area centred on the Project area, and corresponds to the area used for the dispersion modeling domain and for assessment of cumulative effects.

Activities associated with the operation of the former Woodfibre mill through the last century have contributed to air quality conditions in the area surrounding the Project. Since the 2006 decommissioning of the mill, there has been little industrial activity contributing to air quality conditions, other than the operation of a small power generation facility. Today, based on data from monitoring stations at Langdale, Squamish, and Horseshoe Bay, existing air quality conditions are considered to be good; concentrations of indicator compounds are below the most stringent ambient air quality criteria. The substances most commonly considered when assessing air quality (carbon monoxide, nitrogen dioxide, sulfur dioxide, and suspended particles) are all currently below the federal and provincial ambient air quality objectives and standards.

Air emissions from Project construction, operation, and decommissioning phases were estimated based on planned activities and equipment use. Due to the intermittent, short-term, and fugitive nature of construction and decommissioning, it is expected that effects from the construction and decommissioning phases will be less than during the operation phase.

For the Project's operation phase, the air quality assessment predicted that changes to air quality as a result of Project activities and components, including changes resulting from particulate emissions from marine vessels, when coupled with existing conditions are not expected to exceed ambient air quality criteria offsite for SO_2 (3 Hour, 24 Hour) and CO (1Hour, 8 Hour). Therefore the effects to air quality are expected to be negligible. For NO_2 (1 Hour, 24 Hour, Annual) and SO_2 (1 Hour), the effects to air quality are expected to be not significant.

For the Project's operation phase, the air quality cumulative effects assessment predicted that changes to air quality as a result of Project activities and components when coupled with existing conditions and reasonably foreseeable future projects are likely to be negligible magnitude, locally restricted, long-term, continuous and reversible. Therefore, potential adverse residual cumulative effects to air quality as a result of the Project are not likely to be significant.

The indicator compounds having the greatest magnitude of measurement are particulates (TSP, PM_{10}, and $PM_{2.5}$) and were therefore considered for monitoring and follow-up programs. However, monitoring the effects of particulate emissions from marine vessels is challenging, since these sources are mobile and operate intermittently. Monitoring and follow-up programs for air quality are therefore not planned. As a mitigation measure, WLNG plans to provide electrical power to the docking facilities at the Project site to reduce the requirement for the LNG carriers to operate their auxiliary engines while docked, thereby reducing particulate emissions from the Project.

E5.3 GREENHOUSE GAS MANAGEMENT (VC)

The GHG emissions from the Project will contribute to sector, provincial, and national targets and norms. The Project may also contribute to climate change through changes in the levels of GHG emissions in the atmosphere, since carbon dioxide is the major component of GHG from an LNG facility, along with methane and nitrous oxide, as products of combustion from several Project sources.

Since climate change and GHG emissions are both regional and global in nature, spatial boundaries correlate with provincial and federal GHG policy, regulations, and legislation, with emphasis on defining the current and future climate conditions within the air quality RAA (approximately 50 km x 40 km, centred on the Project area).

Greenhouse gases are expressed as tonnes or kilotonnes of equivalent carbon dioxide (CO_2e), which is calculated by multiplying the annual emissions of each GHG by its 100-year global warming potential. Existing GHG conditions for the area surrounding the Project are based on studies of local meteorological trends and annual provincial and federal GHG inventory reports. At a broad scale, baseline (2010) GHG conditions are 61,500 kilotonnes CO_2e for BC, 699,000 kilotonnes CO_2e in Canada, and 20,894,000 kilotonnes CO_2e globally.

The assessment considered direct and indirect GHGs from all three Project phases, and assumed a worst-case scenario in which all equipment is running simultaneously at design capacity over the course of a year. Calculated GHG emissions were then compared against the current provincial and federal totals (as proxies for future targets) to evaluate the influence of Project GHG emissions on target totals. The influence of Project-related GHG emissions on climate change was evaluated by assessing whether any measurable change in climate could result from these emissions. The Project's CAC emissions which include GHG emissions are anticipated to be markedly lower than similar projects and the current provincial and federal targets. The low total was estimated using an operation max capacity, which is a conservative estimate since sustained full operating capacity of all equipment is unlikely. The potential Project adverse effect on GHG emission targets is likely to be moderate-term, continuous, and irreversible, but low in magnitude, and therefore likely to be negligible.

Based on the Project activities and the interactions between Project-related activities and GHG management issues identified, it is likely that the Project will likely result in negligible adverse residual effects to the GHG management VC. As such, a cumulative effects assessment is not required.

Mitigating measures to reduce Project GHG emissions have been incorporated into Project design through machinery/technology selection, process design, and managing fugitive emissions. Also, the decision to use electric power rather than direct drive to power the LNG facility will result in notable reductions in air quality contaminants of concern and an approximately 80% reduction in greenhouse gases.

E5.4 ATMOSPHERIC SOUND (IC)

The atmospheric sound IC addresses both ambient sound in proximity to the Project as well as increases in low-frequency noise due to Project activities. Industrial equipment and vehicles used for construction and operation of the Project have the potential to increase sound levels in proximity to the Project. Atmospheric sound from the Project was assessed in accordance with sound regulations specified by the OGC in the *British Columbia Noise Control Best Practices Guideline*. Health Canada's (federal) approach to noise assessment is based on determining the % highly annoyed.

The *OGC Guideline* considers sound-sensitive receptors to be any permanent residences or seasonally occupied dwellings within 1.5 km of the Project area. The LAA for atmospheric sound therefore extends 1.5 km in all directions from the Project area boundary. The RAA extends 8 km in all directions from the Project area boundary. There are no sound-sensitive receptors within the LAA, therefore representative receptors located in Britannia Beach, Darrell Bay, and Watts Point in Murrin Park (all situated on the east side of Howe Sound) were identified and assessed.

Sound levels for the Project construction and operation phases were predicted using computer models, and compared to assessment criteria (e.g., *OGC Guideline* permissible sound level and low frequency noise threshold, Health Canada Guidance % highly annoyed, sleep disturbance, and speech intelligibility metrics). Adverse changes in atmospheric sound from Project-related construction, operation, and decommissioning activities are likely to be within the *OGC Guideline* and Health Canada Guidance.

The District of Squamish has a noise bylaw that applies to the Project area. Because the changes in atmospheric sound would be negligible using *OGC Guideline* and Health Canada Guidance, the nuisance-based bylaw is satisfied; however, since the bylaw limits construction to daytime hours only, a permit will be acquired to perform limited construction activities during nighttime, when required.

E5.5 LIGHT (IC)

The existing light environment in the Project area is influenced by light mainly from the nearby communities of Squamish and Britannia Beach. Project construction, operation, and decommissioning will result in additional light interacting with the existing environment. The Project flood and wall pack lighting on land, and flood lighting from the FSO will be among the sources resulting in additional light in and around the Project area. While Project-related light changes are anticipated to be modest, the changes are likely to contribute to higher total light levels in the LAA and RAA. The LAA for light is a 16 km^2 x 16 km^2 square centered on the Project that encompasses the nearby communities of Britannia Beach, Darrell Bay, and Squamish. The RAA is a 50 km x 40 km rectangle centered on the Project.

Sky glow and light trespass are the parameters used to assess the potential changes in light levels attributable to the Project. Sky glow is the illumination of the night sky due to the scattering and reflection of light rays radiated in directions above the horizontal, or reflected from the ground and buildings by aerosols present in the night sky. This illumination results in a loss of contrast, which reduces the number of visible stars and produces a visible glow in the direction of the Project site. The Illuminating Engineering Society of North America and Commission Internationale de l'Eclairage (CIE)/International Commission on Illumination guidelines relating to potential Project-related changes on sky glow and light trespass at the surrounding locations, were used in the assessment.

Mitigation measures have been incorporated into the Project design. Lighting will be directed downward, shielded, and managed from the facility's control room so that light can be regulated for specific tasks. Where feasible, lights that emit fluorescent light without the visible long (red) wavelength components of the spectrum that are attractive to birds will be used on Project infrastructure.

The points of reception are in CIE environmental lighting zone E3 based on observations and the existing sky glow levels. The assessment concludes that Project-related light emissions are not likely to result in a change to the existing CIE environmental lighting zone at either of the points of reference or the points for which the points of reference are considered representative.

E5.6 GEOTECHNICAL AND NATURAL HAZARDS (IC)

The Project area is located within the zone of moderate to high earthquake risk, and along the shoreline of watersheds comprising steep slopes, with active and historic mass wasting events and potentially unstable terrain. The potential for damage or loss of proposed on-shore and marine facilities was therefore considered for the following geotechnical and natural hazards:

- naturally occurring mass movements (landslides, snow avalanches) within the Mill Creek and Woodfibre Creek watersheds that may directly or indirectly affect the Project area
- earthquake-related ground shaking, soil liquefaction-induced loss of strength and foundation support, lateral spreading movements, and potential fault ruptures
- failures of steep delta/fan slopes and steep onshore slopes

The LAA for geotechnical and natural terrain hazards encompasses the Project area where surface or groundwater conditions will be modified, and areas adjacent to the Project area that will not be directly modified, such as Mill Creek and Woodfibre Creek channels and Howe Sound shoreline, but potentially could be affected by activities or changes in geotechnical, geological, and hydrogeological conditions within the Project area. The LAA also encompasses the existing landfill. The RAA includes the LAA and the Mill Creek and Woodfibre Creek watersheds, portions of the adjacent sub-watersheds, and marine environments.

Avalanches and terrain instability events have occurred and continue to occur in the RAA. The likelihood of these events continuing is expected to remain the same throughout the Project life. Avalanches and debris and rock slides in the steep valley sidewalls are common in the Mill Creek and Woodfibre Creek watersheds, but are not expected to directly affect the Project area. Activities associated with the Project area are not anticipated to increase the potential for initiating mass wasting (landslide) events.

There is a potential for debris flows and debris floods to occur upstream in the RAA that could affect the Project area. Further investigation and assessment will be required to evaluate this potential, and determine if engineering designs are required to mitigate potential risks.

If subjected to earthquake events, the upper portions of the existing fluvial and fan/delta deposits, on which the facility will be situated, are expected to be susceptible to liquefaction and associated risk of excessive settlements, lateral movement, or instability. The final design for the Project will meet the applicable performance requirements for an LNG plant and facilities. Mitigation measures designed by and constructed under the supervision of qualified and experienced personnel will be implemented to limit the risk and effect of seismic events on the Project, and ensure the Project performance objectives and public safety requirements are met.

The risk and effect of earthquake or tsunami events, whether due to large landslide or rockslide events in Howe Sound, are likely to be low to very low. Similarly, the effect of rockfalls, landslides, or debris flows due to earthquake events in the Project area is likely to be low to very low. However, the potential for and risk of instability of the existing landfill and proposed cutslope located upslope of the Project facilities could affect the stability of the Project area. Effective long-term drainage control and monitoring and construction of suitable cutslope stabilization measures, are expected to be required. The Proponent is currently investigating slope stability concerns related to the existing landfill, and will implement measures to stabilise the slopes based on the results of the investigation.

The potential for a shoreline or submarine landslide event to occur (similar to the 1955 submarine landslide that occurred at the site), will be addressed with detailed studies and further investigations. All onshore and offshore Project facilities will be designed and constructed to achieve the life safety and performance criteria of the National and BC Building Codes, or as otherwise required for the Project. Potential rockslide and debris flow and flood assessments and plans will be designed and supervised by qualified and experienced professional engineers and geoscientists.

E5.7 SITE CONTAMINATION (IC)

The Woodfibre property is considered to be a contaminated site under the *Environmental Management Act (EMA)* SBC 2003, c.53. The two key regulations under the *EMA* relating to the assessment and remediation of contaminated sites are the *Contaminated Sites Regulation* (CSR) and the *Hazardous Waste Regulation*. The CSR is triggered by particular milestone events on a site. For the project site, the

CSR was first triggered by decommissioning of the former pulp mill in 2006, but the remediation process has been expedited as the current owner, WFP, has committed to remediation of the site prior to transferring it to WLNG. Site investigations and remediation were undertaken, and two Certificates of Compliance (COCs) were issued for the uplands and water lot (sediment) portions of the Woodfibre property on December 22, 2014.

The issued COCs provide assurance that site contamination, including interactions with other Project VCs, is acceptable. Potential effects, including mobilization of contaminants as a result of activities during Project construction were considered. The Project components and activities that are expected to interact with contaminants, and the potential effects, have been described and determined to be acceptable for a COC.

The guidance, procedures and protocols outlined in the CSR were used as the method of identifying and remediating site contamination, and to define existing conditions as a basis for approval of development and operation of the project facility. The existing conditions are those conditions existing at the time of issuance of the COCs. Based on the investigation conducted for the site, the existing contamination can be safely managed in place in accordance with the assumptions and conditions outlined in the COCs.

The recent remediation of the Woodfibre Pulp and Paper Mill site resulted in improvement to site contamination conditions. This positive effect of the Project on site contamination will continue since the condition and control requirements of the COCs will include any contaminated media from future excavations be dealt with in accordance with the CSR. The COCs outline conditions for onsite use and ongoing monitoring to mitigate potential transport of contaminants during site construction, operation, and decommissioning such that environmental conditions will continue to improve over time. To obtain the COCs, Western Forest Products needed to demonstrate that contaminants are not continuing to discharge into the aquatic environment (freshwater or marine), and that any contaminants left in situ have been remediated to risk-based standards. In addition, issuance of a risk-based COC means that the Woodfibre property meets the requirements of the CSR, and risks to human health, wildlife, marine resources, and water quality are acceptable.

All mitigation measures are those that are specified in the COCs. All excavation, infrastructure, and decommissioning work will require production and implementation of health and safety and environmental management plans, with the oversight of an approved professional to manage contaminated media in accordance with the *EMA.* Adverse changes to the site contamination and resulting adverse effects to the environment and human health will be avoided by complying with the COCs during the construction, operation and decommissioning phases of the Project.

E5.8 SURFACE WATER QUALITY (IC)

The upper sections of Mill Creek and Woodfibre Creek are typical of coastal freshwater systems of the southern Coast Mountains, flowing from steep mountain slopes and receiving high volumes of precipitation through much of the year. Except for the lowest segments of Mill Creek, both watersheds are densely vegetated and portions have been logged. Two smaller, unnamed watercourses flow through the Project area into culverts that run beneath the existing access roads along the shore, and are then discharged into Howe Sound. The LAA for surface water quality is the terrestrial portion of the Project area. The RAA includes the LAA and the watersheds for Mill Creek and Woodfibre Creek, the two main watercourses in and adjacent to the Project area.

Water quality parameters evaluated in water samples collected in 2006, 2007, and 2013 generally meet the BC water quality guidelines, with several exceptions. Total and dissolved calcium levels exceeded BC water quality guidelines in one sample taken from Mill Creek, and several parameters in Woodfibre Creek exceeded guideline levels, including chloride, total organic carbon, total and dissolved calcium, and dissolved aluminium. The majority of exceedances were identified on surface water samples along existing site roads. Total dissolved solids ranged from 27 milligrams per litre (mg/L) to 356 mg/L in samples taken from Mill Creek, and from 10 mg/L to 148 mg/L in those from surface water runoff. Total suspended solids were less than 0.5 mg/L in all samples taken from Mill Creek.

The following potential interactions between Project activities and surface water quality were identified and effects assessed:

- Construction and decommissioning activities near the local creeks may result in soil erosion and sediment transport by surface runoff that may subsequently enter those creeks.
- Construction, operation, and decommissioning activities may affect surface water quality as a result of accidents or malfunctions during these activities.
- Construction of a new water intake within Mill Creek may temporarily affect water quality (however, there will be no discharges of process water or wastewater into Mill Creek or Woodfibre Creek during the Project).

With application of design and proposed mitigation measures, changes in water quality are likely to remain within the guidelines for aquatic life. Similarly, interactions between Project-related changes following mitigation and the incremental changes of other certain and reasonably foreseeable projects and activities are not likely to result in a cumulative change.

E5.9 SURFACE WATER QUANTITY (IC)

Maintaining water flow in natural creeks is important for natural fluvial morphological functions, aquatic and terrestrial wildlife, and use by people. Of the four watercourses in the Project area, flows in the Mill Creek and Woodfibre Creek may potentially be affected by Project-related demand for freshwater, and

through changes to hydrology and resulting from alterations to land cover and drainage characteristics during construction, operation, and decommissioning phases. Project-related changes to the two smaller, unnamed creeks are not anticipated. The Project is not expected to have a notable effect on the extreme high flows of Mill Creek or Woodfibre Creek. However, since high flows may breach the stream banks and flood the Project area, flooding is identified as a potential effect of the environment on the Project (see **Section E12 Effects of the Environment on the Project**). The LAA for surface water quantity is the terrestrial portion of the Project area. The RAA is the LAA plus Mill Creek and Woodfibre Creek watersheds.

Annual average natural flows in Mill Creek and Woodfibre Creek are estimated to be 3.4 m^3/s and 2.0 m^3/s respectively, with the lowest flows typically occurring in August. Based on the synthetic hydrographs, the average August flow are 1.9 m^3/s for Mill Creek and 1.1 m^3/s for Woodfibre Creek. The estimated 200-year return period peak flows are 166 m^3/s (instantaneous peak) and 80 m^3/s (daily peak) for Mill Creek and 110 m^3/s (instantaneous peak) and 53 m^3/s (daily peak) for Woodfibre Creek.

Water diversions during Project construction and decommissioning will reduce flows in Mill Creek. The flow reduction will depend on the timing of the extractions. It is estimated that a maximum demand of 2,500 m^3/day will be required—a relatively small volume compared to average annual flows and dry-month average and median flows in Mill Creek (approximately 2% to 4% of streamflows), but equivalent to approximately 77% of flow during an extreme low-flow event.

During Project operation, freshwater will be required to support LNG production processes, infrastructure for employees (domestic and potable water), and firefighting. Water would be diverted from Mill Creek through a buried gravity pipe and stored in a tank. It is estimated that approximately 25 m^3/h will be diverted from Mill Creek during normal Project operation. Assuming water is extracted at a constant rate, water diversion would be 0.007 m^3/s.

During Project construction, a small area of land (less than 15 ha, or 0.4% of Mill Creek watershed) will be cleared to accommodate some of the new facilities. Given this small area relative to Mill Creek watershed, changes to creek hydrology as a result of altering the existing land cover are not anticipated. The new fire house, safety and first-aid facility, guardhouse, and road upgrade leading to these buildings would be located within previously cleared areas of the Woodfibre Creek watershed, that are considered negligible compared with the total area of Woodfibre Creek watershed.

The Project has been designed to minimize changes to surface water quantity and, aside from the construction of temporary drainage ditches and potentially a sediment pond, no other changes to drainage patterns are anticipated as a result of the Project. The Proponent will ensure that minimum instream flow releases will be established by a qualified professional. When required, the water diversions will be interrupted or reduced as required to maintain minimum or higher instream flows. There will not be

any discharges to creeks associated with the Project. It is not anticipated that surface water quantity conditions will be substantially influenced by the Project and other reasonably certain foreseeable projects and activities

E5.10 MARINE WATER QUALITY (IC)

Howe Sound extends from its most northern point, the Squamish River, to the southwest where it empties into the much larger Strait of Georgia. The maximum depth of Howe Sound is approximately 280 m with a sill located near Anvil Island at approximately -70 m depth. Historically, water quality in Howe Sound has been influenced by a number of natural and anthropogenic factors. Natural factors include circulation patterns, freshwater inputs, currents, salinity, and biological activity. Anthropogenic factors include discharges and disposal of substances directly or indirectly into Howe Sound. Industrial activities, including the existing Port Mellon Pulp Mill, the former Woodfibre Pulp and Paper Mill, and the former Britannia Mine, have historically discharged wastewater into Howe Sound since the early 1900s.

The LAA for marine water quality studies included the marine portion of the Project area; the RAA included most of Howe Sound. A comprehensive review of available literature was completed to characterize existing water quality conditions both in and adjacent to the Project area. Seasonal field studies were conducted to characterize existing conditions within the LAA.

Some polycyclic aromatic hydrocarbons (PAHs) were detected in the water samples collected in 2014; however, none of the detected PAHs exceeded Canadian water quality guidelines or BC water quality guidelines.

Concentrations of metals in the Project and reference areas are low. Many metals were found to be below detection limits in all samples, Total and dissolved cadmium and lead, total chromium, and dissolved iron and titanium were detected in less than 50% of the samples. The exceptions to the low concentrations of metals were copper, boron, and zinc. Copper was present predominantly in its particulate form associated with freshwater input, and exceeded BC short-term maximum water quality guidelines (0.003 mg/L) and BC long-term water quality guidelines (0.002 mg/L) in samples collected from the surface in summer. Boron was present mainly in the dissolved form and associated with oceanic water occurring in higher concentrations at the depth below the pycnocline, where boron concentrations exceeded BC water quality guideline (1.2 mg/L) in all samples. Zinc was present predominantly in its dissolved form and exceeded BC water quality guideline (0.01 mg/L) in four samples.

The Project has the potential to affect marine water quality in the Project area through surface water runoff, sediment disturbance, discharge of treated process water and stormwater, and discharge of seawater from the seawater cooling system. During operations, seawater associated with the seawater cooling system discharge may result in changes in water temperature and introduction of residual chlorine. Treated process water and stormwater from the water treatment plant may affect water quality

with contaminants of potential concern in excess of federal and provincial water quality guidelines. The contaminants may include hydrocarbons, metals, suspended solids, pH, temperature, mercaptane, amines. Project LNG carrier maneuvering at the floating storage and offloading unit (FSO) may result in increased suspended sediment from bottom sediment into the water column.

Changes to marine water quality due to Project-related activities are summarized as follows:

- No Project-related changes in marine water quality are likely beyond natural variability and exceeding water quality guidelines, including increase in levels of suspended sediments, turbidity and contaminants, due to increased site erosion, sediment transport, seabed disturbance, concrete works, pile removal, and other construction activities. Identified potential interactions will be mitigated by development and implementation of a Construction Environmental Management Plan (CEMP) and associated management plans, and environmental monitoring.
- No changes exceeding water quality guidelines are likely due to increase in marine water temperature, residual chlorine, PAHs, metals, mercaptans, amines, and other contaminants of potential concern from seawater cooling system and treated effluent discharge. This will be achieved through Project design that includes process water treatment, chlorine removal, and the diffuser design.
- No changes in marine water quality are likely due to remobilization of legacy contaminants from sediments (i.e., PAHs, metals, dioxins and furans) and increase of suspended sediment due to propeller wash during shipping operations (i.e., berthing for LNG transfer and shipping within Howe Sound). Jet velocities on the seafloor generated by Project vessels will be below the threshold velocity of motion of seafloor sediment.

Environment monitoring plans will be developed and implemented to confirm that the recommended mitigation measures for marine water quality are effective. Monitoring will comprise two main components: operational (or compliance) monitoring and effects monitoring. Details are provided in **E17 Summary of Proposed Environmental and Operation Management Plans and Follow-up Programs**.

E5.11 VEGETATION COMMUNITIES (VC)

Most of the terrestrial component of the Project is situated on developed land and consists of pavement, buildings, and cleared areas dominated by invasive plants. However, several natural vegetation communities—including regenerating, mature, and old forest—exist within and surrounding the Project area. Vegetation communities are defined for this assessment as all native plant communities, including sensitive ecosystems, which occur in the Project area.

The LAA for vegetation communities is a 282 ha area that includes the Project area plus a 500-m buffer. The RAA is a 7,519 ha area comprising the watersheds of Mill Creek and Woodfibre Creek, the majority of the Foulger Creek watershed, and portions of the watersheds of the two unnamed watercourses described in **E5.8 Surface Water Quality**.

Terrestrial ecosystem mapping was used to identify and quantify the vegetation communities within the LAA and RAA. The terrestrial ecosystem mapping data were mainly classified through two previous separate terrestrial ecosystem mapping projects completed in 2007 and 2008.

Three biogeoclimatic ecological classification zones occur in the RAA: Coastal Western Hemlock (CWH), Mountain Hemlock (MH), and Coastal Mountain-Heather Alpine. The CWH is predominant at the lowest elevations, and of which three variants occur in the Project area: Dry Maritime (CWHdm). Submontane Very Wet Maritime (CWHvm1), and Montane Very Wet Maritime (CWHvm2). The Project area is predominantly within the CWHdm extending into the CWHvm1 to the west.

Approximately 16% (1,212 ha) of the RAA has been previously disturbed. Mature forest covers 6% of the RAA, and old forest covers approximately 46%. Approximately 74% (27 ha) of the Project area is disturbed and is covered in old concrete and compact fill. Where vegetation does exist in the Project area, it is generally dominated by invasive species, primarily Himalayan blackberry. Three small patches of mature forest dominated by western hemlock and Douglas-fir with a dense understorey of native shrub and fern species. No historical occurrences of provincially or federally designated plant species have been reported within the LAA or RAA.

The Project will require the removal of native vegetation communities. With design mitigations to reduce the area of vegetation to be removed, it is anticipated that the Project will result in removal of less than 2 ha of mature forest, no old forest removal, and less than 1 ha of riparian forest associated with Mill Creek. This residual effect is low in magnitude, site-specific, long term, continuous over the life of the Project, and likely to occur. The vegetation removed may be replaced at the end of life of the Project; therefore, vegetation loss is predicted to be reversible. The cumulative effects assessment considers the combined effects of the Project and other reasonably foreseeable future projects on vegetation communities. Direct loss due to site clearing and introduction or proliferation of invasive species is likely to result in a low magnitude of residual effects on vegetation communities; therefore, the magnitude of residual adverse cumulative effects on vegetation communities is also likely to be low. The potential cumulative effects likely to be restricted to the RAA, long term, continuous over life of the Project, and likely to occur; they are also likely to be reversible with Project decommissioning and reclamation activities. The residual adverse cumulative effects are not likely to exceed ecological thresholds or compromise the resilience of vegetation communities in the RAA, and are therefore not likely to be significant.

A Green Zone situated around the lower reaches of Mill Creek has been incorporated into the Project design to mitigate for effects to riparian habitat (see **Figure E-1**). Following Project construction, the Green Zone and areas that will not be required for Project operation will be re-vegetated with suitable native species. Other mitigations include completion of a pre-construction rare plant survey and, if necessary, salvage, and implementation of an Invasive Plant Management Plan.

E5.12 AVIFAUNA (VC)

The avifauna VC includes two subcomponents: (1) platform and cavity-nesting birds (specifically bald eagle, osprey, western screech-owl), and (2) passerines and columbiformes (specifically barn swallow, band-tailed pigeon, and olive-sided flycatcher). Of these species, the *kennicottii* subspecies of western screech-owl is provincially Blue-listed and has been designated as Special Concern on Schedule 1 of *SARA* and Threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC); the barn swallow is provincially Blue-listed and designated as Threatened by COSEWIC, but is not listed under *SARA;* band-tailed pigeon is provincially Blue-listed and has been designated Special Concern on Schedule 1 of *SARA* and by COSEWIC; and olive-sided flycatcher is provincially Blue-listed, and has been designated Threatened on Schedule 1 of *SARA* and by COSEWIC.

The LAA is a 282 ha area comprising a 500-m buffer around and including the terrestrial component of the Project area. The RAA is a 7,519 ha area that includes the LAA plus the area generally bounded to the south by the Foulger Creek watershed, to the west and northwest by the height of land, and to the east by an unnamed watershed and Howe Sound. This RAA is based on the provincial Biogeoclimatic Ecosystem Classification system which forms the basis for prediction of potential effects of the Project on wildlife, and generally falls within the CWH zone (described in **E5.11 Vegetation Communities,** above)

Existing conditions were described using results from desktop and field surveys. Breeding bird surveys were conducted during spring of 2013 and 2014. The LAA provides appropriate nesting and foraging habitat for a variety of hawk, accipiter, vulture, and eagle species. Forested habitat within the LAA supports large trees, which may provide nesting structures for several raptor species. Diurnal raptor foraging may occur across the LAA depending on species-specific hunting habits. Owl species with the potential to occur in the LAA use a variety of habitat types depending on species, life requisites, and season of use. Bald eagle was the only raptor species observed in the LAA during field surveys; a pair of bald eagles was recorded nesting west of Woodfibre Creek during 2014 field surveys.

Habitat removal will be required to develop the Project area. Habitat loss for platform and cavity nesting birds is likely to be reversible. Mitigation measures will reduce potential interactions with infrastructure that may occur during Project construction and ongoing monitoring will allow for adaptive management. Habitat loss for passerines and columbiformes is likely to be reversible and the effect is not likely to be greater than predicted due to mitigation measures and conservative assumptions regarding the Project footprint.

Changes in mortality due to the Project will be effectively minimized by proposed mitigation measures. The effect of the Project on mortality to platform and cavity nesting birds is predicted to be low and localised to the Project area. Changes in mortality due to the Project will be effectively minimized by proposed mitigation measures. The effect of the Project on mortality to passerines and columbiformes is likely to be low and localized to the Project area.

The assessment of net effects includes consideration of potential combined Project effects on bald eagle and osprey, western screech-owl, and on band-tailed pigeon, barn swallow and olive-sided flycatcher (passerines and columbiformes). For bald eagle and osprey, the residual adverse effects are unlikely to exceed ecological thresholds and compromise the resilience of bird populations and are therefore not likely to be significant. For western screech-owl, it is expected that mitigation measures will reduce potential interactions with Project infrastructure and activities and ongoing monitoring will allow for adaptive management. However the Project is expected to reduce habitat availability and potentially result in a change to mortality, although these effects are not likely to compromise the resilience of western screech-owl populations, and are therefore not likely to be significant. For passerines and columbiformes, the combined residual adverse effects are unlikely to exceed ecological thresholds and compromise the resilience of bird populations and are therefore not likely to be significant.

The net cumulative effects assessment includes the combined effects of the Project with other reasonably foreseeable future projects. The net cumulative residual adverse effects on bald eagle and osprey are unlikely to exceed ecological thresholds and compromise the resilience of bird populations and are therefore not likely to be significant. The net cumulative effects on western screech-owl are considered unlikely to exceed ecological thresholds and compromise the resilience of bird populations and are therefore are also not likely to be significant. The net cumulative effects on passerines and columbiformes are considered unlikely to exceed ecological thresholds and compromise the resilience of bird populations and are therefore not likely to be significant.

A number of design and other measures to mitigate effects, including implementation of a Wildlife Management Plan during the construction phase.

E5.13 At-risk Bat Species (VC)

Bats may roost in existing buildings within the Project area and forage over its terrestrial and marine environments. Increases in ambient sound levels and artificial light at night may alter bat foraging behaviour and habitat use. Keen's myotis and little brown myotis were selected as representative species of this VC due to their potential or confirmed presence in the area, along with their provincial or federal designation.

The LAA for at-risk bat species is a 312 ha area defined by applying a 500-m buffer around the terrestrial Project area and a 100-m buffer from the shoreline into the marine habitat. The 7,562 ha RAA is defined as the area encompassed by the Mill Creek, Woodfibre Creek, and Foulger Creek watersheds. The RAA is generally bounded to the south by the Foulger Creek watershed, to the west and northwest by the height of land, to the east by an unnamed watershed and Howe Sound, and a 100-m buffer from the shoreline into the marine habitat.

Desktop and field surveys were conducted to characterize the condition of bat habitat within the LAA and to assess the potential presence of at-risk bat species. Surveys were undertaken during summer 2013. Woodfibre LNG Limited is not aware of any bat surveys undertaken in the LAA or RAA prior to that.

The limited availability of old-growth forest, cave (particularly karst) habitat, and freshwater riparian habitats suggests that Keen's myotis is unlikely to occur in the terrestrial portion of the LAA. These bats have been documented foraging in estuarine habitats, so it is possible that they could forage along the LAA foreshore. Low-elevation ponds and riparian areas also provide the most important foraging habitat for Keen's myotis due to high insect productivity in these areas. Little brown myotis is likely to occur in the LAA, as evidenced by acoustic calls identified in all of the habitats sampled (foreshore, forest, and un-vegetated areas), and it is also likely to be roosting in the LAA, which offers diverse roosting habitats.

The areas of direct and indirect habitat loss predicted to be adversely affected by the Project are small relative to the area of foraging habitat available in the LAA. Due to the reversibility of Project impacts and effective mitigation measures the residual effect on habitat is not likely to be greater than predicted.

Changes in mortality due to the Project will be effectively minimized by proposed mitigation measures. The effect of the Project on mortality to at-risk bat species is likely to be low in magnitude, localized to the Project area and reversible and is not likely to be greater than predicted.

The net cumulative effects assessment considers the combined effects of the Project with other reasonably foreseeable future projects on at-risk bat species. The net adverse cumulative effects are unlikely to exceed ecological thresholds, as at-risk bat species are determined to have moderate resilience to imposed stressors. The cumulative effects of the Project are unlikely to exceed ecological thresholds and compromise the resilience of the regional populations of at-risk bat species; therefore, they are also not likely to be significant.

Project design and mitigation measures to minimize the loss of habitat, to avoid clearing during bat maternity seasons, and to manage light are anticipated to be effective. A Wildlife Management Plan will also be implemented during the construction phase.

E5.14 AMPHIBIANS (VC)

Three provincially and federally listed representative amphibian species were selected as one VC because they have potential to occur in and around the LAA (described below). The species, each of which is provincially Blue-listed and federally listed as Special Concern, are coastal tailed frog, western toad, and northern red-legged frog.

The LAA is a 282 ha area consisting of the Project area plus a 500 m buffer around the Project area. The RAA is a 7,519 ha area encompassing Mill Creek, Woodfibre Creek, and Foulger Creek watersheds.

Desktop and field surveys were conducted to characterize the condition of amphibian habitat within the LAA and to assess the potential presence of these species. General reconnaissance surveys were undertaken in October 2013. Amphibian breeding surveys were undertaken during spring 2013 and 2014 to document potential breeding habitat and search for evidence of amphibian breeding.

No natural occurring aquatic habitat that could provide breeding habitat for western toad or northern red-legged frog was observed in the LAA. The topography of the LAA is steeply sloped and does not provide suitable benches or depressions where water could naturally pool and form wetlands or ponds. However, pools may form in depressions and ditches within anthropogenically disturbed areas, and may be used for breeding. The headwaters of Mill Creek and Woodfibre Creek are expected to provide suitable habitat for coastal tailed frog. Neither species was observed during field surveys.

The Project has potential to result in loss or alteration of habitat, creation of barriers to movement, reduction in riparian habitat function, and changes in mortality, all of which may affect the abundance and persistence of these species within the LAA.

The lack of availability of high quality breeding habitat and mitigation measures proposed to reduce loss of potential amphibian habitat are likely to be effective in avoiding effects to amphibians. The potential for a residual adverse effect is limited to the Project area, reversible and low in magnitude and is not likely to be greater than predicted.

The Project has been designed to re-use existing roadways that are not situated in suitable habitats. The magnitude of potential change in amphibian mortality due to direct mortality during site clearing, and indirect mortality due to mortality from vehicles and equipment is predicted to be low and limited to the immediate Project area during construction and operation. The residual effect is not likely to be greater than predicted.

Project design and other measures to mitigate effects on the amphibians VC include establishment and revegetation of the Green Zone adjacent to Mill Creek, minimization of linear feature development where feasible, implementation of an Erosion Prevention and Sediment Control Plan as part of the Construction Environmental Management Plan to reduce sedimentation of amphibian habitat, stormwater management, and minimizing clearing of vegetation, particularly of sensitive ecosystems. These measures will be prepared and implemented in accordance with applicable provincial and federal guidelines and regulations. A Wildlife Management Plan will also be implemented during the construction phase.

E5.15 FRESHWATER FISH AND FISH HABITAT (VC)

Given that both Mill Creek and Woodfibre Creek are known to be fish-bearing, freshwater fish and fish habitat were selected as a VC. Anadromous fish fill an important niche in freshwater ecosystems by providing a food source for predatory freshwater and terrestrial animals, and are an important distributer of marine nutrients to freshwater and terrestrial environments. Resident fish species fill an important niche in freshwater ecosystems by providing nutrient linkages between vegetation, benthic communities, and wildlife within the aquatic and terrestrial habitats. The LAA includes the freshwater habitat of Mill Creek and Woodfibre Creek within the Project area plus a 30-m buffer on either side of each watercourse, totaling approximately 2.5 ha. The RAA includes the LAA plus Mill Creek and Woodfibre Creek watersheds and Howe Sound, totaling approximately 145 km^2.

In addition to desktop studies, baseline surveys were completed at five accessible sites within Mill Creek and Woodfibre Creek between August 2013 and July 2014. Two unnamed watercourses that are partially within the Project area were not surveyed since they are ephemeral and unlikely to support fish at any time of year.

Both Mill Creek and Woodfibre Creek exhibit characteristics and habitats typical of the wide, fast-flowing creeks with cobble and boulder substrates that are common in the region. Both pass through coniferous forest that exhibits evidence of past logging activities. Both creeks are considered to provide generally poor habitat for salmon and trout, although they do provide some habitat for these and a variety of other fish species of value to commercial, recreational, and Aboriginal fisheries, and fish presence is comparable to other regional watercourses within the region.

Fish species observed in Mill Creek include coho salmon, pink salmon, rainbow trout, sculpin species, and gunnel fish. Fish species observed in Woodfibre Creek include pink salmon, rainbow trout, chinook salmon, and sculpin. Cutthroat trout are the only provincially Blue-listed freshwater fish species of concern present in the LAA, and are not currently federally listed. The benthic invertebrate community of lower Woodfibre Creek is considered moderately rich in taxonomic diversity, while Mill Creek exhibits low to moderate diversity of taxa. Benthic invertebrates represent important aquatic food sources and are the major prey for several species of fish.

Potential residual adverse effects of the Project include changes to fish mortality, loss of fish habitat, and reduction in food and nutrient content. The residual Project-related effect to freshwater fish mortality during all construction phases is likely to be negligible. During construction, the residual effect associated with fish mortality is likely to be of negligible magnitude, confined to the Project area, short-term, reversible, and occur in a low resilience context. During operation, the residual effect associated with fish mortality is likely to be of negligible magnitude, confined to the Project area, long-term, reversible and occur in a low resilience context. During decommissioning, the residual effect associated with fish mortality is likely to be of negligible magnitude, confined to the Project area, short-term, reversible and occur in a low resilience context.

No critical fish habitats were identified within the LAA; therefore, no critical fish habitats are likely to be adversely affected by the Project. The Project-related residual effects to freshwater fish habitat are therefore likely to be negligible, and no measurable effects on the function of fish habitat are anticipated with mitigation measures.

During construction, the residual effect associated with loss of freshwater fish habitat is likely to be of negligible magnitude, confined to the Project area, short-term, reversible, and occur in a low resilience context. During operation, the residual effect associated with loss of freshwater fish habitat is likely to be of negligible magnitude, confined to the Project area, long-term, reversible, and occur in a low resilience context. During decommissioning, the residual effect associated with loss of freshwater fish habitat is likely to be of negligible magnitude, confined to the Project area, short-term, reversible and occur in a low resilience context.

Residual effects of the Project on food and nutrient content are likely to be limited to Mill Creek, and would be reversible. The duration of residual effects resulting from construction-phase activities is likely to be short, whereas the duration of effects to fish habitat resulting from operation-phase activities is expected to be long. Residual effects during both phases are likely to occur continuously. During all phases, the Project-related activities are likely to occur in an ecological context of moderate resilience. By adhering to the proposed mitigation measures, Project-related reductions in food and nutrient content are likely to be negligible.

Based on the Project activities and the interactions between Project-related activities and freshwater fish and fish habitat identified, it is likely that the residual effects of potential changes in fish mortality, habitat loss, and reduced food and nutrient content will be negligible.

Woodfibre LNG Limited will develop a Water Management Plan for Mill Creek, which will afford protection of fish and fish habitat by prescribing the minimum instream flow releases. A Fisheries and Aquatic Life Monitoring Program will be developed prior to the start of construction.

E5.16 MARINE BENTHIC HABITAT (VC)

Marine benthic habitat encompasses both marine sediments and benthic communities living near or within the seafloor in the intertidal and subtidal zones of the marine environment. Marine sediments provide the main substrate for benthic epifaunal (living above the seafloor) and infaunal (living in the seafloor) biological communities. Marine benthic habitat was therefore assessed through the two subcomponents of marine sediment and marine benthic communities.

Potential effects from the Project on marine benthic habitat may include loss of habitat from shoreline modifications and installation of Project infrastructure (Project footprint), shading effect from the Project infrastructure, changes in water and sediment quality, and introduction of invasive species from ships' ballast water and hulls.

The LAA for the studies is the marine portion of the Project area; the RAA is Howe Sound. Both desktop reviews and field studies have been undertaken to collect information on marine benthic habitat baseline conditions in the LAA and reference area. Field studies included collection of field samples for analysis of sediment quality and benthic invertebrates, and collection of intertidal and subtidal survey data.

Marine benthic communities identified in the LAA include a community within the subtidal zone that is generally associated with soft substrates (e.g., silt and sand), as well as a community within the intertidal zone that is generally associated with hard substrates (e.g., boulder and riprap). In general, the subtidal zone contained a low abundance and diversity of macroalgae and a greater abundance and diversity of benthic invertebrates. The intertidal zone in general contained a low diversity of benthic invertebrates and a greater amount of macroalgae compared to the subtidal zone.

The residual effect of the Project on sediment quality from seabed disturbance is likely to be short-term, partially reversible and localized in extent. The residual effect is therefore likely to be negligible. The residual effect of the Project on sediment quality from removal of existing pilings is likely to be partially reversible and localized in extent and is therefore likely to be negligible. The residual effect of the Project on sediment quality from ship propeller scour is likely to be partially reversible and localized in extent and is therefore likely to be negligible.

After the application of mitigation and Project design measures the significance of the potential adverse residual effects on marine benthic habitat quality are likely to be negligible. The effects are anticipated to be localized and partially reversible. The potential effect on marine benthic habitat from construction and demolition of marine infrastructure and shading of marine vegetation is likely to be fully reversible and localized. Therefore, the residual effect is likely to be negligible. The effect of potential mortality from impingement in seawater intake is likely to be reversible, low magnitude, and is likely to be negligible. The effect of potential invasive species introduction is likely to be irreversible but unlikely, and is anticipated to be negligible.

Based on the Project activities and the interactions between Project-related activities and marine sediments and marine benthic communities identified, it is concluded that the Project is not likely to interact cumulatively with other reasonably foreseeable projects and activities.

E5.17 MARINE BIRDS (VC)

Marine birds are bird species that depend on marine and coastal habitat for one or more of their life requisites. Coastal ecosystems provide important breeding, non-breeding, migrating, and moulting grounds and habitat for marine birds. Shoreline and upper subtidal areas provide rearing and spawning habitat for marine fish, which are a source of food for marine birds. Shoreline features provide important breeding, nesting, and rearing habitat for marine birds. The Project may affect marine birds through changes to water quality, habitat and food availability, light and noise conditions, and collisions with onshore infrastructure and marine vessels.

The LAA for marine birds is a 70 ha area comprising the marine portion of the Project area. The RAA is all of Howe Sound (approximately 320 km^2).

Desktop and incidental wildlife observations were undertaken in 2013 to describe existing conditions for marine birds. Fifteen designated marine bird species at risk have the potential to occur, or are known to occur in the LAA and RAA. Marbled murrelet (provincially Blue-listed; federally Threatened under *SARA*) and great blue heron, *fannini* subspecies (provincially Blue-listed, and federally Special Concern under *SARA*) have been confirmed in the RAA and LAA respectively.

The area predicted to be affected by the Project is small relative to the area of foraging habitat available in the LAA. Due to the low magnitude, localized extent and reversibility of anticipated Project impacts and effective mitigation measures, the residual effect on habitat is not likely to be greater than predicted.

Changes in mortality due to the Project will be effectively minimized by proposed mitigation measures. The effect of the Project on mortality to marine birds is likely to be low magnitude, and localized to the Project area and marine LNG carrier route. The residual effect on mortality is not likely to be greater than predicted.

The net cumulative effects assessment considers the combined effects of the Project with other reasonably foreseeable future projects on marine birds. The net cumulative effects are unlikely to exceed ecological thresholds, as marine bird species are determined to have moderate resilience to imposed stressors. The cumulative effects of the Project are unlikely to exceed ecological thresholds and compromise the resilience of the regional populations of marine bird species; therefore, they are not likely to be significant.

E5.18 FORAGE FISH AND OTHER FISH (VC)

Subcomponents of this VC include forage fish (herring, surf smelt, Pacific sand lance, and eulachon), anadromous salmonids (coho salmon, chinook salmon, chum salmon, pink salmon, steelhead, sea-run coastal cutthroat trout, and sea-run Dolly Varden), and other important pelagic and groundfish in the LAA (sculpin, eelpout, sole, gunnel, perch) and RAA (e.g., rockfish).

The LAA for studies of forage fish and other fish included the marine portion of the Project area; the RAA was Howe Sound. Desktop reviews and field studies were undertaken to describe existing conditions of Forage fish and other fish.

Two listed forage fish and other fish species have the potential to be affected by the Project. Eulachon (Central Pacific Coast and Fraser River populations) is provincially Blue-listed and federally designated as Endangered, is known to spawn in the RAA, and has been observed in the LAA. Coastal cutthroat trout is provincially Blue-listed and has been recorded in the LAA and RAA.

The potential change in habitat quality and potential loss of habitat from Project activities are restricted to the Project area, are reversible and therefore considered negligible. The effect of Project generated underwater noise is considered short-term and restricted to the Project area, and with implementation of mitigation measures, is not likely to exceed levels that are expected to cause injury or mortality to fish, and is therefore likely to be negligible. The residual effect of potential mortality from the impingement of fish is likely to be negligible as the number of fish impinged over the life of the Project is not likely to affect the relative abundance of forage fish and other fish populations.

Based on the Project activities and the interactions between Project-related activities and forage fish and other fish identified, it is concluded that the Project-related residual effects are likely to be negligible and therefore are not likely to interact cumulatively with other reasonably foreseeable projects and activities, and no further assessment of potential cumulative effects is undertaken.

Environment monitoring plans will be developed and implemented to support effective mitigation measures. Monitoring will consist of operation or compliance monitoring and effectiveness monitoring.

E5.19 MARINE MAMMALS (VC)

Marine mammals include whales, dolphins, porpoises, seals, and sea lions. There is potential for presence of listed marine mammal species in the Project area (e.g., humpback whales, killer whales, harbour porpoise, Steller sea lions). There is potential for Project construction and operation activities to result in injury or behavioural disturbance of marine mammals.

The LAA for marine mammals includes the marine portion of the Project area and the marine corridor plus a 1 km area on either side of the proposed LNG carrier route, in Howe Sound, and on either side of the worker ferry route and water taxi route between the Project site and Darrell Bay / Squamish Harbour. The LAA was established with consideration to the nature and characteristics of marine mammals, their potential exposure to various influences of underwater noise and vessel strikes, pathways of effects, and the maximum extent of potential adverse effects. The RAA includes the LAA and most of Howe Sound.

Potential Project-related activities considered to have potential to result in adverse effects pertained to underwater noise associated with pile driving during the construction phase, and marine vessel operations during all Project phases. Baseline studies therefore focused on desktop studies of existing vessel traffic in the RAA, opportunistic sightings of marine mammals, and measurements of ambient underwater sound.

Ambient underwater noise levels were measured from a recording station near the Project area, for comparison of anticipated underwater noise levels from proposed Project activities (e.g., impact pile driving, and vessel operations) with established acoustic injury and behavioural threshold criteria for marine mammals. Broadband ambient noise levels ranged from 112.0 decibels to 126.8 decibels re 1 micropascals, with a median of 116 decibels (dB) re 1 micropascals.

Marine mammal species vary greatly in their seasonal occurrence and habitat use within the LAA and RAA. As of 2013, the most common marine mammal species reported in the upper reaches of Howe Sound near the Project area are harbour seals, Pacific white-sided dolphins, and killer whales. Harbour seals are year-round residents in Howe Sound, while sea lions (California and Steller) and porpoises (harbour and Dall's) are considered occasional visitors throughout the year. Since 2009, however, sightings of Pacific white-sided dolphins, killer whales, grey whales, and humpback whales have notably increased. This shift has been linked with improved water quality in the area, and an associated increase in prey fish (mainly herring and salmonids). No established pinniped haul-out sites or rookeries have been identified near the Project area. However, harbour seals and Steller sea lions were observed resting on logs near Squamish Yacht Club, approximately 6 km from the Project area. Several other harbour seal haul-out sites were identified at Pam Rocks near Anvil Island and at a small islet west of Pasley Island.

With implementation of mitigation measures, the Project generated underwater noise is not likely to exceed levels that are expected to cause injury or mortality to marine mammals. The potential residual effect is likely to be short term, intermittent and site-specific, and the level of effect is therefore likely to be negligible.

It is likely that marine mammals will show changes in behaviour as a result of underwater noise generated by Project activities due to exceedances of the National Marine Fisheries Service behavioural thresholds. Based on available literature, marine mammals will either habituate or avoid areas experiencing the temporary noise. The anticipated effects are likely to be reversible and localized and are therefore not likely to be significant.

Behavioural disturbance from cumulative project vessel noise is considered likely to occur as a result of Project residual effects in combination with the incremental effects of the other reasonable and foreseeable projects. Changes in behaviour as a result of increases in underwater noise from Project activities are likely to be temporary in nature and fully reversible, with no effects at the population level anticipated. Therefore, the cumulative adverse effect is not likely to be significant.

Mitigation measures include implementation of an Underwater Noise Management Plan as part of a Marine Works Management Plan, and a Marine Mammal Management Plan to mitigate potential mortality and behavioural changes to marine mammals (as well as birds and fish). The Underwater Noise Management Plan will reference Fisheries and Oceans Canada *Best Management pPractices for Pile Driving and Related Operations*. Additional management plans are provided in **Section E17 Summary of Proposed Environmental and Operation Management Plans and Follow-up Programs**. The Proponent will also undertake vessel passage planning concerning the interaction of future traffic in studies as part of the Technical Review Process under TERMPOL Code of Recommended Standards for the safety and Prevention of Pollution for Marine Transportation Systems and Related Assessment Procedures.

E6. ASSESSMENT OF POTENTIAL ECONOMIC EFFECTS

E6.1 ECONOMIC BACKGROUND

Communities in the region of the Project include the District of Squamish (Squamish), the Resort Municipality of Whistler, Squamish-Lillooet Regional District (SLRD) Electoral Area D, and Squamish Nation communities. Given its size and diversity, Metro Vancouver and its economy are also linked to these communities and to the Project.

Historically, the economy of the region has primarily been industry and resource-based, with emphasis on mineral extraction and forestry. With the closure of the Woodfibre mill and downturn of traditional resource and industry businesses, the region's economy has shifted from its traditional base to capitalize on its growing reputation as a tourism and recreation destination. The 2010 Vancouver Olympic Games helped reduce the impact to Squamish associated with the downturn of traditional resource and industry businesses, and played an important role in stimulating the region's construction and tourism-based economy through public and private-sector investments. Accordingly, construction and tourism-based businesses now play increasingly predominant economic roles in the region.

Potential economic effects of the Project were assessed through consideration of the valued components of labour market and sustainable economy. Selection of these VCs reflects environmental assessment issues and guidelines, potential Aboriginal concerns, issues identified by EAO, CEA Agency, Aboriginal groups, and stakeholders, as well as professional judgment about key sensitive resources, and social and cultural values.

Existing conditions for both VCs were determined through desktop studies and phone interviews with representatives of provincial and municipal departments responsible for labour, economic development and marine use; local and regional economic development corporations; chambers of commerce; and tourism associations and tourism operators.

E6.2 LABOUR MARKET (VC)

The potential labour supply for the Project consists of workers with the required skills and occupational training needed to undertake Project work. The labour supply may be drawn from residents living near each respective Project component, as well as from throughout BC, Canada, and internationally. However, through procurement policy and training programs WLNG intends to access the local labour market as much as possible. Labour market demand could have an effect on other VCs, such as infrastructure and community services. Labour market demand corresponds to the number of positions of the requisite skills at the required time to construct and operate the Project, plus demand by supplier (i.e., indirect) and consumer (i.e., induced) industries. Labour market was selected as a VC because the Project is expected to generate direct, indirect, and induced employment opportunities during all phases.

The LAA for the studies undertaken to assess the labour market included Squamish, Whistler, SLRD Electoral Area D, Squamish First Nation communities, and Metro Vancouver. The RAA was all of BC.

No potential Project-related adverse effects or residual effects to the labour market VC are likely. Based on the Project activities the interactions between Project-related activities and labour market components identified are likely to be beneficial. As such, no adverse effects are likely and the assessment is not carried further into mitigation or the assessment of residual and cumulative effects.

As described in **Section E2.8 Project Benefits**, WLNG has committed to undertaking a local hiring strategy and a local training strategy to enhance the likelihood that LAA residents are well-positioned to seek these opportunities based on their individual capacities to supply the needed skills on a timely basis. In addition, WLNG will monitor the progress of the local hiring strategy and the local training strategy and issue an annual report on hiring and training results for the Project construction and operation phases. With implementation of these benefit enhancement measures, the Project is expected to offer fair and equitable access to Project employment opportunities for interested residents of the LAA communities.

E6.3 SUSTAINABLE ECONOMY (VC)

The sustainable economy VC is assessed through consideration of three subcomponents: regional economic development, commercial marine use, and local government finances. The rationale for selecting each subcomponent is as follows:

- **Regional Economic Development** - The Project will offer new contracting opportunities and potentially assist in diversifying and expanding the local business base, which will be of interest to local business providers. Project construction and operation activities may require substantial expenditures on goods and services, and may result in local or regional supply shortages and increased costs. Project operation phase activities may or may not be compatible with local economic plans or strategies. The LAA for the assessment of regional economic development included Squamish, Whistler, SLRD Electoral Area D, Squamish First Nation communities, and Metro Vancouver. The RAA was all of BC.
- **Commercial Marine Use** - The Project may displace marine-based economic activities and affect certain environmental conditions (noise and visual resources) and therefore may affect commercial marine users, including tourism operations. Tourism development is a priority for the District of Squamish, and potential affects to tourism have been raised by stakeholders as a concern. The LAA for the assessment of commercial marine use comprised the marine portion of the Project area, a 2.0 km area extending from the Project boundary, and the worker ferry and water taxi direct routes with 0.5 km assessment area in the marine environment on either side. The RAA was Howe Sound.
- **Local Government Finances** - For municipal and regional governments, the Project may have fiscal benefits or involve direct fiscal outlays due to direct servicing requirements of the Project and/or incremental service requirements due to permanent in-migration associated with Project labour requirements. These effects would be of interest to local stakeholders, as well as municipal and regional governments. The LAA for the assessment of local government finances comprised Squamish and the SLRD. The RAA was the same as the LAA.

The residual effect on marine-based tourism displacement is not likely to be significant due to effective implementation of mitigation measures, resilience of the receptor, and the characterization of the effect as moderate magnitude, long-term, frequent, reversible, and restricted to areas in the vicinity of the Project.

To minimize displacement of marine tourism activities caused by overlap with the Project area and Project related vessel traffic, WLNG will develop a coordinated Squamish Harbour Vessel Traffic Plan, working with tourism operators, recreation user groups, District of Squamish, and Matthews Southwest and Bethel Lands Corporation to minimize any disruption by the Project associated with ferry and water taxi traffic.

The cumulative effect on marine-based tourism displacement is predicted to be not significant because there is a high likelihood that there will be some interaction. However, due to effective implementation of mitigation measures, resilience of the receptor, and the characterization of the effect as moderate magnitude, long-term, frequent, reversible, and restricted to areas in the vicinity of the Project.

E7. ASSESSMENT OF POTENTIAL SOCIAL EFFECTS

E7.1 BACKGROUND

Assessment of potential social effects of the Project was undertaken through consideration of infrastructure and community services, marine transport, land and resource use, visual quality, and current use of lands and resources for traditional purposes.

E7.2 INFRASTRUCTURE AND COMMUNITY SERVICES (VC)

Potential effects of the Project on infrastructure and community services include the demand for services (e.g., health, emergency) and physical infrastructure (e.g., housing and temporary accommodation, water, waste) due to the Project, and associated availability and affordability of these services and amenities. Demand may originate from Project requirements (e.g., for on-site emergency and waste services), or from Project workforce requirements and associated in-migration. The infrastructure and community services VC was therefore assessed through consideration of three subcomponents: housing and accommodation, community infrastructure and services, and emergency services.

E7.2.1 Housing and Accommodation

Demand for housing may increase due to Project-related workforce requirements and associated in-migration for employment opportunities, which may result in availability and affordability issues in the short- and medium-term.

For housing and accommodation, it is assumed that, where possible, the majority of any in-migrating workers in either the construction or operation Project phases will live within the local area defined as Squamish, Whistler, SLRD Electoral Area D, and Metro Vancouver. This area was considered the LAA and the geographical area where Project interactions with housing and accommodation could occur with respect to change in demand for housing and temporary accommodation. The RAA is the same as the LAA for this subcomponent.

Based on Project labour requirements, mitigation measures and the resilience of the housing and accommodation subcomponent the residual effect on housing availability and affordability is expected to be negligible. Project-related effects are likely to be limited to the RAA, occur in the moderate-term and be reversible.

Based on the Project activities and the interactions between Project-related activities and infrastructure and community services identified, it is likely that the Project will result in negligible adverse effects to the housing and accommodation subcomponent.

E7.2.2 Community Infrastructure and Services

This subcomponent of the Infrastructure and Community Services VC includes assessment of healthcare, education, recreation, transportation, potable water, wastewater, and solid waste infrastructure and services.

The LAA is the administrative jurisdiction in which direct provision of services to the Project would be financially feasible, where potential population effects would occur, and where any associated changes in demand for infrastructure and services would be experienced. The LAA includes Squamish, Whistler, and SLRD Electoral Area D, and was established to encompass the area in which the Project is expected to interact with and potentially have direct or indirect effects on community infrastructure and services. The RAA is the same as the LAA for this subcomponent

Demand for community infrastructure and services may increase due to direct Project requirements or from Project workforce requirements and associated in-migration. The increase in demand could result in capacity issues. Community infrastructure and services include waste disposal, recycling, non-emergency health care, education, and transportation.

Based on Project labour and material supply requirements, traffic management, mitigation measures and resilience of the community infrastructure and services subcomponent, the residual effects on traffic related services are expected to be negligible. Project-related adverse effects are likely to be limited to the RAA, occur in the moderate-term and be reversible.

Based on the Project activities and the interactions between Project-related activities and infrastructure and community services identified, it is likely that the Project will result in negligible effects to the community infrastructure and services subcomponent.

E7.2.3 Emergency Services

These comprise emergency services in the vicinity of the Project and that have the Project site within their service areas, including policing, ambulance, fire, marine rescue, and emergency management and response. These services vary in geography serviced according to their mandates.

The LAA for the various emergency services is based on the Project areas that may experience emergencies, and this area encompasses the land and marine portions of the Project site (including the planned Control Zone in the Project area) and the Project's marine corridors. Effects on emergency services providers that service these areas are considered in the assessment. The RAA is the same as the LAA for this subcomponent.

The Project will provide all emergency response services on-site during all Project phases. Through mitigation measures no changes to demands on local or regional emergency services are likely. Project-related adverse effects are likely to be limited to the RAA, occur in the moderate to long-term and be reversible. Therefore the potential effect to the emergency services subcomponent is likely to be negligible.

E7.3 MARINE TRANSPORT (VC)

Marine transport in this assessment refers to the transport of cargo or passengers, marine fisheries, and recreational and tourism activities within the navigable waters of Howe Sound. Potential effects of Project-related infrastructure and vessel traffic during the construction, operation, and decommissioning phases on commercial and recreational marine users within Howe Sound were assessed.

Desktop studies and informational interviews were conducted to inform the baseline study, since secondary-source data on recreational boating use patterns were not available. The LAA for studies to describe marine transport existing conditions included the marine portion of the Project area, a 500-m-wide area extending from the shoreline, the shipping route with a 1-km assessment area in the marine environment on either side, and the worker ferry direct route and water taxi direct route with 0.5-km assessment area in the marine environment on either side. The LAA is inclusive of all current and proposed marine infrastructure, Control Zone, and the preliminary vessel turning circles. The RAA was the same as the LAA.

The waterways in Howe Sound are currently shared by a wide range of commercial, government, and recreational vessels. Commercial and government vessels identified in Howe Sound include passenger ferries, tugs and barges, deep sea cargo ships, Canadian navy and other government ships, fishing boats, and water taxis. Recreational vessels identified include: yachts, pleasure boats, and self-propelled craft. Associated marine recreational activities identified include fishing, diving, waterskiing and wakeboarding, windsports (kiteboarding and windsurfing), kayaking, and paddle-boarding.

Large vessel traffic within the LAA relates to BC Ferries movements along scheduled routes, deep sea shipping traffic to Squamish Terminals and Port Mellon, and tug and barge traffic primarily related to forestry operations.

Interference with navigation from Project-related infrastructure can be minimized through the proposed mitigation measures. The potential effect is likely to be of negligible magnitude, restricted to the marine portion of the Project area and reversible. In addition, the site has previously operated as a deep-sea port up until 2006. Based on these factors, the residual effects related to interference with navigation from Project-related infrastructure following mitigation are likely to be negligible.

Vessel traffic generated by the Project during construction and operation phases is relatively low when compared to existing marine traffic, and the width of the channel allows recreational and commercial users to access routes and destinations. Therefore residual effects to commercial transport, fisheries, recreational activities, and tourism are not likely to be significant.

Based on the Project activities and the interactions between Project-related activities and marine transport identified, it is likely that the Project will result in negligible effects of interference with navigation from Project-related infrastructure.

Residual cumulative effects from Project-related shipping are likely to interact with the BURNCO Aggregate project's barge traffic along a small section of the Project's proposed shipping route. Interactions between shipping activities from both projects are only likely to occur intermittently, when both vessels are present at the same time. Following implementation of the mitigation measures proposed cumulative residual effects are likely to be negligible.

Project LNG carriers will transit along an established shipping route from the mouth of Howe Sound approximately 40 km north to the Project site. Project LNG carriers are expected to follow an established shipping route in the LAA.

Navigational and safety requirements of LNG carriers berthing at the Project and transiting the shipping route in Howe Sound will be assessed in studies agreed by Transport Canada as part of the TERMPOL. Pursuant to the completion of this review, recommendations of the TERMPOL Review Committee will be adopted in the design and operation practices of the Project.

E7.4 LAND AND RESOURCE USE (VC)

The land and resource use VC encompasses all land and marine based activities, both commercial and recreational, that may be affected by Project construction and operation activities. Consideration was given to land use designations, tenured and licensed activities, and areas used by the public for recreational activities. Land and resource use was assessed through the subcomponents of BC government and local government land use designations, parks and protected areas, trapping and guide outfitting, linear infrastructure, energy and mineral development, forestry, recreational hunting and angling, and other outdoor recreation activities.

The residual effect to guide outfitting access is likely to be negligible due to the negligible magnitude, uncommon interaction, restricted geographical extent and reversibility of the potential effect. Further an agreement between the proponent and Coastal Inlet Adventures will allow seasonal access subject to advance notification. With adherence to the proposed mitigation the residual effect to guide outfitting access is likely to be negligible.

The residual effect to outdoor recreation access is considered not significant due to the relatively infrequent traversing of LNG carriers through the LAA and the implementation of a coordinated Squamish Harbour Vessel Traffic Plan.

Based on the Project activities and the interactions between Project-related activities and land and resource uses identified, it is likely that the Project will result in negligible effects to the guide outfitting subcomponent.

The Project-related effect is likely to be adverse and of moderate magnitude due to the area of land and associated timber volumes that would become inaccessible. Geographic extent is likely to be regional and duration is long-term. Frequency is rated frequent due to intermittent forestry activities and silviculture obligations, and the effect is likely to be reversible. This will be a time-limited effect on timber harvesting in general due to the Project operation phase being defined as a minimum of 25 years, meaning that access via the Project area may become available in the Project's decommissioning phase. Context is rated as resilient because current forestry users have other chart areas in the Soo Timber Supply Area that they can use to harvest their allowed harvest volumes under their tenures, and because the BC Ministry of Forests, Lands and Natural Resource Operations has the authority to adjust chart areas in the Soo Timber Supply Area to incorporate this access effect into the overall planning for Soo Timber Supply Area timber harvesting (if the ministry deems it necessary to do so). As a result, this effect is not likely to be significant. Likelihood and confidence are rated as high because there is a high degree of certainty that forestry activity would occur using the forestry roads were it not for the Project's access termination.

The potential cumulative effect to access to outdoor recreation is likely to be a continuous moderate change in local access over the moderate term, reversible upon closure of the Project. The cumulative effect to outdoor recreation access is not likely to be significant due to the relatively infrequent traversing of LNG carriers through the LAA, the implementation of a coordinated Squamish Harbour Vessel Traffic Plan and work with other recreational users of the Howe Sound.

The Squamish Harbour Vessel Traffic Plan will act as a monitoring and follow-up program since it will allow concerns by stakeholders, such as recreation user groups and District of Squamish, to be raised and addressed by WLNG.

E7.5 VISUAL QUALITY (VC)

Visual quality refers to the scenic and visual aesthetic aspects of the landscape. Scenic components of the environment have a value to individuals, society, and to the economy of the region, particularly since scenic landscapes provide the context for tourism and recreation activities such as the Sea-to-Sky Highway 99 corridor between Vancouver and Whistler.

The Project could result in potential adverse effects on visual resources in the Project area and surrounding landscape because construction and operation of Project components are expected to introduce changes that may alter the existing views from receptor sites in marine traffic routes, the Sea-to-Sky Highway 99 corridor, and related recreational, tourism, and culturally significant locations.

The visual aesthetics of this area are valued by local residents and recreational users. Concerns primarily relate to maintaining the quality of visual resources in the Project area as it is visible from the Sea-to-Sky Highway 99 corridor and recreational sites near the community of Squamish, BC. In addition, cultural, recreational, and tourism values are closely related to visual quality and the enjoyment of visual resources. Given the potential for adverse Project-related effects on the visual resources at the Project site and surrounding landscape, along with the region's aesthetic values of the public, visual quality was selected as a VC.

The LAA for visual quality includes key viewing locations and visually sensitive areas within 8 km of the Project area, to account for foreground and middle-ground viewing distances. The RAA includes viewing opportunities beyond a minimum viewing distance of 8 km and a maximum viewing extent of 15 km from the Project area to account for background viewing distances.

Visual quality was assessed by considering visual effects from key viewing receptor sites. In the area surrounding the Project, these sites include Porteau Cove, the unobstructed view from Highway 99 northbound at Minaty Bay, Furry Creek, the parking lot at Stawamus Chief, from the water at Watts Point in Howe Sound, Stawamus Chief at First Peak, and the Sea-to-Sky gondola. At least 75% of the Project area is visible from these receptor sites, with the exception of Stawamus Chief Parking Lot from which 64% of the Project area is visible.

There is a high likelihood that residual effects to visual quality will occur within the LAA during the construction and operation phases of the Project. The average visual change of 1% baseline existing visual condition rating with visual character remaining similar to the existing condition the residual effect on visual quality is not likely to be significant. The adverse effect to visual quality during decommissioning is expected to be limited to the LAA, fully reversible and low in magnitude, and is therefore not likely to be significant.

Assessment of cumulative residual effects during construction and operation indicates that additional Project components and activities are likely to affect the visual quality of the RAA and produce a negligible adverse residual effect by introducing visible anthropogenic features to the existing visual condition of the landscape. The additional cumulative mitigation measures identified are designed to avoid and minimize adverse effects. The expected cumulative effects from additional developments are likely to be low magnitude and reversible and therefore negligible.

E7.6 CURRENT USE OF LANDS AND RESOURCES FOR TRADITIONAL PURPOSES (VC)

The EAO section 11 Order, dated March 21, 2014, sets out procedural requirements for the Proponent regarding the assessment of effects from the Project on Aboriginal Interests. The order defines Aboriginal groups as those covered in Schedules B, C, and D in the section 11 Order. Schedule B identifies the Squamish Nation with regard to all Project components and Schedule C identifies the Tsleil-Waututh Nation in relation to offsite Project effects. Schedule D identifies the Aboriginal groups for whom the EAO identified for notification and will lead the consultation. A review of potential effects to current use for Aboriginal groups identified in Schedule D will be provided as a separate document or an addendum to the Application during the Application Review phase.

The subsequent EAO section 13 Order, dated November 6, 2014, excludes the Squamish Nation from the requirements of the section 11 Order with respect to paragraphs 13.3.2 (identifying Aboriginal Interests in the Application and mitigating potential adverse effects), 15.1 (Providing Aboriginal consultation reports to the EAO Project Lead), and 15.2 (submitting Aboriginal consultation reports to Aboriginal groups identified in Schedule B and C). Consequently, the Application addresses the potential effects that are likely to result from the Project to current use for the Tsleil-Waututh Nation with regard to offsite Project components. The offsite components relate to the LAAs that are outside of the Project area.

In accordance with the EAO section 11 and 13 Orders, the assessment of potential adverse effects to current use focuses on the Tsleil-Waututh Nation. It is anticipated that current use information, in the form of a Tsleil-Waututh Nation Knowledge Study, will be provided by the Tsleil-Waututh Nation during the Application Review phase of the EA. The assessment therefore relied on baseline information that is publicly available.

Based on the general and limited information currently available regarding Tsleil-Waututh Nation traditional use and on the Project activities and the interactions between Project-related activities and current uses identified, it is likely that the Project will result in negligible adverse effects to the current use.

E8. ASSESSMENT OF POTENTIAL HERITAGE EFFECTS

Heritage Resources are the physical evidence of ancient flora and fauna, or cultural activities including but not limited to remains of ancient campsites, subsistence procurement sites, historical structures, abandoned or sunken shipwrecks, fossils, and human burial locations. The heritage resources VC is assessed through consideration of three subcomponents: palaeontological resources, archaeological resources, and historical resources. The heritage resources subcomponents were selected using EAO criteria as follows:

- **palaeontological resources**: are known to occur in the geographic area of the Project, may be affected adversely by Project physical disturbance, have values attributed by community heritage organizations and the public, and are subject to various federal and provincial statutes and supporting regulations and guidelines
- **archaeological resources**: are known to occur in the geographic area of the Project, may be affected adversely by Project physical disturbance, have values attributed by Aboriginal groups, community heritage organizations, and the public, are subject to various federal and provincial regulations (primarily the *HCA* and *CEAA 2012*) and guidelines
- **historical resources:** are known to occur in the geographic area of the Project, may be affected adversely by Project physical disturbance, have values attributed by community heritage organizations and the public, are subject to various federal (i.e., *CEAA 2012*) and provincial regulations and guidelines

The LAA for assessment of heritage resources is the 141.12 ha Project area. The RAA for palaeontology is the land surrounding and adjacent to Howe Sound, including the terrestrial areas captured within a 7 km buffer around the shoreline of Howe Sound, to provide regional palaeontological context for the assessment. The RAA for archaeology is a 10 km radius area around the LAA to provide the contextual setting for the archaeology of the region. The RAA for historical resources is the same as the LAA.

Residual adverse effects were evaluated related to heritage resource integrity and heritage resource access. Because no previously recorded heritage resources were reported in the immediate area of the Project, and due to a delay in receipt of a permit from the Squamish Nation for a Preliminary Field Reconnaissance, the assessment is based on a desktop Heritage Overview Assessment to determine the potential for existence of various heritage resources in the area. The assessment used an archaeological potential model combined with a palaeontological sensitivity model and ground-truthing to provide a higher level of confidence in the results than would be the case with either method on its own.

There is a risk with carrying out a desk-top based assessment that has not been refined by field study, given that detectable heritage resources may be present and potentially affected by Project-related activities. Consequently, the Proponent commits to further field study of the LAA prior to clearing the site or commencing Project construction activities. The results of further field study may refine the results of the effects assessment for heritage resources.

E8.1 PALAEONTOLOGICAL RESOURCES

There are currently no known palaeontological resources within the LAA; additionally, the likelihood for a significant residual adverse effect occurring is low because: (a) WLNG is committed to conducting pre-disturbance field studies to refine the palaeontological sensitivity assessment; (b) the Heritage Resource Chance Find Management Procedures will be in place during Project activities and designed to deal with paleontological sensitive areas identified during the various Project phases; and (c) as a result of the identification and assessment of paleontological resources through (a) or (b), and site alteration mitigation measures will be effectively applied. These measures have been found to be effective on the basis of professional experience; consequently there is a high level of confidence that these measures are likely to effectively reduce the residual effects to a level that is not significant.

The residual effect of an adverse effect to palaeontological site access in the LAA and RAA would not be permanent or irreversible and is, therefore, not likely to be significant as a result of the Project. Identification of the site through additional field studies or chance find procedures, along with implementation of appropriate mitigation measures is, however, critical in keeping the effect from becoming a change to paleontological site integrity. These mitigations would still be applied during any future Project phase whereby covering may be removed, thereby re-exposing the site surface and restoring site access.

No adverse effect to palaeontological site integrity is likely if heritage resources are identified within the LAA. There is potential, however, for heritage resources to be found in the LAA. If a palaeontological heritage resource is located within the LAA, its site integrity may be adversely affected by any Project activities that would affect both intact and previously disturbed surface soils. These effects would be expected primarily during the construction phase. If the palaeontological heritage resource is appropriately mitigated according to existing policies, guidelines, a significant adverse residual effect is not likely to result to heritage resource integrity from the Project. On the basis that no residual cumulative effects are likely, it is also unlikely that the Project would cause cumulative adverse effects to heritage resource integrity.

No change in palaeontological site access is likely if palaeontological resources are not identified within the LAA. However, there is potential for heritage materials to be located at the LAA. If a palaeontological heritage resource is located within the LAA, any Project activities that may result in covering or clearing of the surface could potentially change access to heritage resources. This effect is unlikely to result in a significant residual effect if found to be reversible and not permanent. Nevertheless, the heritage resource should be appropriately mitigated in accordance to the policies, guidelines, and direction of the BC Archaeology Branch and the CEA Agency.

No change in palaeontological site access is anticipated in the absence of an identified heritage resource within the LAA. However, there is potential for heritage materials to be located at the LAA. If a heritage resource is located within the LAA, any Project activities that may result in covering or clearing of the surface could potentially change access to heritage resources. This effect is unlikely to result in a significant residual effect if found to be reversible and not permanent. Nevertheless, the heritage resource should be appropriately mitigated in accordance to the policies, guidelines, and direction of the BC Archaeology Branch and the CEA Agency

E8.2 ARCHAEOLOGICAL RESOURCES

Previously recorded archaeological sites in the region of the Project include surface, subsurface, and intertidal resources and fluvial fans around the Howe Sound shoreline. The Squamish Nation place name for Woodfibre (*Sui7a't*) indicates the Woodfibre site was used as a seasonal camp location. Although no archaeological sites have as yet been identified, there is potential for undocumented archaeological sites in and adjacent to the Project area, and areas of archaeological potential may include subsurface archaeological features and materials, surface lithic scatters, culturally modified trees, rock art, intertidal and subtidal features such as canoe runs and other rock alignments, and heritage ship wrecks.

Archaeological potential within the LAA is represented by areas determined to have potential versus those having low potential, in accordance with provincial guidelines for archaeological overview assessments. The area within the LAA determined to have archaeological potential is approximately 22% of the total LAA, with the remaining 78% having low or no archaeological potential. These estimates of archaeological potential for the LAA were determined based on data limited to background information review of the LAA and RAA.

There are currently no known archaeological resources within the LAA. Moreover, it is not likely that a significant residual effect will occur as a result of the Project because: (a) WLNG is committed to conducting pre-disturbance field studies to refine the archaeological potential assessment; (b) the Heritage Resource Chance Find Management Procedures will be in place during Project activities which might affect areas with archaeological potential; and (c) as a result of the identification and assessment of archaeological resources through (a) or (b), appropriate mitigation measures will be implemented. These measures have been found to be effective on the basis of professional experience; consequently there is a high level of confidence that these measures are likely to effectively reduce the residual effects to a level that is not significant.

The residual effect of a change to archaeological site access in the LAA and RAA will not be permanent or irreversible, and will therefore not likely be significant, if the Heritage Chance Find Management Procedures are implemented.

No change in archaeological site access is likely if in the absence of an identified heritage resource within the LAA. However, there is potential for heritage materials to be located at the LAA. If a heritage resource is located within the LAA, any Project activities that may result in covering or clearing of the surface could potentially change access to heritage resources. This effect is unlikely to result in a significant residual effect if found to be reversible and not permanent. Nevertheless, the heritage resource should be appropriately mitigated in accordance to the policies, guidelines, and direction of the BC Archaeology Branch and the CEA Agency.

E8.3 HISTORICAL RESOURCES

The former Woodfibre Pulp and Paper Mill, with its associated town site, is considered a historically important early 20th century industrial facility within BC.

There are currently no known historical resources within the LAA. Moreover, it is unlikely that a significant residual effect will occur as a result of the Project because: (a) WLNG is committed to conduct pre-disturbance field studies to identify and assess potential historical sites and structures; (b) the Heritage Resource Chance Find Management Procedures will be in place during Project activities which will be applied to areas with potential for significant historical remains; and (c) as a result of the identification and assessment of historical resources through (a) or (b), and mitigation measures will be implemented appropriately . These measures have been found to be effective on the basis of professional experience; consequently there is a high level of confidence that these measures are likely to effectively reduce the residual effects to a level that is not significant.

No change to historical site integrity is likely if no heritage resources are identified within the LAA. There is potential, however, for heritage resources to be found in the LAA. If a heritage resource is located within the LAA, its site integrity may be affected by any Project activities that would affect both intact and previously disturbed surface soils. These effects would likely occur primarily during the construction phase. If the heritage resource is appropriately mitigated according to existing policies, guidelines, a significant adverse residual effect is not likely to result from the Project to heritage resource integrity. On the basis that no residual cumulative effects are likely, it is also unlikely that the Project would cause cumulative adverse effects to heritage resource integrity.

E9. HEALTH ASSESSMENT

Health is assessed through the VC of public health, which is identified as the ultimate receptor of Project effects to health. Due to the breadth and complexity of the potential effects to public health, however, public health is split into two independent VCs, to present a more comprehensive assessment of potential effects to public health. These VCs are community health and well-being, and an HHRA.

While community health and well-being pertains to the assessment of potential Project-related effects on the social aspects of public health, the HHRA provides an assessment of the potential effects of the Project on the physical aspects of human health. These two components of public health have separate methods and results, and are therefore presented as separate VC sections.

E9.1 COMMUNITY HEALTH AND WELL-BEING (VC)

Assessment of community health and well-being was carried out through consideration through several subcomponents, summarized as follows:

- **Employment and income** are linked to health and well-being. Health Canada notes that low income Canadians are more likely to die earlier and experience more illness than higher income earners, regardless of age, sex, ethnicity, and place of residence. Distribution of income is also a key determinant of health in a society. Research shows that gaps in income distribution within a community lead to social problems and poorer health across the population as a whole.
- **Education** is considered one of the most important predictors of health. Research has shown that those who graduate from high school live, on average 9.2 years longer than those who do not, which is attributed to improvement in cognitive ability and decision making in addition to better occupations and higher income.
- **Affordable housing** includes housing conditions, size and availability, and is key to overall health and well-being. Housing availability can be affected by increases in population, which can lead to unaffordable housing and overcrowding. Both physical and social health are affected by high housing costs, since overcrowding can lead to increased spread of illness. High housing costs can also disproportionally affect those who are not employed by a project and those who do not retain benefits of increased income.
- **Smoking, and drug and alcohol use** are considered personal health practices that influence overall health and well-being. Research shows that personal health practices are influenced by the socio-economic environments in which individuals live and work. Smoking is a risk factor for a number of illnesses, including lung cancer, heart disease, stroke, chronic respiratory disease, and other conditions.
- **Community connectedness** includes civic vitality, community cohesion, social support networks within the community, and community safety. Studies have shown individuals and communities that have more social support have lower premature death rates. Other studies have shown that low social participation and support are associated with all causes of mortality. For this assessment, community connectedness refers to social support networks and participation in community organizations and activities.
- **Accidents and mortality** information, including cause of death, help identify the key health issues affecting a community. Life expectancy is a widely used indicator of health, measuring quantity rather than quality of life.
- **Health services**, particularly those aimed at maintaining health and preventing disease are identified by Health Canada as a key indicator for population health. Health services provide a key role in disease prevention that aid in the maintenance of good health.

- **Crime** is related to the social environment and, like health conditions, provides context to well-being in a community. While crime is generally considered an indicator of social environment, it is assessed individually because increased crime rates are often associated with resource development projects that require either a temporary workforce or create population growth due to project employment opportunities.
- **Leisure and recreation** - The Canadian Index of Wellbeing includes leisure and culture as one of their key domains of well-being. Leisure and culture are viewed together since art and culture are often viewed as part of leisure time. Recreation is viewed as activities experienced during one's leisure time. The frequency of participation in leisure activities is often linked to well-being, including both physical health and social well-being, depending on the type of leisure activity. However some leisure activities, such as smoking, and drug or alcohol use or passive activities such as television viewing can lead to decreased well-being.

The LAA for assessment of all subcomponents comprised Squamish, Whistler, and SLRD Electoral Area D. The RAA is the same as the LAA. Information to describe existing conditions and support the assessment was entirely derived from a literature review.

The potential effect of an increase in accidents and mortality would be restricted to a regional area, reversible in nature but is unlikely to occur; therefore the effect is likely to be negligible. The potential effect of an increase in drug and alcohol would be restricted to a regional area and reversible in nature but unlikely to occur; therefore the effect is likely to be negligible. The potential effect of a decrease in community connectedness would be restricted to a regional area and reversible in nature but unlikely to occur; therefore the effect is likely to be negligible.

Based on the Project activities and the interactions between Project-related activities and community health and wellbeing identified, it is likely that the Project will result in negligible effects to the community health and well-being VC.

E9.2 HUMAN HEALTH RISK ASSESSMENT (VC)

The HHRA was originally identified as a subcomponent of the public health VC, which is focused on the protection of people's health. Due to the complexity and depth of the assessment, the HHRA was assessed as a VC. The HHRA focuses on locations where people are known to be present (e.g., communities, First Nations seasonal hunting/harvesting camps, recreational areas) and that are in proximity to the Project area, as it is the health of the people living at these locations that could potentially be affected by Project-related emissions.

The purpose of the HHRA is to quantify the potential health risks to people from present-day conditions (baseline case) and the predicted conditions using modelling (application case), the environmental quality in the Project area, and to determine any effects resulting from the Project. The baseline case and application case are equivalent to the existing conditions and future with the Project, respectively.

Unlike other technical disciplines, field data were not used to directly measure existing risks to human health. Instead, existing risks were estimated using the same risk assessment approach and methods used to evaluate how the Project may affect human health. The LAA for the HHRA is a 20 km x 20 km area surrounding the Project. The RAA is a 50 km x 65 km (N-S) area surrounding the Project, including Horseshoe Bay to the south and the Squamish Nation's sites to the north.

A baseline sampling program was carried out to characterize the range of pre-existing environmental contaminant levels present within soil and foods that are consumed by people in the LAA and RAA (e.g., berries, crabs), and to provide an indication of background conditions in the case that a multimedia assessment was needed based on the results of the soil deposition modelling. Sampling programs were designed to collect soil and foods from a range of ecological habitats, a range of distances from the Project, and a range of locally abundant species known to be harvested by local communities. Choice of sampling locations focused on those that may potentially be affected by the Project and that do not include disturbed areas on-site associated with the former Woodfibre Pulp and Paper Mill as these issues are addressed through the supporting studies for the COCs (as described in **E5.7 Site Contamination)**. In addition, a combined desktop and field study was conducted to determine the significance of site contamination in sediment to human health and the environment.

Given that predicted concentrations have been over-estimated rather than under-estimated, and considering the potential receptors and exposure pathways that were evaluated, it is not likely that residual effects from Dibenzo(a,h)anthracene will be significant. Also, given that predicted concentrations have been over-estimated rather than under-estimated, and considering the potential receptors and exposure pathways that were evaluated, residual effects from all other contaminants of potential concern included in the HHRA are likely to be negligible.

Based on the Project activities and the interactions between Project-related activities and HHRA identified, it is likely that the Project will result in negligible effects to the HHRA VC.

E10. CHANGES TO THE ENVIRONMENT AND EFFECTS OF CHANGES TO THE ENVIRONMENT

Changes to the environment are defined in subsections 5(1) and 5(2) of *CEAA 2012* and categorized as:

- changes to components of the environment within federal jurisdiction
- changes to the environment that would occur on federal or trans-boundary lands
- changes to the environment directly linked or necessarily incidental to federal decisions
- effects of changes to the environment directly linked or necessarily incidental to federal decisions

Effects of changes to the environment that are directly linked or necessarily incidental to federal decisions consider residual effects to health and socio-economic conditions; physical and cultural heritage; and any structure, site, or thing that is of historical, archaeological, paleontological, or architectural significance.

The Project is located on fee simple and provincial Crown land, predominantly on land and water areas previously used for the Woodfibre Pulp and Paper Mill. As described in detail in relevant sections of the Application, changes to the environment under federal jurisdiction are likely to result in negligible or not significant residual Project-related and cumulative effects for fish and fish habitat, aquatic species, and species at risk. No changes are likely to occur on federal lands and trans-boundary lands.

Changes to the environment may be linked to federal decisions related to the *Fisheries Act*, the *Navigation Protection Act*, *Canadian Aviation Regulations*, and the *Species at Risk Act*. No Project-related effects were identified or likely regarding changes to the environment on health and socio-economic conditions, physical and cultural heritage, and any structure, site, or thing that is of historical, paleontological, or architectural heritage linked to the federal decisions.

Table E-3 provides a summary of potential changes to the environment pertaining to *CEAA 2012* subsections as noted. Details regarding adverse effects and mitigations to VCs that could relate to the above mentioned federal decisions are provided in the following VC sections in the Application: **5.12 Avifauna, 5.13 At-Risk Bat Species, 5.15 Freshwater Fish and Fish Habitat, 5.16 Marine Benthic Habitat, 5.17 Marine Birds, 5.18 Forage Fish and Other Fish (Marine)**, and **5.19 Marine Mammals**. No significant adverse residual effects are likely to result from the Project to those VCs.

Table E-3 Summary of Potential Changes to the Environment

Topic	Changes
Changes to components of the environment within federal jurisdiction (per *CEAA 2012* section 5(1)(a))	
(i) Fish and fish habitat as defined in subsection 2(1) of the *Fisheries Act*.	• fish habitat • food and nutrient content • fish behavior • fish mortality risk

(ii) aquatic species as defined in subsection 2(1) of the *Species at Risk Act*: a wildlife species that is a fish, as defined in section 2 of the *Fisheries Act*, a marine plant, as defined in section 47 of the *Fisheries Act*.	• marine plants:
	  • changes in habitat quality, including effects from site erosion and sediment transport
	  • loss of habitat
	  • mortality
	• fish are considered in the row above

(iii) migratory birds as defined in subsection 2(1) of the *Migratory Birds Convention Act, 1994*	• migratory bird habitat availability • migratory bird mortality

Topic	Changes
Changes to the environment that would occur on federal or trans-boundary lands (per *CEAA 2012* Section 5(1)(b)	
The Project site is not located on or near any federal lands or reserves, will not rely on federal financial funding, and is not within the waters or lands administered by a Canada Port Authority. With the exception of Project air emissions (including indicator compounds (CACs) (detailed in **Section 5.2 Air Quality)** and Greenhouse gas emissions (**detailed in Section 5.3 GHG Management**) that may disperse over nearby federal lands, (e.g., First Nations Reserves), no changes to the environment on federal land or trans-boundary lands are anticipated.	
Changes to the environment that are directly linked or necessarily incidental to federal decisions (in addition to the components within federal jurisdiction) (per *CEAA 2012* Section 5(2)(a)	
Fisheries Act	• environmental changes to fish and fish habitat
Navigation Protection Act	• environmental changes that restrict navigation
Species at Risk Act	• environmental changes to species at risk
Canadian Aviation Regulations section 601 (lighting and marking)	• environmental changes that impact ambient lighting (lighting of flare towers) • environmental effects of lighting on migratory birds

E11. ACCIDENTS AND MALFUNCTIONS

An accident is considered to mean an unexpected occurrence or unintended action that can cause an adverse environmental or human health effect. A malfunction is considered to mean the failure of a device, piece of equipment, or a system to function as intended, which can cause an adverse environmental or human health effect. Both are referred to as “events”. Accidents and malfunctions resulting from intentional acts of terrorism/war are beyond the scope of this assessment.

The Project will be designed and built in accordance with the BC *Oil and Gas Activities Act* and the associated *LNG Facility Regulation.* This regulation dictates that the Project LNG facility will be built according to the design requirements and operational parameters of the CSA, in particular with CSA standard Z276: *Liquefied Natural Gas – Production, Storage, and Handling*, which standardizes the design, location, construction, operation, and maintenance of domestic LNG facilities. This standard results in safe operations and requires response planning to address the risk of accidents and malfunctions. The final design for the Project components will also be based on engineering construction standards and building codes applicable in BC, as well as national and international standards, guidelines and codes of practice where there are no applicable codes for BC. These standards and building codes serve an important role in avoiding and reducing the risk of accidents and malfunctions.

In addition to these regulatory design requirements, existing legislative requirements pertaining to toxic or hazardous material spills, explosion or fire also result in a design that avoids and reduce potential Project-related accident and malfunction effects. Furthermore, WLNG will implement a suite of internal processes and measures to mitigate the consequences of an accident or malfunction. These are detailed in **E17 Summary of Proposed Environmental and Operation Management Plans and Follow-up Programs**.

In accordance with part 4 of the OGC *LNG Facility Regulation*, before beginning Project operation, WLNG will prepare a safety and loss management program that complies with CSA Z276 and includes the following:

- integrity management program
- emergency response plan
- fugitive emissions management plan
- change management program
- security management plan

The Project will also adopt the following principles, listed in order of priority, in managing emergency situations:

- protect and save people
- protect and save the environment
- protect and save the long-term operability of assets and WLNG reputation.

The accidents and malfunctions that may occur during the Project's construction, operation, or decommissioning phases and that have been assessed for effects are as follows:

- events involving spills of toxic or hazardous materials (e.g. hydrocarbon fuels, lubricants, and concrete but not LNG) into environmentally sensitive habitat
- structural failure of a culvert, ditch, detention pond, or sediment containment measure resulting in localized flooding, erosion, sedimentation, or discharge of deleterious materials to the aquatic environment
- inappropriate operation of machinery or equipment that leads to a disturbance of environmentally sensitive habitat or accidental mortality of animals
- collision between vehicles, or between a vehicle and infrastructure, at the Project site
- loss of containment of LNG
    - loading from the FSO to the LNG carrier
    - at the land-based LNG facility
- unplanned facility shutdown, including emergency flaring, process upset, or power outage
- explosion or fire
    - loading from the FSO to the LNG carrier
    - in the land-based LNG facility
    - in a structure away from the LNG facility and FSO
- marine vessel collision with other vessels, ground, marine facilities, and marine mammals, with potential loss of cargo

The likelihood, consequence, and risk (with mitigation) for each of these events have been assessed. The risk evaluation considered the interaction of likelihood and consequence. Of the 14 potential events identified above, 13 are considered a low risk with the implementation of effective Project design and management and contingency measures. No high or very high risks have been identified, and thresholds established by the OGC and other regulatory bodies are not exceeded for any events. The risk for spills of toxic or hazardous materials (excluding LNG) was identified as low to medium and was assessed for effects and changes to several VCs and ICs.

E12. EFFECTS OF THE ENVIRONMENT ON THE PROJECT

CEAA 2012 subsection 19(h) specifies that an environmental assessment of a designated project must take into account changes to the designated project that may be caused by the environment. Accordingly, the Application identifies environmental factors that may affect the land and marine components of the Project. These factors include the following geotechnical and natural hazards:

- extreme weather and weather-related events (e.g., wind, heavy precipitation, extreme temperatures, fog, drought)
- flood risk (e.g., high flows in Mill and Woodfibre creeks)
- natural seismic events, such as earthquakes and associated effects, (e.g., soil liquefaction-induced loss of strength and foundation support, lateral spreading movements and potential fault ruptures, seiches, and tsunami)
- slope instability such as failures of steep delta-fan slopes and steep onshore slopes, and mass wasting events such as landslides and snow avalanches within the Mill Creek and Woodfibre Creek watersheds
- volcanic events
- wildfires, including natural fuel types
- predicted climate change effects on sea level, precipitation, and temperature during the Project lifecycle. The implications of climate-induced changes to the extreme weather events listed above, such as storm frequency and intensity are also assessed.

A significant effect of the environment on the Project is considered to be an event that results in one or more of the following criteria:

- delay in construction of more than two to four weeks
- interruption in operation (e.g., loading LNG carriers) of more than two to four weeks
- damage to infrastructure that compromises public safety
- damage to infrastructure that would not be economically or technically feasible to repair

The primary mitigation measures to avoid or reduce adverse effects of the environment on the Project are sound design and planning so that Project components can withstand both routine and extreme environmental conditions. With implementation of the Project design and construction standards and the additional proposed mitigation (described in detail in the VC sections of the assessment), it is unlikely that the environmental hazards noted above will significantly affect the Project.

Since the Project will be designed to prevent or reduce the severity of effects of the environment, the likelihood of an adverse effect on the Project is low and the risk of an event that exceeds prescribed design standards is likely to be remote. Based on a consideration of the various mitigation strategies applied through Project design criteria, construction standards and additional mitigation, it is not likely that significant adverse effects of the environment will occur on the Project.

E13. ABORIGINAL GROUPS

Woodfibre LNG Limited recognizes and respects that local Aboriginal groups and their leadership want meaningful and ongoing input into the planning, operation, and development of LNG facilities and associated infrastructure. Accordingly, the Proponent is committed to continued and active engagement with Aboriginal groups who have interests that may potentially be adversely affected by the Project. The goal of the Proponent's Aboriginal consultation and engagement program is to identify Project-related impacts, to propose, consult on, plan, and implement appropriate mitigation measures, and to accommodate for any unresolved impacts.

The Proponent is also actively exploring opportunities to provide direct benefits to Aboriginal groups that are directly affected by the Project (i.e., the Schedule B and C requirements related to Aboriginal groups as described in the EAO's section 11 and 13 Orders). Based on input from these Aboriginal groups, this may include: employment, training, contracting opportunities, business opportunities and participation in environmental protection, capacity building and cultural priorities.

E13.1 INFORMATION REQUIREMENTS

The Proponent began planning for Aboriginal engagement and consultation on the Project in April 2013 with the Squamish Nation, and in April 2014 with the Tsleil-Waututh Nation. The scope and extent of engagement and consultation with each of the Aboriginal groups has varied based on the direction prescribed by the EAO in the section 11 order. The Proponent submitted an Aboriginal Consultation Plan to the EAO on September 29, 2014. A summary of comments received from Aboriginal groups on the Aboriginal Consultation Plan, and the action taken by the Proponent in response to the comments can be found in **Part C** of the Application.

Part C of the Application also provides available background information for those Aboriginal groups identified in the section 11 Order, including traditional territories, ethnography, language, land use setting and planning, governance, economy and reserves. The background information section is followed by an overview of the Aboriginal Consultation and Engagement Process, and a summary of consultation and engagement undertaken with Aboriginal groups throughout the Pre-Application stage, including the identification of key issues and concerns raised by Aboriginal groups and WLNG's responses and actions taken to address those concerns.

As per the section 11 Order, WLNG is required to engage with the Squamish Nation regarding all Project components and with the Tsleil-Waututh Nation with regard to offsite Project-related effects. As per parts 12.2, the EAO assumed the lead role for consultation with those groups listed under Schedule D: Musqueam First Nation, Cowichan Tribes First Nation, Halalt First Nation, Lake Cowichan First Nation, Lyackson First Nation, Penelakut Tribe, Stz'uminus First Nation, and the Métis Nation BC.

E13.2 ABORIGINAL INTERESTS

Aboriginal Interests are defined in Part A, Section 1 of the section 11 Order as "asserted Aboriginal rights, including title, or such determined Aboriginal or treaty rights". Section 35 of the *Constitution Act, 1982* 30 & 31 Victoria, c. 3 (UK), provides constitutional protection to the Aboriginal Interests of Aboriginal peoples in Canada. Aboriginal rights protect the activities, practice, custom, or traditions that are integral to the distinctive culture of the Aboriginal group claiming the rights, and have existed prior to European contact. Examples of Aboriginal rights include but are not limited to activities such as hunting, fishing, gathering, and trapping, and include Aboriginal title. The Canadian legal system recognizes Aboriginal title as a "unique collective right to the use of and jurisdiction over a group's ancestral territories" (Hanson 2009). Aboriginal title is a result of the occupation of and relationship with Aboriginal ancestral territories by Aboriginal groups, as well as their ongoing social structures and political and legal systems. Treaty rights protect and enforce agreements between the Crown and Aboriginal groups.

Pursuant to the section 13 Order, issued November 6, 2014, the assessment of potential effects to the Aboriginal Interests of the Squamish Nation will be assessed under the Squamish process and submitted to the EAO in a separate report. Throughout that process, the Proponent will consult with the Squamish Nation with respect to potential effects of the Project on Squamish Nation Aboriginal Interests; and if effects exist, the Proponent will work with the Squamish Nation to determine how they may or may not be mitigated.

The focus of the information contained in the Application is therefore on the identified Aboriginal Interests of the Tsleil-Waututh Nation. Project-specific Traditional Knowledge / Traditional Use studies from the Aboriginal groups named in the EAO section 11 Order have not been made available to WLNG, as of November 2014. As a result, the assessment conducted for this section of the Application is largely based

on publicly available data, and the Proponent anticipates that Traditional Knowledge and Traditional Use information, in the form of a Tsleil-Waututh Knowledge Study, will be made available in time to factor that into the remaining aspects of the EA. The Proponent recognizes that the absence of public information on Traditional Use does not necessarily indicate absence of rights-protected Traditional Use activities or valued-use sites. Should the Tsleil-Waututh Nation raise additional potential effects to one or more of these Aboriginal Interests, WLNG is committed to further consultation on and consideration of the concern.

Adverse effects on Aboriginal Interests can occur where there is an interaction between Project components or activities and the resources that are the basis of the interest, or access to the resource. Based on the section 11 Order, WLNG's consultation activities, and reviews of the information sources listed above, the assessment of potential effects on the Aboriginal Interests of the Tsleil-Waututh Nation is focused on offsite Project components.

The Proponent understands that the Tsleil-Waututh Nation have identified the following Aboriginal Interests:

- Aboriginal harvest rights (marine mammals, wildlife, vegetation)
- Aboriginal fishing rights (marine fish)
- use of heritage resources and culturally significant sites

The potential effects of the Project on Aboriginal Interests can be summarized as follows:

- harvesting:
  - change in harvested species (abundance, behaviour, and health) and associated habitat
  - change in harvesting areas and the ability to access or use these areas
- fishing:
  - change in fished species (abundance, behaviour, and health) and associated habitat:
  - change in access to fishing areas and the ability to access or use these areas
- use of heritage resources and culturally significant sites:
  - change in culturally significant areas and the ability to access or use these areas
  - change in heritage resources

Based on the information available, no residual effects to the Tsleil-Waututh's ability to pursue identified Aboriginal Interests are likely as a result of potential Project changes to the environment.

E13.3 STATUTORY REQUIREMENTS UNDER *CEAA 2012* SECTION 5

In accordance with section 5(1)(c) of *CEAA 2012*, the Application (**Section 18.0 Statutory Requirements under *Canadian Environmental Assessment Act 2012* Section 5(1)(c)**) describes the assessment of effects to Aboriginal groups occurring in Canada from any change that may be caused to the environment, relating to health and socio-economic conditions, physical and cultural heritage, the current use of lands and resources for traditional purposes, and any structure, site, or thing that is of historical, archaeological, paleontological, or architectural significance.

The assessment of the above factors provides a description of how effects relating to section 5(1)(c) of *CEAA 2012* were considered in the effects assessment in **Part B** of the Application, of any environmental effects on factors identified in section 5(1)(c) of *CEAA 2012*, as listed above, including cumulative effects and of measures to avoid, mitigate, or otherwise manage potential environmental effects on these factors.

E13.4 OTHER MATTERS OF CONCERN TO ABORIGINAL GROUPS

The Application identifies and describes potential social, economic, heritage, and health matters of concern raised by Aboriginal groups during the Aboriginal engagement program, which are distinct from Aboriginal Interests and which were not addressed in **Part B** of the Application. Other matters of concern Aboriginal groups include economic benefits and terrestrial wildlife.

The Tsleil-Waututh Nation proposes that potential benefits with respect to Aboriginal groups could be identified in the assessment and wherever possible could identify opportunities to ensure allocation of meaningful economic benefits are returned to local Aboriginal groups.

The Tsleil-Waututh Nation asserts that Project-related effects to ungulates, black bears, cougars, and wolves should be assessed in the Application. **Part B** of the Application does not assess the potential effects to ungulates, black bears, cougars or wolves. Ungulates, black bears, cougars, and wolves were all considered for selection as a VC in the assessment of Project-related effects; however, terrestrial mammals were not recommended for assessment as Project VCs.

E13.5 SUMMARY OF ABORIGINAL GROUPS INFORMATION REQUIREMENTS

The potential Project-related effects and cumulative effects on Aboriginal groups' rights and interests are likely to be addressed by mitigation measures described for each VC. Based on the Project activities and following a review of the interactions between Project-related activities and Aboriginal Interests identified, it is likely that residual Project-related effects to Aboriginal Interests, if any, will be negligible. Woodfibre LNG Limited believes the proposed mitigations are technically and economically feasible and will address the adverse effects as described in each of the VC sections of this Application.

E14. SUMMARY OF PUBLIC CONSULTATION

During this substituted EA, the process conducted by the EAO is the process by which the public has the opportunity to provide its views with respect to the potential environmental effects of the Project. This process meets both the BC*EAA* and the *CEAA 2012* requirements for public consultation. A Project Assessment Report, which will contain an analysis and conclusions on the significance of environmental effects, will be made available to the public.

The consultation process is designed to meet the requirements under the *Public Consultation Policy Regulation* and the public consultation provisions as described in the EAO's EA review procedures ordered under section 11 of the BC*EAA*. As required by the section 11 Order, a Public Consultation Plan was prepared to outline and guide public consultation activities during the Pre-Application Phase and Application Review Phase. The main purpose of the Project's public consultation program is to allow the public and stakeholders to have meaningful input throughout the development of the Project before, during, and after the EA process

The Pre-Application-phase public consultation program was confirmed with the EAO and focussed on the District of Squamish, since the Project is located within municipal limits and proximal to district communities. In addition, the Proponent notified other nearby communities of Brackendale, Britannia Beach, Lions Bay, West Vancouver, Whistler, and Bowen Island. Online consultation channels are available for any other stakeholders who would like to participate.

E15. SUMMARY OF PROJECT CUMULATIVE AND RESIDUAL EFFECTS

Summaries of the residual and cumulative environmental effects that cannot be avoided or mitigated through the re-design or relocation of the Project, or through Proponent commitments to mitigation measures are provided in this Application in **Section 21**, **Table 21-1** and **Table 21-2**, respectively.

E16. SUMMARY OF MITIGATION MEASURES

A suite of mitigation measures has been identified to reduce the adverse effects of the Project on each VC and thus reduce potential for significant adverse effects. A consolidated table of mitigation measures and commitments is provided in **Section 22**, **Table 22-1** of this Application.

E17. SUMMARY OF PROPOSED ENVIRONMENTAL AND OPERATION MANAGEMENT PLANS AND FOLLOW-UP PROGRAMS

The environmental management program for the Project includes environmental management plans applicable to each phase of the Project, (i.e., CEMP, operations environmental management plan (OEMP) and decommissioning environmental management plan (DEMP)). It also includes communications plans, monitoring and follow-up plans, reporting requirements, and responsibilities.

The Project also involves several activities that require unique consideration and site-specific or discipline-specific sub-plans designed to prevent or reduce environmental impacts. Stand-alone plans will be developed prior to the start of Project construction and operation, and will be updated throughout the course of the Project as needed. Details of each plan will be developed during final design through discussions with relevant permitting agencies, stakeholders, and Aboriginal groups. The proposed plans under the environmental management program are summarized in **Table E-4**.

The plans will be developed and implemented by WLNG in conjunction with contractors. The plans will be used in combination with site-specific environmental protection plans during construction to ensure that the mitigation measures described in previous sections are implemented and effective. The environmental management system will include follow-up monitoring as required to facilitate the evaluation of the effectiveness of specific mitigation measures.

Table E-4 Summary of Construction, Operation, and Decommissioning Environmental Management Plans

Environmental Management Plans and Sections	Sub-Plans	Monitoring Program
Construction Environmental Management Plan		
General Best Management Practices	-	Surface Water Quality Monitoring
Environmental Monitoring	-	All programs
Blasting Management	-	
Construction Emergency Response Plan	Spill Prevention and Emergency Response Natural Hazards Abatement Fire Hazard Abatement	-
Creosote Pile Removal	-	Marine Water Quality Monitoring Program Fisheries and Aquatic Life Monitoring Program
Concrete Works Management	-	Surface Water Quality Monitoring Program Marine Water Quality Monitoring Program
Dust Control Management	-	
Erosion Prevention and Sediment Control	-	Surface Water Quality Monitoring Program Marine Water Quality Monitoring Program
Heritage Resources Chance Find Procedure	-	-
Invasive Plant Management	-	Vegetation Monitoring Program
Marine Works Management	Underwater Noise Management	Marine Water Quality Monitoring Program
Marine Mammals Management	-	Fisheries and Aquatic Life Monitoring Program
Noise, Vibration, and Ambient Light Management	-	-

Environmental Management Plans and Sections	Sub-Plans	Monitoring Program
Waste Management	Construction Waste Solid Waste Hazardous Waste	-
Wildlife Management	Human and Wildlife Conflict Management	Fisheries and Aquatic Life Monitoring Program Wildlife Monitoring Program
Operations Environmental Management Plan		
Environmental Monitoring	-	All programs
Ballast Water Management	-	-
Fugitive Emissions Management Plan	-	Air Quality Monitoring Program
Heritage Resources Chance Find Procedure	-	-
Invasive Plant Management	-	Vegetation Monitoring Program
Marine Mammals Management	-	Fisheries and Aquatic Life Monitoring Program
Noise and Light Control Plan	-	-
Venting and Flaring Plan	-	-
Waste Management	Solid Waste Hazardous Waste	-
Water Management	Mill Creek Instream Flow Requirement (IFR)	Surface Water Quality Monitoring Program Marine Water Quality Monitoring Program Fisheries and Aquatic Life Monitoring Program
Wildlife Management	Human and Wildlife Conflict Management	Fisheries and Aquatic Life Monitoring Program Wildlife Monitoring Program
Decommissioning Environmental Management Plan		
Environmental Monitoring	To be determined	To be determined
Earth Works and Grading		
Erosion and Sediment Control		
Decommissioning Emergency Response Plan		
Dust Control Management		
Heritage Resources Chance Find Management Procedure		
Invasive Plant Management		
Marine Works Management		
Marine Mammals Management		
Noise, Vibration, and Ambient Light Management		
Wildlife Management		

Follow-up programs have been identified for each VC except for those where confidence in the effects assessment is high, or where a monitoring program is already in place. Follow-up strategies include identification of measures to evaluate the accuracy of original prediction of effects and the effectiveness of proposed mitigation measures, as well as an appropriate strategy to apply in the event that the original predictions of effects and mitigation effectiveness are not as expected. **Table E-5** summarizes the proposed monitoring and follow-up programs to be undertaken.

Table E-5 Summary of Monitoring and Follow-up Programs

No.	Monitoring and Follow-up Program	Valued Component(s)	Project Phase	Application Section
1	Air Quality	Air quality Greenhouse gas management	Operation	5.2 5.3
2	Marine Water Quality	Marine benthic habitat Forage fish and other fish Marine mammals	Construction, Operation	5.16 5.18 5.19
3	Surface Water Quality	Amphibians Freshwater fish and fish habitat	Construction	5.8 5.14 5.15
4	Fisheries and Aquatic Life	Amphibians Freshwater fish and fish habitat Marine benthic habitat Forage fish and other fish Marine mammals	Construction, Operation	5.14 5.15 5.16 5.18 5.19
5	Wildlife	Avifauna At-risk bats Amphibians Marine birds	Construction, Operation	5.12 5.13 5.14 5.17
6	Vegetation	Vegetation communities Avifauna At-risk bats	Construction, Operation	5.11 5.12 5.13

All follow-up programs will be shared with Section 11 Order Schedule B and C Aboriginal groups prior to submission to the EAO, CEA Agency, Environment Canada, and MOE.

E17.1 COMPLIANCE REPORTING

Compliance reporting is a process that is designed to ensure proponents are implementing and following the conditions designed to mitigate potential adverse effects to the environment, economic, social, heritage, and health values, and to Aboriginal interests following issuance of an EAC.

In consultation with other partner agencies, the EAO prepares a compliance management plan to provide the general approach for overseeing compliance on a project. The EAO prioritizes each condition set out in the EAC based on the potential for non-compliance, as well as prioritising the condition and the respective risk associated with non-compliance. This plan is updated throughout the life of the project.

The Proponent will prepare and submit compliance self-reports, which demonstrate compliance with conditions of the EAC and commitments made in the Application for an EAC.

The Project's environmental management team (described below) will implement an inspection program to periodically verify that all activities are carried out in manner that meets or exceeds environmental objectives. If the methods outlined in EMPs do not meet the environmental objectives, the team will consult with appropriate agencies and stakeholders to amend or update the plan as is deemed necessary

Compliance and monitoring reports will be provided to applicable regulatory agencies and authorities as required. These reports will provide updates on applicable Project phase progress and any associated environmental issues and mitigations identified. The Proponent will undertake all required compliance monitoring and reporting. This will include meeting all conditions of the required certificates, permits, authorizations, licences, and EAC conditions. Compliance reporting includes submission of the CEMP, OEMP, and DEMP (described above).

E17.2 ENVIRONMENTAL MANAGEMENT TEAM

The Proponent will engage a team of qualified individuals (the environmental management team) to develop and implement the CEMP and to conduct environmental monitoring at the Project site. The environmental management team will be an integral part of the Project team and will have primary responsibility for confirming that environmental management measures, controls and specifications are properly implemented as per the terms and conditions of regulatory permits and approvals for the Project.

The Proponent is committed to maintaining a high level of integrity with regard to environmental communications and reporting throughout the Project. Key members of the Project team will have specific responsibilities for reporting to senior WLNG management, regulatory agencies, Aboriginal groups and stakeholders on environmental performance and compliance.

E18. CONCLUSIONS RESULTING FROM THE ASSESSMENT

Woodfibre LNG Limited concludes that, through the process of site selection, engineering design, implementation of mitigation measures, adherence to best management practices, and implementation of effective environmental management plans, it can construct, operate, and decommission this Project in a way that meets the EAO stated goal of promoting sustainable development while avoiding or minimizing potential adverse Project-related effects to a level whereby no significant adverse effects are likely to result from the Project. For example, Woodfibre LNG Limited is committed to using electric power rather than direct drive to power the LNG facility. This design decision will result in notable reductions in air quality contaminants of concern and an approximately 80% reduction in greenhouse gases.

With submission of the Application, Woodfibre LNG Limited requests that the BC Minister of Environment Government of British Columbia issue an Environmental Assessment Certificate for the Project.