

18 COMMUNITY HEALTH AND WELL-BEING

18.1 Introduction

Physical and mental well-being is associated with a person’s quality of life and happiness. ‘Quality of life’ is defined as “a feeling of well-being, fulfillment, or satisfaction resulting from factors external to the individual” (COPR 2010). The concept of well-being is central to the City of Prince Rupert’s Official Community Plan (COPR 2010). The main social issues in Prince Rupert and Port Edward have been identified as poverty, mental illness and alcohol abuse (COPR 2010). Community Health and Well-Being is a VC because project interactions may adversely influence poverty, drug and alcohol abuse, and homelessness.

Disparity in health and income mark social status and quality of life. Crime rates, volunteerism levels, participation in civil society, and individual perceptions of well-being are included as measurable parameters to understand the capacity of a community to cope with external stresses (Brannen et al. 2009; Dai 2006; Adger 2000; Wilkenson 1999). These factors are considered in the assessment of changes in community health and well-being.

Other sections in the EIS/Application closely linked to the assessment of health and well-being are air quality (Section 6), acoustic environment (Section 8), economic environment (Section 14), navigation and marine resource use (Section 15), infrastructure and services (Section 16), visual quality (Section 17), human and ecological health (Section 19), and current use of lands and resources for traditional purposes (Section 21).

18.2 Scope of Assessment

18.2.1 Regulatory and Policy Setting

The government agencies with regulatory responsibilities related to community health and well-being are listed in Table 18-1 (FRBC 2012).

Table 18-1: Government Agencies with Community Health Responsibilities

Provincial/Federal Organizations	Role
Health Canada	Ensures that any health risks and benefits associated with food, products, substances, and environmental factors are managed and communicated to Canadians. Responsible to support delivery of, and access to, health programs and services for First Nations and Inuit peoples.
Ministry of Health – Health Protection Branch	Develops and implements legislation, policies and programs in the area of environmental health protection. Ensures quality, appropriate, cost-effective and timely health services are available to British Columbians. Works with health authorities, care providers and related groups and ministries to provide access to health care and protection services.
Ministry of Environment	Responsible for air, water and waste standards and for the protection of human health.

18.2.2 Influence of Consultation on the Assessment

Consultation with service providers, community planners, and officials in Prince Rupert and Port Edward identified that changes in local demographics could result in increased demand on health and emergency infrastructure and services, affect community cohesion and result in poor health behaviours. Concerns regarding loss of place and the ability to recreate and harvest country foods on and near Lelu Island were also raised. Additionally, use and comparison of 2006 Census (Statistics Canada 2013) and National Household Survey (Statistics Canada 2013) data for baseline and effects assessments was cautioned; census data do not represent current conditions, and data collection methods and outcomes of the National Household Survey differ from previously conducted surveys.

Concerns and recommendations raised during consultations informed baseline and effects assessments, and outcomes of consultations influenced the development of mitigation measures.

18.2.3 Selection of Potential Effects

The following two effects are considered in the assessment of community health and well-being:

- Change in social determinants of health
- Change in diet and nutrition.

In assessing the change to community health and well-being, this VC considers measurable parameters related to population, education, employment, income, housing, physical and mental health conditions, supply and demand of health infrastructure and services, recreational opportunities and changes in the composition of diets.

18.2.4 Selection of Measurable Parameters

Table 18-2 presents measurable parameters for community health and well-being.

Table 18-2: Measurable Parameters for Community Health and Well-Being

Environmental Effect	Measurable Parameter(s) and Units of Measurement	Notes or Rationale for Selection of the Measurable Parameter
Change in social determinants of health	<ul style="list-style-type: none"> ▪ Population (demographics, rate of change) ▪ Education, employment and income ▪ Housing ▪ Community cohesion ▪ Physical and mental health conditions ▪ Supply and demand of health infrastructure and services <ul style="list-style-type: none"> ▪ Demand associated with physical health ▪ Demand associated with mental health ▪ Demand associated with health and safety site inspections ▪ Recreation opportunities 	<ul style="list-style-type: none"> ▪ Project may directly and indirectly affect community health ▪ Potential for in-migration of temporary and/or permanent populations leading to increased demand for health infrastructure and services
Change in diet and nutrition	<ul style="list-style-type: none"> ▪ Change in the composition of diets (proportion of country foods to market foods) 	<ul style="list-style-type: none"> ▪ Project may affect country foods availability and quality

Effect assessments and associated measurable parameters of other VCs are relevant to the assessment of Community Health and Well-Being. Baseline information and effect assessments from Section 14 Economic Environment, Section 15 Navigation and Marine Resource Use, Section 16 Infrastructure and Services, Section 17 Visual Quality, and Section 21 Current Use of Lands for Traditional Purposes inform baseline and effects assessments of Community Health and Well-Being.

18.2.5 Boundaries

18.2.5.1 Temporal Boundaries

Based on the project schedule, the temporal boundaries for each project phase are:

- **Construction:** Q1 2015 – Q4 2018
- **Operations:** Q1 2019 – 2048+
- **Decommissioning:** 2048+

18.2.5.2 Spatial Boundaries

The spatial boundaries for Community Health and Well-being are shown on Figure 18-1.

- **Project development area (PDA)**—Lelu Island to within 30 m of the average high water mark, the bridge abutment and access road corridor, and areas covered by the bridge, pioneer dock, materials off-loading facility (MOF), marine terminal and associated dredging.
- **Local assessment area (LAA)**—includes the following communities: Metlakatla First Nation, Lax Kw'alaams First Nation, Gitxaala Nation, the District of Port Edward and the City of Prince Rupert
- **Regional assessment area (RAA)**—consists of the communities within the mainland portion of the Skeena Queen Charlotte Regional District (SQCRD).

LAA and RAA spatial boundaries were identified through consultation with local and regional health service providers and representatives of local and regional health authority jurisdictions as well as application of professional judgment of the study team.

18.2.5.3 Administrative and Technical Boundaries

Northern Health is responsible for the delivery of hospital, home care and residential care services within three geographic operating divisions known as health service delivery areas: the Northeast HSDA, the Northern Interior HSDA and the Northwest HSDA (Northern Health 2013). Northern Health is governed by a ten-member board of directors appointed by the Government of British Columbia (Northern Health 2013). Northern Health provides health services to over 300,000 people within a 600,000 km² area (Northern Health 2013). The City of Prince Rupert's Official Community Plan (2007) identifies and addresses a number of social and community issues, including poverty, mental illness and drug and alcohol abuse. Through their Official Community Plans, the City of Prince Rupert and District of Port Edward councils have administrative discretion over decisions that have the potential to affect various aspects of living that are related to community health and well-being. Both councils have made commitments to enhance and protect community health. Northern Health and the British Columbia Ministry of Health have also issued reports regarding the impacts of

oil and gas development in northeastern BC and provide guidance for measuring quality of life and community well-being (FRBC 2012).

While some health related data is available at a sub-regional level, other information is reported on a broader basis (i.e., Northwest Health Services Delivery Area), which includes communities outside of the LAA or RAA. Where possible, community specific data is provided.

18.2.6 Residual Effects Description Criteria

Table 18-3 provides a description of the criteria used to provide context to the residual effects assessment for community health and well-being.

Table 18-3: Characterization of Residual Effects for Community Health and Well-Being

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Characterization of Residual Effects		
Context	Refers primarily to the current and future sensitivity and resilience of the VC to change caused by the Project. Consideration of context draws heavily on the description of existing conditions of the VC, which reflect cumulative effects of other projects and activities that have been carried out, and especially information about the impact of natural and human-caused trends in the condition of the VC.	<p>Low resilience: community health and well-being is vulnerable to small adverse changes from baseline conditions.</p> <p>Moderate resilience: community health and well-being is vulnerable to moderate adverse changes from baseline conditions.</p> <p>High resilience: community health and well-being is vulnerable to large adverse changes from baseline conditions .</p>
Magnitude	Refers to the expected size or severity of the residual effect. When evaluating magnitude of residual effects, consider the proportion of the VC affected within the spatial boundaries and the relative effect.	<p>Negligible: no measurable change from baseline conditions</p> <p>Low: a measurable change but effect cannot be distinguished from baseline conditions</p> <p>Moderate: a measurable change in determinates of community health and well-being which will not affect quality of life in the LAA</p> <p>High: a measurable change in determinates of community health and well-being which will affect quality of life in the LAA</p>
Geographic Extent	Refers to the spatial scale over which the residual effect is expected to occur.	<p>PDA: residual effects restricted to the PDA.</p> <p>LAA: residual effects extend into the LAA.</p> <p>RAA: residual effects extend into the RAA.</p>

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Duration	Refers to the length of time the residual effect persists—which may be longer than the duration of the physical work or activity that gave rise to the residual effect.	<p>Short term: residual effect restricted to the duration of the construction period or less.</p> <p>Medium term: residual effect extends past the construction period but less than the life of the Project.</p> <p>Long term: residual effect extends through the life of the Project.</p> <p>Permanent: residual effect is permanent.</p>
Reversibility	Pertains to whether or not the residual effect on the VC can be reversed once the physical work or activity causing the disturbance ceases.	<p>Reversible: residual effects will cease after project closure and decommissioning.</p> <p>Irreversible: residual effects will persist after the life of the Project.</p>
Frequency	Refers to how often the residual effect occurs and is usually closely related to the frequency of the physical work or activity causing the residual effect.	<p>Single event: residual effect occurs once.</p> <p>Multiple irregular event: residual effect reoccurs with no set schedule.</p> <p>Multiple regular event: residual effect reoccurs on a set schedule.</p> <p>Continuous: residual effect occurs continuously.</p>
Likelihood of Residual Effects		
Likelihood	Refers to whether or not a residual effect is likely to occur.	<p>L = Low probability of occurrence</p> <p>M = Medium probability of occurrence</p> <p>H = High probability of occurrence</p>

18.2.7 Significance Threshold for Residual Effects

A significant adverse effect on community health and well-being is one that results in changes to social determinants or diet and nutrition that will directly and indirectly, place increased demands on community and health services or infrastructure that exceeds current capacity, such that standards of service are routinely and persistently reduced below current levels for an extended period of time, potentially resulting in adverse health outcomes.

18.3 Baseline Conditions

18.3.1 Baseline Methods and Data Sources

Baseline data was collected through information interviews with key informants, community members and concerned stakeholders. Issues of importance to local and Aboriginal groups were identified through consultation with key informants and stakeholders; and the review of publically available literature and statistics. Relevant issues from Aboriginal groups were identified using existing traditional knowledge/traditional land use studies and secondary data sources.

A majority of community statistics are from 2006 census information. The results of the 2011 National Household Survey (NHS), a voluntary survey that replaced the census long form, are unavailable.

18.3.2 Overview of Baseline Conditions

Information presented in this section is categorized into five themes: population; labour force; income; education and social determinants of health.

18.3.2.1 Population

Between 2006 and 2011, the population of the LAA decreased by 2%, from 14,695 to 14,397 (Statistics Canada 2012). In 2011, male residents comprised approximately 50% of the population in the LAA (Statistics Canada 2012). The LAA has a higher percentage of people less than 19 years of age and between the ages of 50 to 54 than those aged 25 to 34 years. Persons aged 60 years and older represent the smallest portion of the total population.

Age cohorts differ between Aboriginal and non-Aboriginal populations in the Prince Rupert census area. Compared to provincial averages, in Prince Rupert there are relatively low percentages of Aboriginal people aged 25 to 39 (13.7%) and over the age of 49 years (19.1%) when compared to the non-Aboriginal population (Statistics Canada 2012). The implication is that young Aboriginal people, both on and off reserve, represent the largest potential workforce. The non-Aboriginal portion of the labour force is ageing with relatively few non-Aboriginal youth remaining in the communities.

In the LAA, in 2011, Aboriginal people comprised approximately 41% of the population, representing a 4 percentage point increase since 2006 (Statistics Canada 2012). A majority of Aboriginal people living off reserve in the LAA reside in Prince Rupert (95%) with another 5% living in Port Edward. Aboriginal people represent 51% of the total population of Port Edward and 38% of the total population of Prince Rupert (Statistics Canada 2012). The three reserves in the LAA (Lax Kw'alaams IR 1, S1/2 Tsimpsean IR 2 and Dolphin Island IR 1) have a combined population of 6,378, of whom 1,168 live on reserve. The on-reserve population is 18% of the registered population (registered population refers to the number of persons in a First Nation community who are registered as Indians under the *Indian Act*; also referred to as Status Indians). The rest of the population lives either on other reserve lands outside the RAA, on crown land or off reserve with a majority residing in Prince Rupert and other communities in BC. The on-reserve Aboriginal population is relatively young with 29.6% under the age of 15 (Statistics Canada 2007a). See Section 14 for more detail.

18.3.2.2 Labour Force

The labour force participation rate in the LAA dropped from 67.7% in 2006 to 65.5% in 2011 (Statistics Canada 2012). Comparative 2006 and 2011 data are not available for the Lax Kw'alaams First Nation and the S1/2 Tsimpsean reserve. In 2006, for the Lax Kw'alaams First Nation, the S1/2 Tsimpsean and Dolphin Island reserve labour force participation rates were 52.4% or less (Statistics Canada 2007a, 2007b). The majority of unemployed workers in the LAA reside in Prince Rupert (91%), where unemployment rates increased from 12.9% in 2006 to 14.6% in 2011 (Statistics Canada 2012). In the LAA the overall unemployment rate increased from 14% in 2006 to 15% in 2011 (Statistics Canada 2012). See Section 14 for more detail.

18.3.2.3 Income

Median income earnings reported for residents in British Columbia in 2010 was \$28,765; \$25,971 in the Skeena-Queen Charlotte Regional District (SQCRD); and \$28,432 in Prince Rupert Census Area (Prince Rupert CA – includes Prince Rupert and Port Edward) (Statistics Canada 2011). Median incomes for Aboriginal residents in the Prince Rupert CA (\$19,574) were 44% lower than the overall average (Statistics Canada 2007a). Individual residents of Dolphin Island 1 IR reported the lowest median incomes in the SQCRD of \$10,241 (Statistics Canada 2011). Median earning from full-time employment income for the SQCRD was \$48,567 lower than the provincial median of \$49,143 (Statistics Canada 2011). The Prince Rupert CA had median earnings from full-time employment of \$49,425 the highest median income in the SQCRD (Statistics Canada 2007). Meaning earnings from full time employment for Dolphin Island IR 1 was \$24,208, less than half that of median earning for the SQCRD (Statistics Canada 2007). See Section 14 for more detail.

18.3.2.4 Education

Information from the 2006 census and 2011 National Household Survey shows that there are major differences in educational attainment levels for Aboriginal and non-Aboriginal residents in the LAA. Between 2006 and 2011, there has been an increase in overall levels of educational attainment. In 2006, 52.8% of Aboriginal adults in Prince Rupert had not completed a high school education compared to 23.3% of non-Aboriginal adults (Statistics Canada 2007a, 2007b). Similarly, 14.7% of non-Aboriginal adults had a university certificate, degree or diploma, compared to 1.9% of Aboriginal adults (Statistics Canada 2007a, 2007b). The percentage of the adult population who had an apprenticeship or trades certificate or diploma in Prince Rupert as of 2006 was 8.1% for the Aboriginal population and 13.7% of the non-Aboriginal population (Statistics Canada 2007a, b). As of 2011, 30.0% of adults in Prince Rupert (people aged 15 years and older) had not completed high school and another 27.0% had completed high school but had no post-secondary training. In BC, 16.7% of adults had not completed high school and another 27.7% had only completed high school. See Section 14 for more detail.

18.3.2.5 Crime Rates

In the LAA, residents in Prince Rupert expressed “the highest dissatisfaction with the area as a place to live and also the highest percentage of residents feeling weakly attached to the local community” compared to other west and east coast communities experiencing similar economic decline (Dai 2006). Crime rates, an indicator of community well-being, are of concern to residents of the LAA (RCMP pers. comm. 2013). The rates are higher than the provincial average for serious crimes and serious drug crimes. In 2011, Prince Rupert had an average crime rate of 276.0 (MOJ BC 2012). Violent crimes include homicides, attempted murders, assaults (sexual and other), other sexual offences, abductions and robberies. Table 18-4 shows that juvenile violent and property crime and serious drug crime, in particular, are high in the area compared to provincial averages.

Table 18-4: Crime Rate Averages from 2008 to 2010

Crime Type Ages		Average Crime (average 2008-2010)	
		BC	Prince Rupert
Serious Crime (Violent and Property Crime per 1,000 population)	All Ages	11.1	13.9
	Juvenile (12-17)	3.8	10.9
Serious Drug Crime (non-Cannabis related per 100, 000 population)	All Ages	193.6	380.5
	Juvenile (12-17)	46.4	26.2

SOURCE:

Vital Statistics Agency, Ministry of Health and BC Stats, Prepared by BC Stats

Organized crime interests are suspected of seeing large camps of transient workers with no connection to the community as an opportunity to make money. According to RCMP, there is currently a moderate drug issue related to cocaine, marijuana and prescription medication in Prince Rupert (RCMP 2013, pers. comm.).

18.3.2.6 Health Behaviour Measures**Drug and Alcohol Use**

The rate of alcohol-attributed deaths in Prince Rupert between 2003 and 2007 was higher (14.5%) than the provincial average (10.6%) (NH 2010). In 2008, of BC's five regional health authorities, Northern Health (includes Health Service Delivery area: Northeast, Northwest, and Northern Interior) had the highest estimated rate of hospitalizations related to alcohol and drug use and the highest mortality rates associated with alcohol use (NH 2010). Northern Health community profiles show that alcohol sales and consumption per capita in 2009 were higher in the Prince Rupert local health authority (\$1,006 and 163 L) compared to the province of BC (\$801 and 112 L) (NH 2010).

Gambling

According to the Provincial Health Office, there are insufficient data on problem gambling in Prince Rupert; data are suppressed to protect confidentiality based on limited data sets (PHO pers. comm. 2013). In 2009, the Province's Health Officer's Annual Report indicated that the percentage of problem gamblers in BC more than doubled, increasing from 0.4% (13,000) to 0.9% (31,000) from 2004 (PHO 2009). However, it is not possible to assess the level of problem gambling in Prince Rupert given the lack of reliable data.

Community Cohesion

Community cohesion, measured through indices, based on social determinants of health, is used to illustrate the susceptibility of communities and disadvantaged individuals and groups to social change (Habitat 2013). Rates of community engagement and volunteerism are often associated with community cohesion and resilience; that is, where community cohesion is resilient to change, higher rates of community engagement and volunteerism occur.

Socio-economic indices compiled by BCStats ranked 78 communities in BC in 2012 on a 'worst to best' case scale comparing various indicators of community well-being. In terms of ranking, 1 is the

worst possible ranking and 78 the best. Table 18-5 presents 2012 rankings for Prince Rupert and Vancouver (for comparison). Rankings are unavailable for Port Edward.

Table 18-5: Socio-Economic Composite Index Rankings 2012 – Prince Rupert

Community	Composite Index						
	Overall	Human Economic Hardship	Crime	Health	Education	Children-at-Risk	Youth-at-Risk
Prince Rupert	3	2	20	25	5	2	1
Vancouver	62	29	22	77	66	63	43

SOURCE: BCStats 2013

Social determinants of health driving poor rankings in Prince Rupert are related to drug offences (juvenile and adult), low educational attainment and higher percentage of persons on income assistance. These social determinants of health drive down rankings of human economic hardship, education, children at risk and youth at risk. Comparatively, Vancouver's poor ranking in human economic hardship is primarily attributed to the high percentage of seniors receiving maximum GIS (ranked 3) and poor rankings in crime and youth-at-risk attributed to high rates of serious violent crime.

18.3.2.7 Physical and Mental Health Conditions

Infectious Disease

Due to high density living in camps and overcrowding in households, infectious disease is a common problem in resource development projects. Rates of reportable infectious diseases for BC and the Northwest HSDA are presented in Table 18-6. Of these diseases sexually transmitted, infectious respiratory and gastrointestinal illnesses are most relevant to the assessment.

Table 18-6: 2011 Rates of Reportable Infectious Disease BC and Northwest HSDA

Infectious Disease	Rate per 100,000 population	
	BC	Northwest HSDA
Sexually Transmitted and Bloodborne Pathogens		
HIV	5.1	5.3
AIDS	1.5	0.0
Chlamydia (genital)	267.5	491.5
Gonorrhea (genital)	28	30.5
Hepatitis B (Chronic and Unknown)	23.2	10.6
Hepatitis B (Acute)	0.3	0.0
Hepatitis C	40.8	39.7
Infectious Syphilis	8.0	1.3
Disease Transmitted by Respiratory Routes		
Streptococcal Disease (Invasive)	3.1	9.3
Tuberculosis	6.3	1.3

Infectious Disease	Rate per 100,000 population	
	BC	Northwest HSDA
Enteric, Food and Waterborne Diseases		
Amebiasis	7.4	1.3
Campylobacteriosis	40.1	14.6
Cryptosporidiosis	1.6	1.3
Cyclosporiasis	0.5	-
Shigatoxigenic E. Coli	2.9	1.3
Giardiasis	13.3	9.3
Hepatitis A	0.8	1.3
Listeriosis	0.3	0.0
Salmonellosis	20.1	11.9
Typhoid Fever	0.6	-
Paratyphoid Fever	0.5	-
Shigellosis	3.8	0.0
Vibrio Infection	1.2	1.3
Yersiniosis	8.5	2.6
Vectorborne and Zoonotic Diseases		
Lyme Disease	0.4	0.0
Malaria	0.8	0.0
Rabies Exposures	-	3
West Nile Virus	0.0	-
Environmental Pathogens		
Cryptococcus gattii	0.7	0.0
Legionellosis	0.2	0.0

NOTES:

- Denotes data is unavailable

SOURCE: BCCDC 2012

18.3.2.8 Mental Health

Self-perceived mental health and clinically diagnosed cases of depression and anxiety in the Northwest HSDA are reported to be, respectively, worse and higher than the rest of the province (PHSA 2010: 55). To be considered depressed or to have anxiety, a person must have had one mental health hospitalization or two mental health medical claims within the last twelve months of the survey; per capita mental health hospitalizations and mental health claims in 2008 were greater in the Northwest HSDA than the rest of the Northern Health Region. In 2008, the Northwest HSDA had the second highest provincial ranking of reported mental health problems; the worst ranking in the Northern Health Region at 23.2% versus 18.8% in the Northeast HSDA and the Northern Interior HSDA at 21.2% (PHSA 2010: 39).

2011 census information shows that 5.6% of the total population is divorced and 3.2% of the total population is separated. Divorce percentages for the total population are lower (5.6%) than the province (6.6%) and the nation (6.0%), whereas those who are separated are higher (3.2%) than the province (2.7%) and nation (2.5%). High rates of divorce and separation are linked to increased rates of mental illness (Dai 2006).

18.3.2.9 Causes of Death

Information from 2002 to 2006 indicates that the Northwest HSDA, when compared to the province, has higher rates of mortality and potential years of life lost due to external causes (Table 18-7).

Table 18-7: Selected External Causes of Death, Potential Years of Life Lost Standardized Rates by Northern Health Authority, Other Residents (not including Status Indians) 2002-2006

Selected External Causes of Death	Rate per 100,000 population	
	Northwest HSDA	BC
Total External Deaths	65.5	42.7
Suicide	0.98	0.97
Motor Vehicle Accidents	1.7	0.9
Accidental Poisoning	0.4	0.6
Endocrine, Nutritional, Metabolic	3.51	2.19
Unintentional Injuries	3.6	2.6
Smoking Attributable Deaths	13.9	10.7
Drug Induced Deaths	0.54	0.83
HIV	0.0	0.2
All Cancer	17.9	15.5
Lung Cancer	5.5	4.1
Diabetes	3.0	1.7
Infectious Disease and Parasitic Diseases	0.77	0.97

SOURCE:

Vital Statistics Agency, 2008; prepared by Health Sector IM/IT Division, Ministry of Health Services, and Population Health Surveillance and Epidemiology, Ministry of Healthy Living and Sport, 2008.

18.3.2.10 Health Infrastructure

Health Infrastructure and Services care services in BC are managed and delivered by six health authorities responsible for delivering health care (five geographic health authorities and the Provincial Health Services Authority responsible for province-wide programs). Statistics Canada's health regions are defined by the HSDA's, which are governed at the health authority level. The five health regions are Interior Health Region, Fraser Health Region, Vancouver Coastal Health Region, Vancouver Island Health Region and Northern Health Region. Each of these five health regions consist of three to four health service delivery areas. The relevant legislation for BC's HSDA are

Health Authorities Amendment Act, Statutes of B.C. 2002 (see B.C. Regulation 225/2003 also);
Health Authorities Act Chapter 180 (and associated Regulations) (StatsCan 2009).

Health care services in Prince Rupert are provided by the Northern Health Authority (Northern Health), funded by the provincial Ministry of Health. Northern Health covers approximately 64% of BC and it is divided into three Health Service Delivery Areas: Northwest, Northern Interior and Northeast. Prince Rupert and Port Edward lie within the Northwest Health Services Delivery Area.

There are four facilities providing health care services in the region:

- Prince Rupert Regional Hospital- a 24-bed (20 acute-care beds, two maternity beds and two intensive-care beds) facility which full-range of services including diagnostics, ultrasound, CAT scan, surgery, emergency, day care, acute care, and extended care with additional services such as diabetes education, healthy heart and rehabilitation programs.
- Prince Rupert Community Health- a health care clinic.
- Summit Residences- an assisted living facility that provides meals and support for people who can take care of most but not all of their living needs.
- Acropolis Manor- a long-term care residential facility which provides all care needs for elderly people who cannot live independently. It is a residential care facility which features a 15-apartment Summit Residences assisted living facility, adult day care, and a chapel (Northern Health, no date).

The Prince Rupert Regional Hospital is at 90% to 95% capacity. Inpatient demand often exceeds available capacity in terms of hospital beds. When capacity is exceeded, the Prince Rupert Regional Hospital uses BC Bedline service to find vacancies in other hospitals. A review of Prince Rupert's medical facilities indicates that despite challenges in attracting new staff and limited excess capacity, the Prince Rupert Regional Hospital offers more medical services than some other medical facilities in Northern BC (The Northern View 2012). For services and infrastructure targeted at addressing mental health, excess capacity currently exists within the LAA (The Northern View 2012).

In 2011-12, Northern Health invested \$3.38 million into the infrastructure of Prince Rupert Regional Hospital, including lab and pharmacy renovations and medical air systems upgrades. In the Northwest HSDA, there were 178 physicians per 100,000 population as of January 2013 (Statistics Canada 2013). This is less than the national and provincial ratios in 2011 (209 and 212 physicians per 100,000 population, respectively). According to Northern Health there are 15 general practitioners in the community and seven specialists in the areas of pediatrics, radiology, obstetrics, gynecology, surgery, internal medicine, podiatry and orthopedics. Visiting specialists provide other specialties from time to time. In 2010, Prince Rupert had nine dentists (PRPEEDC 2010). In 2008, there were 13 physicians (ratio 1.0:1,000) and 9 dentists (ratio 0.7:1,000) (COP IRCP 2008:57).

The following are other community and non-profit organization facilities and services committed to community health in LHA 52 (COP DOS 2013):

- Acropolis Manor (Adult Day Program and Respite Care)
- Prince Rupert Community Health
- Friendship House Association (Aboriginal, Aboriginal Child & Youth Mental Health)
- Northern Health & Salvation Army (Nursing, Outreach & Counseling (NOC))

- City of Prince Rupert Community Consultation Sessions Program
- BC Schizophrenia Society
- Men's Health Support & Events
- Annual All Native Basketball Tournament Events
- Senior Center and Activities
- Prince Rupert Aboriginal Community Services (Patient Travel Program)
- The Prince Rupert Community Garden Initiative
- Prince Rupert Association for Community Living (Advocacy Service)
- Prince Rupert Community Enrichment Society (Community-Based Victim Services)
- Kalen Anti-Poverty Society
- Kalen Island Anti-Poverty Society (Free Store & Support Services)
- North Coast Victim Support Services
- The Alcohol and Drug Information and Referral Line (Emergency and Health Services Commission)
- Victim Link
- Youth Against Violence
- United Way.

The ambulance service in Prince Rupert is provided by the public British Columbia Ambulance Service (BCAS). Medivac service is available in the Prince Rupert region (Hartley Bay, Kitkatla, Dona River and Port Simpson), as well as Terrace and North (Kitimat, New Aiyansh, Greenville). Haida Gwaii also receives Medivac service. Prince Rupert has one of three Sikorski S76 helicopters in the Province with a dedicated flight crew on call. The staff can provide services while in flight, with the exception of Advanced Cardiac Care (PRCMDFE 2012).

The 911 Dispatch Centre, located in the Prince Rupert Fire Rescue Department since 2004, answers all 911 calls made in the Prince Rupert and Port Edward area. The 911 Dispatch Centre is manned 24 hours a day by four full-time dispatchers working rotating 12-hour shifts. Vacation and sick relief coverage is provided by four additional part-time dispatchers. On average, the Prince Rupert 911 Call Centre receives about 5,000 emergency calls annually and in 2012 this number reached 7,042, an increase of approximately 15% since 2009 (COPR 2007; FireWise 2012).

18.3.2.11 Diet and Nutrition

Use of country foods to supplement market diets is essential to Aboriginal and non-Aboriginal residents of northern Canada (University of Northern British Columbia and Assembly of First Nations 2011). Publicly available information on the consumption of country food in northwestern BC is limited, especially with reference to non-Aboriginal people; however, consultation, marine use and resource studies conducted for this assessment show that a majority of Aboriginal and non-Aboriginal people living in Port Edward and Prince Rupert rely on marine resources to supplement family income and diets.

For Aboriginal people, country foods (wild plants and animals) are a vital source of nutrients and are used to supplement, and in some cases comprise, diets (University of Northern British Columbia and Assembly of First Nations 2011). Country foods also serve an important role in the cultural identity of Aboriginal people. Drawing from the First Nations Food, Nutrition and Environment Study, the following percentage of coastal First Nations consumed country foods (by food type) in 2009 (University of Northern British Columbia and Assembly of First Nations 2011):

- 99% consumed fish (salmon, hearing roe, eulachon grease, trout)
- 91% consumed beach foods (clams, crab, octopus, kelp)
- 5% consumed sea mammals (harbour seal meat, harbour seal fat, sea lion meat)
- 79% consumed land mammals (moose meat, deer meat, rabbit, moose kidney)
- 12% consumed wild birds (grouse, ducks, geese)
- 85% consumed wild berries (soapberries, Saskatoon berries, Indian plum)
- 18% consumed wild plant roots, shoots or greens (Labrador tea, balsam rood, bracken fern root)
- 5% consumed tree foods (balsam pitch, birch inner bark)
- 22% consumed mushrooms (pine, chanterelle, morel).

Researchers have characterized the amount of fish caught for Aboriginal subsistence as 'significant.' Researchers estimate that 15,000 tonnes of fish per year (close to one-third of the Canadian inland fishery sector) were caught by Aboriginal fishers (Berkes 1990). On the North and Central coast

Roughly a third of all [Aboriginal] residents' meals consist of seafood. In addition, much of the seafood is eaten non-commercially and harvested with residents often playing a role in the processing or harvesting of the seafood consumed. Time spent on these activities ranged from 0 to over 100 hours annually (FERENCE Weicker & Company 2009).

Across Canada, the consumption of traditional foods in Aboriginal communities has declined in the past 50 years partially due to increased access to commercial foods. This change in diet is generally linked to increasing incidents of obesity, diabetes and glucose intolerance in communities, along other chronic non-communicable diseases (UGFSN 2009; Batal et al. 2005).

Concerns regarding food security and quality have become common among Aboriginal groups where resource development is occurring (University of Northern British Columbia and Assembly of First Nations 2011). Changes to the availability of country foods affecting consumption levels or abilities to engage in harvesting activities can adversely affect the physical, emotional, social, and spiritual health of Aboriginal people (University of Northern British Columbia and Assembly of First Nations 2011). Concerns regarding potential contamination of country foods, whether measured or perceived, can affect decisions to consume country foods or engage in harvesting activities.

18.4 Project Interactions with Community Health and Well-Being

Table 18-8 presents the ranking of potential environmental effects resulting from interactions of community health and well-being with project activities.

Table 18-8: Potential Effects on Community Health and Well-Being

Project Activities and Physical Works	Potential Effects	
	Change in Social Determinants of Health	Change in Diet and Nutrition
Construction		
Site Preparation (land-based)	2	2
Onshore Construction	2	2
Vehicle Traffic	1	0
Dredging	2	1
Marine Construction	2	2
Waste Management and Disposal	0	0
Disposal at Sea	0	0
Operational Testing and Commissioning	0	2
Site Clean Up and Reclamation	1	1
Operations		
Operation of LNG Facility and Supporting Infrastructure on Lelu Island	2	2
Marine Terminal Use	2	2
Shipping	2	2
Waste Management and Disposal	0	0
Fish Habitat Offsetting	0	0
Wetland Habitat Compensation	0	0
Decommissioning		
Dismantling Facility and Supporting Infrastructure	1	1
Dismantling of Marine Terminal	1	1
Waste Disposal	1	1
Site Clean Up and Reclamation	1	1

KEY:

0 = No or negligible adverse effect expected; no further consideration warranted.

1 = Potential adverse effect requiring additional mitigation; warrants further consideration.

2 = Key interaction resulting in potential significant adverse effect or significant concern; warrants further detailed consideration.

18.4.1 Justification of Interaction Rankings

Vehicle traffic, waste management and disposal, disposal at sea, operational testing and commissioning, fish habitat offsetting and wetland habitat offsetting are not expected to affect access or availability of country foods and therefore no interaction with diet and nutrition is expected. Because no interaction is expected a rank of 0 has been assigned, and is not assessed further. Waste management and disposal (during construction and operations), disposal at sea, operational testing and commissioning, fish habitat offsetting, and wetland habitat compensation are not expected to lead to changes in social determinants of health or diet and nutrition. These interactions are ranked 0 and are not assessed further.

Interactions between vehicle traffic and social determinants of health with potential adverse effects have been ranked as 1, therefore requiring some mitigation. This interaction is considered here. Consultation has identified concerns that increased road traffic could lead to increased demand for emergency response. Increased demand on health infrastructure and services associated with traffic related incidents is not expected to exceed current capacity and is expected to be manageable to acceptable levels through the application of standard operating procedures and best management practices. Because this interaction can be mitigated through use of current resources, no additional analysis is warranted.

Interactions between dredging and diet and nutrition with potential for adverse effects have been ranked as 1, therefore requiring some mitigation. The availability of marine country foods is anticipated to be affected during dredging operations resulting from changes in fish habitat, direct mortality or physical injury of marine species, change in behaviour, and change in sediment or water quality (see Section 13). Based on the magnitude of the area to be dredged (see Section 13 and 15) effects on the availability of country foods are not expected to result in changes to the composition of diets. Marine areas undisturbed by dredging operations in the LAA support sufficient supply of country foods such that changes in availability in dredged areas are expected to result in changes in the composition of local diets. Because the magnitude of effects caused by dredging operations can be mitigated (see Section 13) and the harvestable areas can be mitigated through best management practices, no additional analysis is warranted.

Interactions between dismantling of the facility, supporting infrastructure and marine terminal as well as waste disposal and site cleanup and reclamation, and both social determinants of health and diet and nutrition with potential for adverse effects have been ranked as 1, therefore requiring some mitigation. These activities could affect social determinants of health through changes in housing demand. However, this interaction is expected to be intermittent and of short duration, with no additional mitigation beyond standard operating procedures required. The availability of marine country foods could be affected by decommissioning activities; for example by temporarily limiting access to some harvest areas. However, the effects will occur over a short term, and mitigations developed during the preparation of the decommissioning plan will limit potential effects. Because this interaction can be mitigated with standard operating procedures (including the decommissioning plan), no additional analysis is warranted.

Interactions ranked as 2 are discussed in detail in Section 18.5.

18.5 Effects Assessment

18.5.1 Analytical Methods

18.5.1.1 Analytical Assessment Techniques

To determine changes to community health and well-being, measurable parameters associated with the effects change in social determinants of health and change in diet and nutrition are assessed. Incorporation of consultation outcomes, previous research and official community plans provide a threshold for the limits of acceptable changes. Changes to community health and well-being also draws on effects assessment outcomes for other VC's to assess effects on the VC community health and well-being.

The approach examines the relationship between socio-economic status such as labour participation rates, income levels, educational levels etc. and health status (De Maio 2010; Marmot and Wilkonson 2006; Carson et al. 2007; Health Canada 2004, 2011). In this context, "health encompasses social, economic, cultural and psychological well-being, and the ability to adapt to the stresses of daily life" (Health Canada 2004).

18.5.1.2 Assumptions and the Conservative Approach

The ability to understand baseline conditions and to predict potential effects is limited because of inherent uncertainties associated with incomplete information and changing socio-economic conditions. A conservative approach (one that likely overstates environmental effects) is used to reduce the potential to understate the significance of an effect.

18.5.2 Changes to Social Determinants of Health

18.5.2.1 Potential Effects

The Project has the potential to affect social determinants of health through changes in population, education, employment and income, housing, community cohesion, physical and mental health conditions, recreational opportunities and health infrastructure and services. Project construction and operation could potentially affect diet and nutrition through changes in access to terrestrial and marine harvesting areas and through changes in the availability of country foods.

Population

It is anticipated that project construction could create 340 annual jobs for RAA residents with 59% of jobs related to direct project employment (200 positions) and the balance associated with indirect (100 positions) and induced (40 positions) employment. Efforts will be made to hire local residents of the RAA where possible; however, task specific requirements for skilled labour (such as trades people) may result in the hiring of non-local residents. It is anticipated that demographic change associated with the in-migration of workers and their families to the LAA associated with project construction will be limited (see Section 14).

Project operations could result in 680 jobs for existing residents of the RAA, 260 direct employment positions, 140 direct-contract positions, 120 indirect positions and 160 induced positions (see Section 14). An additional 120 jobs could be created for new residents moving to the RAA with their families of which 74 are anticipated to be direct positions and 46 direct-contract positions (see Section 14). It is anticipated that workers and their families who in-migrate to the LAA for operations will do so gradually as the Project progresses from construction to operation. Considering the population size of Prince Rupert, in-migrating workers are not anticipated to result in rapid population change. In-migrating workers to Port Edward could result in rapid population change based on its current relatively small population.

Education, Employment and Income

Construction

During peak construction, the Project will require approximately 3,500 to 4,500 workers. Construction workers skilled in trades and construction management as well as general labourers will be required. It is anticipated that workers skilled in trades will be in greatest demand during site preparation, onshore construction and marine construction activities (see Section 14 for anticipated worker requirements). In addition to direct employment, the Project is expected to result in increased indirect and induced employment. It is expected that less skilled workers will primarily benefit from indirect and induced employment (approximately 140 positions during construction) (see Section 14 for estimated indirect and induced employment figures).

The supply of skilled workers in the LAA available to participate in project construction is limited. Industrial construction in the LAA currently employs close to 700 construction workers; yet, in 2011 there were approximately 330 workers with experience in construction trades in the RAA (BC MJTST 2013; Statistics Canada 2013). Rotational skilled workers for construction trades are used to meet required labour demands in the LAA. Market response to increased demand for skilled workers could result in beneficial effects to education levels within the LAA. Individuals seeking employment with the Project either through direct, indirect or induced work may choose to increase their level of education to meet hiring requirements. Individuals who increase their level of education would have a beneficial effect on the availability of skilled labour in the LAA. These individuals may also be more successful in securing employment and potentially improve individual and household income levels.

It is anticipated that 340 local workers will be involved in project construction. These workers will maintain a primary residence within the LAA, foregoing the need to reside at the construction camp on Lelu Island. However, the available supply of skilled workers in construction trades in the LAA is limited; therefore, the Project's beneficial effects on the local labour market are predicted to be modest.

Operation

During operations, approximately 680 jobs will be created for existing residents of the RAA with an additional 120 for in-migrating new residents. These positions will require both skilled workers and labourers. It is anticipated that most positions will require some degree of job specific training or specialization (see Section 14 for more detail). Existing local workers employed by the Project will

have a beneficial effect on labour participation rates within the LAA. Beneficial effects on individual and household income levels are expected as a result of employment with the Project.

Similar to project construction, there is the potential that market response to increased demand for skilled workers could result in increased educational attainment in the LAA. In an effort to meet hiring requirements it is expected that some local residents will seek to increase their level of education to secure employment with the Project. This response would have beneficial effects on the supply of skilled labour in the LAA and could result in beneficial effects to individual and household income levels.

Housing

Construction

Supplementing the available supply of local skilled workers, non-local workers will be flown into the LAA on a rotational basis. Rotational workers will be transported to and from the Prince Rupert Airport or the Northwest Regional Airport Terrace-Kitimat and the majority will reside at the construction camp on Lelu Island. Workers employed on rotational shifts will maintain a primary residence outside the LAA. Rotational workers will have a temporary effect on local population demographics; however, due to the nature of their employment and living accommodations these effects will largely be restricted to the PDA with limited effects on communities within the LAA.

Workers hired from outside the LAA prior to the establishment of the construction camp on Lelu Island will increase demand for rental housing and temporary accommodations such as hotels and motels in Prince Rupert and Port Edward. Considering that the vacancy rate of rental units in Prince Rupert steadily dropped from 13.6% in 2011 to 0.5% in 2013 (CMHC 2012), additional demand is expected to exceed available capacity (see Section 16). During consultation, challenges associated with securing accommodation in the LAA were illustrated by health care professionals who noted that rotational and in-migrating staff is currently experiencing difficulty in finding both temporary and permanent accommodation in the LAA (Gordon-Payne pers. comm. 2013). Considering the current capacity of hotels, motels and rental housing, there is insufficient supply of temporary housing to satisfy increased demand during project construction.

Operation

It is expected that during operations, non-local workers employed by the Project will relocate to the LAA, becoming members of local communities. It is expected that operations will primarily increase demand for owner-occupied housing. The housing of visiting administrative personal and, on occasion, subcontractors and other workers in Port Edward and Prince Rupert will have limited effects on rental housing availability. Changes in demand for rental housing and owner-occupied housing is not expected to exceed available capacity (see Section 16). Increased demand for owner-occupied housing could result in increased housing costs in the LAA (see Section 14 and Section 16).

Community Cohesion

Community cohesion refers to ability to withstand incremental changes in social determinants of health resilience by communities and disadvantaged individuals and groups. Measures of community cohesion are children-at-risk, youth-at-risk, homelessness and at risk homelessness, crime rates, health behaviours, and community participation and volunteerism. These measures were identified through

consultation and highlighted through baseline studies most applicable to the LAA. Rapid population and demographic change affect social determinants of health influencing measures of community cohesion. Population and demographic changes is therefore a substantial driver to community cohesion.

Children-at-Risk

The children-at-risk composite index measured by BCStats considers the following social determinants of health: number of children on income assistance, children in care, infant mortality rates, the percentage of children in grades four and seven below standard reading levels, serious juvenile crime ages 12-17 (charges in violent crime, property crime and non-cannabis drug charges), hospitalization rates (respiratory diseases and injury and poisoning), teen pregnancies and children in need of protection (BCStats 2013). As of 2012, Prince Rupert is ranked as being the second worst community of 78 BC communities for children-at-risk. Of these measured social determinants of health, Prince Rupert ranked the worst for children on income assistance (ages 0-14) and fifth worst for total serious juvenile crime (ages 12-17).

Through the creation of employment and project hiring requirements, the percentage of children (0-14) on income assistance could be positively affected as household incomes in the LAA increase as local workers secure employment. The percentage of children (0-14) on income assistance is partially negatively correlated with household educational attainment; that is, the greater household educational attainment the lower the percentage of children (0-14) on income assistance (Habitat 2013). Considering project hiring requirements of mostly skilled workers, there is the possibility that the percentage of children (0-14) on income assistance could increase or that no positive change could occur because employment could be secured by more skilled workers moving to the LAA in search of employment. However, through targeted awareness and training and local hiring requirements adverse effects on the percentage of children (0-14) on income assistance is anticipated to be minimal.

Juvenile crime rates (12-17) are indicative of adult crime rates, low household incomes and are often linked to household dysfunction (Habitat 2013). Potential effects on adult crime rates are assessed below. Common to most social determinants of health used to measure children-at-risk, household income is negatively correlated with juvenile crime rates; that is, low household income is associated with higher rates of juvenile crime. Using the same rationale as presented above, through increased employment and local hiring requirements household income in the LAA could increase as a result of the Project positively affecting juvenile crime rates. Similar risks exist with respect to employment being secured by non-local residents and increased or non-improved rates of juvenile crime (12-17); however, as previously noted targeted awareness and training and local hiring requirements will limit adverse effects on juvenile crime rates (12-17).

Household dysfunction can be associated with higher rates of juvenile crime (12-17) (Habitat 2013). Increased occurrences of household dysfunction could result from increased negative coping behaviours (see health behaviours below) or from changes to time spent at home by income earners. Rotational workers and workers who are employed in the LAA but maintain a residence elsewhere may be absent from important family engagements and add strain through increased stress on family relationships (Habitat 2013; ACELG 2012; FRBC 2012; Spyce 2010). Continued absence could affect family dynamics.

Youth-at-Risk

Similar to children-at-risk, BCStats compiles a composite youth-at-risk index drawing on various social determinants of health; in particular, the percentage of youth (15-24) on income assistance, the percentage of 18 year olds who did not graduate, total serious crime, hospitalizations due to motor vehicle accidents, non-cannabis drug offences, and the percentage of the population age 15-24 receiving employment insurance. As of 2012, Prince Rupert was ranked as being 78 of 78 BC communities for youth-at-risk. Of these measured social determinants of health, Prince Rupert ranked the worst for the percentage of youth (15-24) on income assistance and second worst for non-cannabis drug offences.

In advance of the construction phase, PNW LNG has begun funding skills training programs, such as the Coastal Pathways Partnership, to ensure that LAA residents have access to resources to enhance their skills-base. PNW LNG has opened a community office in Prince Rupert, with local staff, to assist LAA residents in determining the skills needed for a variety of construction and operational positions. It is anticipated that though increased awareness and the funding of skills training programs such as Coastal Pathways local youth may be more successful in securing employment with the Project having a positive effect on youth-at-risk rates.

Despite increased training opportunities youth (15-24) may not realize employment benefits with the Project as the average age of construction and operation workers in oil and gas industries in Canada is 50-54 years of age with those 15-19 years of age representing the smallest age cohort of workers (RMWB, 2013). Potential changes to individual and household income through secured employment on the Project, which would have a positive effect on the percentage of youth (15-24) on income assistance, is anticipated to be limited without the application of mitigation targeted at increasing youth employment. Increased percentages of youth (15-24) on income assistance as a result of visiting rotational workforces is not anticipated as workers and their families will not be relocating to the LAA thus removing the potential for increased youth unemployment. The percentage of youth (15-24) on income assistance could increase during operations, however, based on potential population change as a result of in-migrating workers potential changes are expected to be minimal.

Youth non-cannabis drug offences could increase if unmitigated during construction; local RCMP have noted that remote construction camp workforces have been linked to increased drug trafficking and use (pers. comm. 2013). Crime prevention mitigation (see Section 16) and workforce drug and alcohol policies are anticipated to limit potential increased rates of youth non-cannabis drug offences.

Homelessness and at-Risk Homelessness

Access to affordable and adequate housing affects community cohesion by lowering the percentage of a household's income spent on housing costs (increasing disposable income used for positive activities such as recreation and healthy eating) and lowers rates of at-risk homelessness and homelessness. Individuals who spend less than 30% of their income on housing costs have higher levels of perceived mental health, are more physically active, and are more likely to engage in community and volunteer activities (Christensen 2012). Changes to local demographics could affect the affordability of housing in the LAA; however, due to the accommodation of a majority of construction workers in the construction camp on Lelu Island and the limited in-migration of operational workers, changes to housing affordability is anticipated to be minimal (see Section 14 and 16).

Crime Rates

Drawing from baseline conditions, rates of serious crime and serious drug crime (non-cannabis related) are higher in the LAA than the provincial average. BCStats' composite index ranks Prince Rupert 20th of 78 communities in terms of crime rates with serious violent crime ranked sixth highest and rates of non-cannabis drug offences second highest in the province.

While there exists the potential that serious violent crime (homicide, attempted murder, sexual and non-sexual assault) could result from changes in population, the nature of employment and accommodation of the rotational construction workforce will limit exposure of workers to individuals living in the LAA; this will lower the potential for serious violent crime; assault resulting from bar brawls; and similar situations that have been identified through consultation as being of greatest concern.

Combined with crime prevention mitigations (see Section 16) and workforce drug and alcohol policies, changes to crime rates related to serious violent crime and non-cannabis drug offences are anticipated to be minimal.

Health Behaviours

Increased employment and levels of individual and household income (including disposable income) as well as increased levels of stress associated with securing employment can increase the occurrence of negative coping behaviours such as drug and alcohol abuse and reckless behaviour within a community (Habitat 2013; ACELG 2012). Individually increased rates of drug and alcohol use and reckless behaviour could prove detrimental to a person's mental and physical health. Collectively, higher rates of negative coping behaviours could increase demand on health infrastructure and services potentially affecting quality and use. Section 18.3.2.10 describes support and health programs offered in the LAA that positively influence social determinants of health. Through mitigation measures targeted at providing training and employment coaching as well as through employee assistance programs offered through employee benefit programs potential effects related to health behaviours will be limited.

Community Participation and Volunteerism

Participation in community events and positive rates of volunteerism within a community are positively correlated with higher levels of individual and household income, secure employment, low crime rates, and positive health and health behaviours (Habitat 2013). Potential adverse effects highlighted in the above sections affect the ability and willingness of individuals to participate in community events and donate time to volunteer activities. Changes to social determinates of health as a result of the population change could affect community participation and volunteerism; however, through mitigations targeted at lowering adverse effects on each social determinant of health the extent to which community participation and volunteerism could be affected is expected to be minimal.

Physical and Mental Health Conditions

Construction

Individuals successful in securing employment during construction could realize improved mental and physical health because stable employment and income is associated with lower levels of stress and depressive symptoms, more frequent healthy eating, increased physical activity and less drug and alcohol use (Rosenthal et al., 2012; Bartley et al in ed. Marmot and Wilkonson 2006).

The physical and mental health of individuals unable to secure employment due to limited education, skills or for other socio-economic or physical reasons may be negatively affected. The inability to secure employment could increase stress and depressive symptoms and lead to poor eating habits, less physical activity or drug and alcohol use. Within the LAA, the inability of some community members to secure employment due to a lack of training and skills is perceived to have increased levels of stress and depression leading to poor eating habits, drug and alcohol use and divorce and separation (Dai 2006). Individuals currently unemployed and those already suffering from a general lack of positive mental or physical health may be more susceptible to adverse effects resulting from the inability to secure employment (Rosenthal et al. 2012; Bartley et al. in ed. Marmot and Wilkonson 2006).

Resource development and rotational workforces are often related to increased rates of transmission of infectious disease (Habitat 2013; ACELG 2012; FRBC 2012; Spyce 2010; Dai and Taylor 2009; Dai 2006). Considering a construction workforce of at least 4,500 workers and the 'fly-in fly-out' rotational nature of their employment, there is the potential that the rate of airborne infectious disease in the LAA could increase (Habitat 2013). Rotational workforces are often commonly linked to increased rates of sexually transmitted infections (Habitat 2013).

Operation

Similar to workers who secure employment during construction, those employed during operations could realize improved mental and physical health. Alternatively, the mental and physical health of workers unable to secure employment during operations may be adversely affected.

Health Infrastructure and Services

Increased demand resulting from the in-migration of non-local workers and their families could affect quality, access and use of infrastructure and services in the LAA (see Section 16).

Increased demand for health infrastructure and services will occur during all phases of the Project because of in-migrating workers and their families to the LAA. It is expected that demand will be greatest during construction. During construction and operations, workers seeking first aid attention will be primarily treated by onsite mobile medical services and facilities (medics and ambulances). Additional services will be offered during construction and operation through first aid facilities located at the construction camp on Lelu Island. Mandatory first aid training and adherence to WorkSafeBC and corporate health and safety plans will reduce increased demand from in-migrating workers. While on-site first aid facilities will be available for minor injuries and ailments, increased demand of emergency services and specialized medical treatment may occur. Increased demand for sexual health clinics and related services and infrastructure could also affect the quality of service offered in the LAA.

Recreational Opportunities

Facilitating physical activity and recreation, parks and eco-tourism destinations are linked to improved physical and mental health (Canadian Parks and Recreation Association [CPRA] 2013). Restricting access to recreational locations could lead to negative psycho-social conditions and affect perceived sense of place, ultimately affecting perceived quality of life (Budruk & Wilhelm Stanis, 2013; Payne & Schaumleffel, 2008).

From baseline information, area use data and comments received during consultation, limiting access to Lelu Island and marine areas adjacent to trestle infrastructure is not expected to reduce the supply of spatially distributed recreational areas or infrastructure within the LAA in such a magnitude that the remaining supply of recreational locations is insufficient for meeting citizen demand.

See Section 17 (Visual Quality), Section 16 (Infrastructure and Services) and Section 15 (Navigation and Marine Resource Use) for more information on potential effects on recreation.

18.5.2.2 Mitigation

PNW LNG recognizes that there needs to be management of social issues to protect the quality of life and to maintain (and enhance) community health and well-being. Mitigation measures to reduce adverse potential effects on social determinants of health are:

- Training, employment and business opportunities will be provided to community members.
- An employee assistance program (including mental health support programs) will be provided.
- A vaccination policy will be implemented.
- Workplace hygiene policies will be enforced.
- Contractor boot camps will be provided for local businesses on how to secure project work.
- Non-local construction workers will be housed in the construction camp on Lelu Island.

Other sections in the Application with specific mitigation measures that are relevant to social determinants of health are: Economic Environment (Section 14), Navigation and Marine Resource use (Section 15), infrastructure and Services (Section 16), Visual Quality (Section 17), Human Health (Section 19), Acoustic Environment (Section 8), Air Quality (Section 6) and Current Use of Lands and Resources for Traditional Purposes (Section 21).

Increased tax revenue to all levels of government would provide the means to enhance training programs, health services and social programs that could contribute to improved mental and physical health in the community.

18.5.2.3 Characterization of Residual Effects

Residual Effects on Change in Social Determinants of Health

Population

Project construction is anticipated to result in 340 jobs for residents of the RAA. Where LAA residents are successful in securing employment no change to local demographics will occur.

Similarly, where LAA residents are unsuccessful in securing employment with the Project but RAA residents are no change to local demographics is expected; workers will be employed on rotational schedules and the majority will reside in accommodations on Lelu Island not becoming members of local communities. Changes to local demographics associated with RAA residents who in-migrate to the LAA in search of employment during project construction is expected to be limited as occurrences of in-migrating RAA residents is expected to be minimal.

Considering project operations could result in 680 new jobs for existing RAA residents and that it is anticipated that workers and their families who in-migrate to Prince Rupert for operations will do so gradually, effects on rates of population change are expected to be minimal. With approximately 120 operation jobs anticipated to be filled by non-local residents' changes to local demographics in Prince Rupert are expected to be minimal. While it is anticipated that a majority of workers in-migrating to the LAA will choose to live in Prince Rupert as it is a larger community with more publically available resources, the in-migration of workers to Port Edward could result in rapid population change. If, for instance the total estimated in-migrating workforce during operations chooses to live in Port Edward the in-migrating workforce (not inclusive of families and dependents) would represent a 43.6 percentage point increase in population from 2011 (assuming a total in-migration workforce size of 120). It is therefore anticipated that Port Edward could experience high rates of population change associated with the in-migration of workers and their dependents. However, considering existing capacity of health infrastructure, community services and infrastructure (see Section 16), the demographic profile of oil and gas operations workers, and targeted mitigation measures, changes in rates of population change are not expected to result in adverse effects.

Education, Employment and Income

The Project will have a positive effect on labour participation and unemployment rates, incomes and project-related training and educational programs. The Project will directly affect employment due to job creation. Induced employment will be created as wage and other income is spent in the local and provincial economies.

Beneficial residual effects of increased employment are (Habitat 2013; ACELG 2012):

- Potential increased household income (coupled with low living costs while on shift) could lead to lifestyle improvements for individuals and families, if properly managed.
- Uninterrupted periods of off-time (between shifts) will allow workers to spend time with their family and friends, to pursue traditional land and marine use activities or undertake volunteer, recreational or leisure activities.
- A heightened sense of financial empowerment could be experienced.

The lack of job-ready skills possessed by some individuals, especially in Aboriginal populations (of the Aboriginal population in the LAA 23.3% have completed high school) will be a barrier to participation in direct and perhaps indirect project employment. Even after employment is obtained, during operations, education, training, and experience levels affect a person's ability to advance into more challenging and/or better paying positions. Low levels of achieved education makes it difficult for people to obtain work in the resource sector where a high school diploma and some trade skills are required.

In advance of the construction phase, PNW LNG has begun funding skills training programs, such as the Coastal Pathways Partnership, to ensure that LAA residents have access to resources to enhance their skills-base. PNW LNG has opened a community office in Prince Rupert, with local staff, to assist LAA residents in determining the skills needed for a variety of construction and operational positions.

Housing

Section 16 primarily deals with effects on housing availability and affordability; however, a summary of potential residual effects is presented here because housing is a social determinant of health; with insufficient housing, there could be detrimental residual effects on social determinants of health.

Education programs offered by PNW LNG will increase the employability of individuals within the LAA. However, changes to local population demographics are anticipated to occur because a majority of positions requiring specialized training and skills will be filled by individuals not currently residing in the LAA. This requirement will result in changes to housing availability and affordability.

People hired from outside of the LAA for operations are expected to permanently relocate to Prince Rupert or Port Edward. This in-migration of workers and their families will place increased demand on rental and permanent housing. Considering the LAA has excess capacity for the development of owner-occupied housing, effects on the availability of owner-occupied housing is not expected to occur (see Section 16).

Increased demand for owner-occupied housing could result in increased housing costs in the LAA. Considering Prince Rupert is rated as the second worst community of 78 in terms of economic hardship, changes to housing affordability could increase the risk of homelessness and at-risk homelessness. However, demand associated with a maximum of 500 positions (285 anticipated to be filled by non-local residents) is not expected to increase rents to a point where housing becomes unaffordable or inaccessible (see Section 14).

Increased demand for hotels and motels during project operation is expected to be minimal. By 2019, when the Project is operational, reduced numbers of transient workers associated with the Project will remain in the LAA. This, combined with the multi-year construction of the Project, will allow markets to adjust.

Community Cohesion

It is anticipated that during project construction, a majority of workers will be hired from outside the LAA on rotational work schedules. A majority of these workers will reside at the construction camp on Lelu Island. Construction workers will have a limited effect on local population demographics because they will not become permanent members of local communities; workers will stay in accommodations on Lelu Island and will be transported to and from airports within the LAA following shift rotations. Due to their restricted access to Prince Rupert and Port Edward, combined with crime prevention initiatives (see Section 16) and mitigations targeted at reducing workplace drug and alcohol use, construction workers will have a limited effect on community cohesion.

Targeted mitigation measures at increasing local and youth employment will have beneficial effects on rates of economic hardship, children-at-risk and youth-at-risk. Increased individual and household

income will facilitate increased rates of community engagement and volunteerism and will reduce occurrences of at-risk-homelessness and homelessness.

Operations workers hired from outside the LAA will likely relocate to Prince Rupert or Port Edward. Minimal effects on community cohesion are expected to occur as a result of population change associated with these workers.

Physical and Mental Health Conditions

Physical Health

Residual effects on physical health are related to workplace injuries and potential increased rates of transmission of infectious disease and sexually transmitted infections.

In 2012, the injury rate for BC’s oil and gas and mineral resource sector was 0.01 per person-year of employment, while the construction sectors experienced an injury rate of 0.045 per person-year (WorkSafeBC 2012). Assuming an average demand of 2,870 workers per year from 2015 to 2019, an estimated 130 recordable injuries could occur each year during construction. Based on about 300 operations workers, an estimated three recordable injuries would occur per year during operations. With the addition of PNW LNG provided first aid facilities and personnel, it is anticipated that the increased demand for health infrastructure and services will not exceed available capacity.

Using baseline information, potential infection rates of sexually transmitted and bloodborne pathogens and disease transmitted by respiratory routes are presented in Table 18-9 for the camp-based workforce. Increased rates are calculated assuming a highest case potential of 4,500 workers present at the construction camp at any given time and using Northwest HSDA infection rates.

Table 18-9: Potential Reportable Infection Rates (Per Year) – Construction Camp Workers

Disease	Rate per 100,000 population
	Greatest Potential Camp Workforce (4,500 persons)
Sexually Transmitted and Bloodborne Pathogens	
HIV	0.2
AIDS	0.0
Chlamydia (genital)	22.1
Gonorrhea (genital)	1.4
Hepatitis B (Chronic and Unknown)	0.5
Hepatitis B (Acute)	0.0
Hepatitis C	1.8
Infectious Syphilis	0.1
Disease Transmitted by Respiratory Routes	
Streptococcal Disease (Invasive)	0.4
Tuberculosis	0.1

Increased rates of infection of sexually transmitted and bloodborne pathogens and diseases transmitted by respiratory routes are expected to be minimal in the LAA. The majority of the construction workforce, the primary cause of population change in the LAA associated with the Project, will reside at the construction camp on Lelu Island and will be transported to and from airport(s) for rotational work schedules. Therefore, exposure to local populations will be limited, which will decrease the potential for increased rates of infection within the LAA. Increased population associated with operations is expected to be minimal and, therefore, limited changes in infection rates are anticipated.

Mental Health

Residual effects on mental health are anticipated to be minimal. Measures targeted at increasing awareness of project hiring requirements and those targeted at providing project-specific training and education programs will address potential inabilities of local residents in securing employment with the Project, which will lower potential effects associated with low incomes. Residual effects on mental health from an increase in negative coping behaviours are expected to be manageable through standard workplace drug and alcohol requirements and through employee assistance programs (available through employee benefit programs).

Positive residual effects on mental health as a result of increased employment and increased individual and household income is expected to have beneficial effects on quality of life within the LAA.

Recreational Opportunities

Access to recreational activities on Lelu Island will be limited because access to the island and surrounding marine areas will be restricted during all project phases. Restricted access to Lelu Island will diminish land-based recreational activities known to take place there, such as camping, berry picking and bird watching (Rod & Gun Club, pers. comm. 2013). Restricted access to marine areas near Lelu Island, in compliance with shipping and marine regulations, could affect recreational fisheries and marine recreational activities such as swimming, kayaking, canoeing and boating (see Section 15) (District of Port Edward 2013; Rod & Gun Club, pers. comm. 2013).

Access to Kitson Island, a popular recreational destination is not expected to be affected by the Project (see Section 15); however, use and enjoyment of the area could be affected. Consultation identified concerns that residual effects on visual quality could affect the use and enjoyment of recreational areas such as Kitson Island and that people would be less likely to recreate in areas where visual quality is degraded (see Section 17). Consultation indicated that restricted access to recreational areas as a result of past projects has affected their use and enjoyment; further such losses is viewed as being highly undesirable (Rod & Gun Club, pers. comm. 2013).

Loss of Lelu Island is an important concern among some residents of the LAA (Rod & Gun Club, pers. comm. 2013). Loss of perceived sense of place is a psycho-social condition is linked to increased risk of depression and feelings of loss of identity. The likelihood that these psycho-social conditions could negatively affect social determinants of health is moderate, considering the adequate supply of recreational sites in the LAA. Therefore, it is not anticipated that quality of life will be affected. Changes in access and recreational use and enjoyment of Lelu Island, Kitson Island and surrounding marine environments is not expected to affect perceived quality of life within the LAA.

Health Infrastructure and Services

Demand Associated with Physical Health

Increased hospitalizations and demand for health infrastructure and services as well as increased demand for public health services associated with infectious disease control and prevention is expected to occur as a result of project activities potentially affecting levels of health service within the LAA. It is expected that demand will be greatest during construction and will decrease during operations.

Increased demand for health infrastructure and services during construction will be reduced through the use of on-site ambulatory care at Lelu Island. Drawing from WorksafeBC workplace injury rates, increased demand requiring the use of health infrastructure and services in the LAA is not expected to exceed available capacity. Operations are expected to result in the in-migration of workers to Port Edward and Prince Rupert. These workers and their families will become regular community members and will increase demand for Northern Health infrastructure and services (such as ambulatory, outpatient and public health infrastructure and services). Drawing from WorksafeBC workplace injury rates, demand for health infrastructure and services during operations as a result of workplace injury is anticipated to be minimal. It is also expected that portions of the healthcare system (private doctors and clinics) will have responded to increased demand for health infrastructure and services by the time the Project is operational and will have resulted in increased capacity. Increased tax revenues associated with the Project could also result in increased government spending on health infrastructure and services, which will increase the capacity of hospitals and nursing care. Increased demand from workers and their families who migrate to the LAA for operations is expected to increase demand on health infrastructure and services but to be within acceptable levels.

Demand Associated with Mental Health

Within the LAA, increased mental health hospitalizations and out-patient visits will increase demand for health infrastructure and services. Residual effects of increased mental health illness in the LAA could have long-term residual effects on society and increase demand for social and community support programs (especially marginalized populations or populations at risk). Drawing from baseline conditions, excess capacity within the LAA currently exists to address mental illness. Combined with mitigation measures targeted at reducing potential increased rates of mental health hospitalizations and illness, long-term residual effects on social and community support programs are not expected to exceed available capacity and affect access, quality and use of health infrastructure.

Demand Associated with Health and Safety Site Inspections

In addition to potential physical injuries and mental illness, demand for health and safety site inspections is expected to increase during site preparation, construction and operation activities. Site inspections will place increased demand on health professionals in the LAA; however, increased demand is not expected to exceed available capacity (see Section 16).

Summary of Change in Social Determinants of Health

Implementation of the mitigation measures will limit residual effects on social determinants of health. Baseline conditions indicate that stress related to high unemployment rates and family dysfunction

have led to increased negative coping behaviours such as like drug and alcohol abuse in the LAA (Dai 2006). Residual effects from increased employment and procurement opportunities will have a permanent positive effect. With applied mitigation measures, the highest magnitude of effects will occur during construction. Project residual effects related to social determinants of health, including physical and mental health conditions, will occur continuously through the duration of the Project.

With applied mitigation measures, residual effects on recreational opportunities are expected to be highest in magnitude and extent during construction and the duration, permanent. The magnitude of the effect will be moderate after the initial phases of operation and the magnitude of residual effects will be moderate during decommissioning when the Project ceases operation. Residual effects are considered to be reversible after the operations cease.

The residual effects related to community cohesion/resilience with regard to population increases are expected to be highest in magnitude during construction. The magnitude of residual effects will be greatest during site preparation as activities will limit the availability of temporary accommodations in Port Edward and Prince Rupert. Increased population and changes to local demographics during construction and operation combined with potential increased crime rates and drug trafficking, specifically at the camp on Lelu Island as cautioned by local RCMP, will increase demand for RCMP services. During operations, Residual effects with respect to housing availability are expected to be low in magnitude (see Section 16). Housing-related project residual effects are considered to be reversible after the Project ceases operation (see Section 16).

18.5.2.4 Likelihood of Residual Effects

There is a high probability that effects on social determinants of health will occur as predicted. The predicted effects are well understood and likelihood is considered high.

18.5.2.5 Determination of Significance of Residual Effects

Recommended mitigation measures will decrease negative effects on social determinants of health and will increase potential positive effects. With population decline and high unemployment rates since 2000, effects of the Project related to economics and population change, along with the proposed mitigation, will bring increased prosperity and training and educational opportunities to the region. With mitigation, changes to social determinants of health are anticipated to be not significant.

18.5.2.6 Confidence and Risk

Confidence in the prediction of residual effects is moderate due to limited primary data on community cohesion and social determinants of health. The primary risk for an inaccurate prediction is that social determinants of health are less resilient to change than expected.

18.5.3 Change in Diet and Nutrition

According to the BC MOE, most individuals engaged in recreational hunting and trapping do so to supplement their diets (BC MOE 2006). While the number of basic resident hunting licenses, issued in BC, declined from 174,000 in 1981-82 to 82,000 in 2003, they then increased to 97,000 in 2012, indicating that hunting as a means of securing country foods to supplement diets remains an important activity (BC MOE 2006; Vancouver Sun 2013).

Aboriginal use of country foods (for food, social and ceremonial (FSC) hunting, trapping and gathering and Aboriginal rights) are discussed in Sections 21 and 26. Potential changes in access

and availability of country foods, as well as perceived contamination, could affect Aboriginal use and interests in country foods near the PDA.

18.5.3.1 Potential Effects

Project activities could affect diet and nutrition through changes in the composition of diets with country foods. Pathways affecting diet and nutrition as it relates to country foods include changes in:

- Access and use of lands and marine environments used for subsistence, recreational and commercial fishing, trapping, hunting, and harvesting
- The availability of country foods through habitat disruption and species displacement
- Perceived contamination of country foods resulting in decisions to forego consumption.

Potential changes in access and availability of country foods as they relate to other VC's are discussed in Sections 9, 10, 11, 12, 14 and 17. First Nation rights, interests and use are discussed in Sections 21 and 26. Potential effects on human health associated with contamination of country foods are discussed in Section 17; however, Section 17 does not assess perceived contamination of country foods and decisions to forego consumption.

18.5.3.2 Mitigation

Mitigation measures presented in biophysical, land and marine use sections of the Application serve as mitigation measures reducing effects on change in diet and nutrition. For more information, see mitigation measures presented for vegetation and wetland resources in Section 9, terrestrial wildlife and marine birds in Section 10, freshwater aquatic resources in Section 11, marine resources in Section 12, navigation and marine resource use in Section 14 and human and ecological health in Section 17. First Nation rights, interests and use are discussed in Sections 21 and 26.

Specific to access, availability and perceived contamination, public awareness and informational sessions will be available. The goal of these programs will be to:

1. Inform the public of changes in access to the PDA potentially affecting access to country foods.
2. Inform the public of project activities that could potentially displace wildlife (providing locations, durations etc.).
3. Provide information and data on actual risks of contamination to soils, waterways, vegetation and wildlife and risks associated with the consumption of contaminated country foods.

18.5.3.3 Characterization of Residual Effects

To quantify change in diet and nutrition, as considered through residual effects on country foods, assessment of the residual effects on biophysical environments, wildlife, land and marine use and human health is useful: residual effects on air quality are assessed in Section 6, vegetation and wetland resources in Section 9, terrestrial wildlife and marine birds in Section 10, freshwater aquatic resources in Section 11, marine resources in Section 12, navigation and marine resource use in Section 14 and human and ecological health in Section 17. First Nation rights, interests and use are discussed in Sections 21 and 26. Each of these sections assesses residual effects that influence

measurable parameters used to determine changes in diet and nutrition. The following subheadings characterize residual effects on different attributes of diet and nutrition.

Access and Availability

Access to and availability of marine resources is described in Section 13 and Section 15. The following information from those sections is pertinent to this discussion: project-related exclusion zones (in addition to pre-existing restrictions, see Section 13 and Section 15) will limit access to Flora Bank west of Lelu Island to Kitson Island. Noted as an area of marine environmental importance (Ocean Ecology 2009; Higgins and Schouwenburg 1973), Flora Bank supports eel grass and other important habitats for a variety of marine species, several of which have commercial, recreational, traditional and cultural importance. Species that occur in Flora Bank and surrounding marine environment and of which are considered important to local diets include Dungeness crab, Pacific salmon (sockeye, Chinook, coho, pink and chum), halibut, Pacific herring, rockfish, lingcod, Pacific cod, sole, and eulachon (Earle 2011; Inuit Tapiriit Kanatami and the Inuit Circumpolar Council 2012; National Collaborating Centre for Aboriginal Health 2013).

While the percentage of FSC and recreationally harvested marine country foods from Flora Bank is unknown, issues raised during consultation highlight the importance of Flora Bank to these fisheries. Limiting access to Flora bank could result in decreased landings and affect the composition of local diets associated with marine country foods. Table 18-10 provides recreational fishery catch data for select species in Fisheries Management Areas (FMA) 4 for 2011. FMA 4 Chatham Sound-Porcher Island is subdivided into 15 subsections ranging from 4-1 to 4-15, and FMA 4-12 contains Flora Bank. Site –specific recreational landing data are suppressed to protect the identity and interests of fishers in FMA 4-12.

Table 18-10: Select Recreational Fisheries Landing Data – Number of Fish - FMA 4 - 2011

	2011 Recreational Landings by Species (Number of Fish)				
	Chinook Salmon	Pink Salmon	Sockeye Salmon	Coho Salmon	Chum Salmon
FMA 4	1,731	454	21,696	1,299	-

NOTE:

- Indicates that no catch data was recorded

SOURCE: DFO 2013

In lieu of recreational data for FMA 4-12, commercial data are used (see Table 18-9) to estimate recreational landings in FMA 4-12. The comparative percentages for the commercial catch between FMA 4 and FMA 4-12 are used to estimate the recreational catch in FMA 4-12, knowing the recreational catch in FMA 4. Although Table 18-10 provides data as number of fish and Table 18-11 as weight, it is assumed that the ratios of catch between FMA 4 and FMA 4-12 still apply. Only species with publically available landing data for FMA 4 and FMA 4-12 are presented.

Table 18-11: Select Fisheries Landing Data – Recorded Pounds - FMA 4 and FMA 4-12

	2012 Landings by Species (Recorded lbs)						
	Golden King Crab	Dungeness Crab	Chinook Salmon	Pink Salmon	Sockeye Salmon	Coho Salmon	Chum Salmon
FMA 4-12	1,008	97,880	278.5	582	42,595.8	-	-
FMA 4	1,409	167,733	13,206.8	46,359.4	2,094,189.8	677.3	922.8

NOTE:

- Indicates that no catch data was recorded

SOURCE: DFO 2013

Table 18-11 shows that 6.1% of all commercial fisheries landings in FMA 4 occurred in subsection 4-12. In FMA 4, 58.5% of crab landings and 2.0% of salmon landings occurred in FMA 4-12. These numbers suggest that recreational fisheries catch in FMA 4-12 for salmon is 2% of 25,180 (salmon catch in FMA 4), which is approximately 500 salmon. (There is no recreational data for the crab catch in FMA 4, so no estimate can be made of the recreational crab catch in FMA 4-12).

Using a conservative approach (due to a lack of fisheries specific data), if salmon fishing were to solely occur on Flora Bank in FMA 4-12, which is unlikely due to water depth and commercial fisheries catch data for FMA 4-12, restricting access to Flora Bank could result in the loss of 500 salmon recreational landings in FMA 4-12. This calculation is based on a conservative approach and assumes a worst-case scenario calculated using publically available data.

Access to freshwater fish in the PDA will not be affected because there are unlikely to be any freshwater fish on Lelu Island at Sphagnum Bog because of its elevated pH levels (see Section 12).

Information on harvest rates of wildlife and vegetation on Lelu Island is not publically available but construction will remove habitat that is typically used by, for example, black-tailed deer, black bear, American marten, grey wolf and bald eagle (see Section 11). With restricted access the ability to harvest vegetation on Lelu Island will be affected (see Section 10) but this is not expected to result in residual effects on diet and nutrition as vegetation harvesting occurs throughout the LAA with acceptable availability.

Perceived Contamination of Country Foods

The perception that country foods can become contaminated as a result of project activities was highlighted during consultation (see Section 17 of effects on human health). While contamination of country foods leading to adverse effects on human health is minimal, the perception that the quality of country foods can be adversely affected by project activities could lead to changes in the composition of local diets. While mitigation measures targeted at educating the general public on operations and actual effects on the quality of country foods will be administered, mistrust in the presented information could occur. This would perpetuate decisions to forego consumption of country foods.

18.5.3.4 Likelihood of Residual Effects

It is expected that the Project will restrict access to the PDA used for the harvesting of country foods. However, it is not expected that the Project will result in measurable changes to the availability of country foods in the LAA. With limited changes to the availability of country foods in the LAA,

changes to diet and nutrition as a result of changes in the composition of diets comprised of country foods are not anticipated.

18.5.3.5 Determination of Significance of Residual Effects

Residual effects are anticipated to result in changes in access and availability of country foods within the LAA continuously for the lifetime of the Project; however, with proposed mitigation (see Sections 9, 10, 11, 12, 17, 21 and 26), residual effects are not anticipated to affect the composition of local diets comprised of country foods or affect nutrition; it is expected that the overall accessibility and availability of country foods in the LAA will remain within acceptable levels. Therefore, residual effects are anticipated to be not significant.

18.5.3.6 Confidence and Risk

Predictions regarding project-specific residual effects are based on publically available information, trade and industry publications, information obtained through consultation initiatives, and professional judgment.

Overall prediction confidence is considered moderate with respect to project-specific residual effects because the characterization of residual effects is largely based on limited information on FSC and recreational fisheries occurring near Lelu Island and the Flora Bank.

Only limited information on Aboriginal, fishing, hunting, and plant-gathering in and around Flora Island was available. It was assumed that country foods are gathered from Lelu Island. The catch of salmon near Flora Banks will be affected but, considering catch data for FMA 4 and the availability of salmon in the area, diet and nutrition are not anticipated to be affected. There is a low likelihood for changes to diet and nutrition to occur as a result of residual effects; therefore, there is a low degree of risk that the assessment inadequately measured the magnitude of residual effects on country foods within the LAA.

18.5.4 Summary of Residual Effects

Table 18-12 provides an overview and ranking of residual effects.

Table 18-12: Summary of Residual Effects on Community Health and Well-Being

Project Phase	Mitigation/Compensation Measures	Residual Effects Characteristics						Likelihood	Significance	Confidence	Follow-up and Monitoring
		Context	Magnitude	Extent	Duration	Frequency	Reversibility				
Change to Social Determinants of Health											
Construction	<ul style="list-style-type: none"> Provide training, employment and business opportunities. Provide an employee assistance program. Implement a vaccination policy. Enforce workplace hygiene policies . Provide contractor information sessions. Non-local construction workers will be housed in an accommodation camp. 	R	M	RAA	L	C	R	H	N	M	None
Operation		R	M	RAA	L	C	R				
Decommissioning		R	M	RAA	L	C	R				
Residual environmental effects for all Phases		R	M	RAA	L	C	R				
Change in Diet and Nutrition											
Construction	<ul style="list-style-type: none"> Mitigation measures presented in biophysical, land and marine use and human health sections of the application serve as mitigation measures reducing residual effects on change in diet and nutrition. Public awareness and informational sessions will be available. 	R	M	LAA	L	C	I	H	N	M	None
Operation		R	M	LAA	L	C	I				
Decommissioning		R	M	LAA	S	MR	I				
Residual environmental effects for all Phases		R	M	LAA	L	C	I				

<p>KEY</p> <p>MAGNITUDE:</p> <p>Negligible: no measurable change from baseline conditions</p> <p>Low: a measurable change but effect cannot be distinguished from baseline conditions</p> <p>Moderate: a measurable change in determinates of community health and well-being of which will not affect quality of life in the LAA</p> <p>High: a measurable change in determinates of community health and well-being of which will affect quality of life in the LAA</p> <p>EXTENT:</p> <p>PDA: effects restricted to the PDA</p> <p>LAA: effects extend into the LAA</p> <p>RAA: effects extend into the RAA</p>	<p>DURATION:</p> <p>Short term: effect restricted to the duration of the construction period or less</p> <p>Medium term: effect extends past the construction period but less than the life of the Project</p> <p>Long term: effect extends through the life of the Project</p> <p>Permanent: effect is permanently measurable</p> <p>FREQUENCY:</p> <p>Single event: effect occurs once</p> <p>Multiple irregular event: effect reoccurs with no set schedule</p> <p>Multiple regular event: effect reoccurs on a set schedule</p> <p>Continuous: effect occurs continuously</p> <p>REVERSIBILITY:</p> <p>Reversible: effects will cease after project closure and reclamation</p> <p>Irreversible: effects will persist after the life of the Project</p>	<p>CONTEXT</p> <p>R= Resilient</p> <p>V= Vulnerable</p> <p>CONFIDENCE:</p> <p>Based on scientific information and statistical analysis, professional judgment and effectiveness of mitigation, and assumptions made</p> <p>Low: well understood and there is a low likelihood of effects on community health and well-being, as predicted</p> <p>Medium: well understood and there is a moderate likelihood of effects on community health and well-being, as predicted</p> <p>High: well understood and there is a high likelihood of effects on community health and well-being, as predicted</p>	<p>LIKELIHOOD OF RESIDUAL EFFECT :</p> <p>Based on professional judgment</p> <p>Low: well understood and there is a low likelihood of effects on community health and well-being, as predicted</p> <p>Medium: well understood and there is a moderate likelihood of effects on community health and well-being, as predicted</p> <p>High: well understood and there is a high likelihood of effects on community health and well-being, as predicted</p> <p>SIGNIFICANCE:</p> <p>S = significant – can be positive (S+) or negative direction</p> <p>N = not significant – can be positive or negative</p>
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18.6 Cumulative Effects

18.6.1 Context for Cumulative Effects

Twenty-five past, present, and reasonably foreseeable projects were considered in the assessment of cumulative effects on community health and well-being, 15 of which were assessed as having a potential cumulative effect with that of the Project. These projects are noted in Table 18-13. Of the 15 projects, three are currently under construction in the LAA: the Prince Rupert Ferry Terminal Project (2006-2014), Westview Terminal Project (2012-2013) and Ridley Terminal Project (2012-2015) (see Table 18-13). The construction and operation of these projects may affect community health and well-being through direct effects on infrastructure and services due to direct incremental demands from the workforces associated with these projects, and their dependents, as well as effects related to population and demographic changes.

The latest construction completion date of these projects is estimated to be 2015; thus, major construction activities should finish prior to the start of project construction. Because construction dates will not overlap, potential cumulative short-term effects caused by increased demand for rental housing, motels, and hotels in Port Edward and Prince Rupert will be minimal.

Two projects have been approved for construction but have not proceeded into the permitting phase: NaiKun Wind Energy Project and Mount Hays Wind Farm. These projects may affect infrastructure and services in Port Edward and Prince Rupert if construction and operation activities overlap with the Project.

The extent to which these fifteen present and foreseeable projects place demand on regional health infrastructure and services will depend on how future projects are constructed, the extent of permanent versus temporary workforces associated with each future project, and the time and ability governments and municipalities have to respond to increased short and long-term demand. Considering current conditions and existing project residual effects, cumulative effects associated with the 15 overlapping projects could affect community health and well-being through increased demand for health infrastructure and services more than expected. Cumulative effects could result in the need to invest in health and health infrastructure and services, especially those listed as requiring investment, sooner and to a greater degree than has been originally budgeted.

These projects will also directly affect employment and procurement opportunities because they will require skilled and non-skilled labour and local goods and services during the Project's construction and operational period. Forecasted labour demands for current and reasonably foreseeable projects suggest that from 2013 to 2018 as many as 500 construction jobs and 130 indirect and induced jobs could be created in the RAA (see Section 14). The Project is also anticipated to result in the creation of 464 direct jobs over a 30 year (minimum) operating life. BCStats estimates that from 2013 to 2018 the population of the SQCRD will increase 2.8% from 19,539 to 20,094 (BCStats 2013a). Considering that multiple large industrial projects are being planned for the Prince Rupert area, this population projection may be conservative. The cumulative effect of increased employment in the RAA will have an overall positive effect on individual and household incomes in the LAA and is expected to positively influence community cohesion.

18.6.2 Cumulative Effects Assessment

The cumulative effects assessment proceeds on an effect by effect basis, with a two-step process to determine the potential for cumulative effects on Community Health and Well-Being. In conducting the cumulative effects assessment, the residual effects arising from interactions with a ranking of 1 or 2 in Table 18-9) are considered. The first step consists of a two questions:

- Is there a project residual environmental effect?
- Does the project residual environmental effect overlap spatially and temporally with those of other past, present or reasonably foreseeable future projects?

Where the answers to both of these two questions are affirmative, a check in Table 18-13 indicates that there is potential for the Project to contribute to cumulative effects on community health and well-being. Potential contribution of these project residual effects to cumulative effects is assessed below. The second step consists of one question:

- Is there a reasonable expectation that the contribution (i.e., addition) of the Project’s residual effects would cause a change in cumulative environmental effects that could affect the viability or sustainability of the VC?

For these projects, additional assessment potential cumulative effects are described.

Table 18-13: Potential Cumulative Environmental Effects on Community Health and Well-Being

Other Projects and Activities with Potential for Cumulative Environmental Effects	Potential Cumulative Environmental Effects	
	Change in Social Determinants of Health	Change in Diet and Nutrition
Atlin Terminal	✓	✓
Canpotex Potash Export Terminal	✓	✓
CN Rail Line		
Douglas Channel LNG		
Enbridge Northern Gateway Project		
Fairview Container Terminal Phase I	✓	✓
Fairview Container Terminal Phase II	✓	✓
Kitimat LNG Terminal Project		
LNG Canada Project		
Pinnacle Pellet Inc.		
Mount McDonald Wind Power Project	✓	✓
NaiKun Wind Energy Project	✓	✓
Northland Cruise Terminal	✓	✓
Odin Seafood		
Prince Rupert LNG Facility	✓	✓
Prince Rupert Gas Transmission Project	✓	✓

Other Projects and Activities with Potential for Cumulative Environmental Effects	Potential Cumulative Environmental Effects	
	Change in Social Determinants of Health	Change in Diet and Nutrition
Prince Rupert Ferry Terminal	✓	✓
Prince Rupert Industrial Park		
Prince Rupert Grain Limited		
Ridley Island Log Sort	✓	✓
Ridley Terminals Inc.	✓	✓
Rio Tinto Alcan Aluminum Smelter and Modernization Project		
Westcoast Connector Gas Transmission Project	✓	✓
WatCo Pulp Mill	✓	✓

NOTES:

✓ = Those 'other projects and activities' whose effects are likely to interact cumulatively with the Project's residual effects.

18.6.2.1 Change to Social Determinants of Health

For the analysis of cumulative effects, change in social determinants of health is based on measurable parameters presented in Section 18.2.4 and those used in the analysis of other sections in the EIS/Application: Section 16, Section 14, and Section 17.

Health Infrastructure and Services

Considering the fifteen potentially overlapping projects, effects on social determinants of health through changes in health infrastructure and services are not expected to affect the viability or sustainability of the VC. Current and future projects considered in this assessment primarily draw on health infrastructure and services offered by the District of Port Edward and the City of Prince Rupert. Although increased demand for health infrastructure and services in Port Edward can be expected, Prince Rupert's health infrastructure and services will be more heavily used. Increased demand for health infrastructure and services in Prince Rupert will place added strain on the municipality but are within manageable levels. Additional tax revenue generated from proposed projects in Prince Rupert (not including the Project, which is located within the District of Port Edward) could help fund major health infrastructure improvement projects and social health programs. Municipal investment in conjunction with mitigation measures taken by each project increase the supply of services and infrastructure and decrease demand. Through these measures, capacity of health infrastructure and services is expected to be responsive to increased demand and capable of accommodating increased cumulative use.

Employment and Procurement

Considering the timing and rate of construction of current and reasonably foreseeable projects, effects on employment and procurement opportunities are not expected to affect the viability or sustainability of the VC. Baseline conditions include high unemployment rates. Cumulative effects are not expected to adversely affect the sustainability of the VC because there will be competition for

skilled and non-skilled labour. Individuals who do not meet hiring requirements and unable to work directly with these projects will still benefit from indirect and induced opportunities and an expanded municipal tax base in Port Edward and Prince Rupert. Additional tax revenue generated from proposed projects could help fund sustainable training and employment and procurement programs like the Coastal Pathways Program and contractor boot camps and educational financial savings programs. Through these kinds of measures, local populations are expected to be more responsive to economic shifts in the future and it will decrease perceived feelings of relative deprivation.

Recreational Opportunities

Considering the timing and rate of construction of the fifteen current and reasonably foreseeable projects, effects on recreational opportunities are expected to affect this aspect of social determinants of health. The fifteen overlapping projects are not expected to negatively affect the spatial supply of recreational sites in the LAA. While feelings related to loss of place could occur, most of the fifteen overlapping projects occur or are planned to be developed on industrial zoned lands, likely lowering the potential magnitude of effects on feelings of place—feelings of place near industrial areas is lower than that of undeveloped areas (Budruk and Wilhelm Stanis 2013). Additional tax revenue generated from proposed projects could also help fund access to more public waterfront recreational spaces, which was a desire highlighted during consultation.

18.6.2.2 Change in Diet and Nutrition

Cumulative effects of the fifteen overlapping projects are not expected to restrict access to or affect the availability of country foods within the LAA in a magnitude such that changes occur to the composition of diets or affect nutrition. Currently situated or planned to be developed primarily on industrially zoned land, changes in access to harvested terrestrial areas or areas used for hunting and trapping associated with the fifteen overlapping projects is expected to be minimal. Access to industrial areas in the LAA is currently restrictive and little hunting or gathering occurs in these areas (Rod & Gun Club pers.comm. 2013). Cumulative effects on access to marine areas used for fishing and harvesting could result in increased restricted access to FMA 4 affecting salmon and crab recreational landings. Drawing on the assessment of cumulative effects in Sections 13 and 15, cumulative changes in access to marine areas and cumulative effects on the availability of marine harvested species are expected to be minimal and therefore not affect diet and nutrition.

18.6.2.3 Summary of Cumulative Effects

Cumulative effects currently, even without the Project, influence quality of community health and well-being in Prince Rupert and Port Edward. Considering project-related residual effects and reasonably foreseeable future project effects, cumulative effects on health infrastructure and services are not expected to affect the sustainability of the VC. Overall, the degree to which past and present effects will influence employment and procurement opportunities will be positive. Demand for labour, health infrastructure and services and housing will be greatest during construction. Demand will cumulatively increase if construction phases of spatially overlapping projects occur at the same time as that of the Project. The degree to which past and present effects will affect people's recreational opportunities are unknown but with an expanded municipal tax base and with applied mitigation measures it is not expected to affect the sustainability of the VC.

With mitigation, project-related residual effects on community health and well-being are predicted to be not significant. Predictions regarding cumulative effects are made using publically available information, trade and industry publications, information obtained through consultation initiatives, and professional judgment. Overall prediction confidence is considered moderate for cumulative effects. Assuming that other projects in the RAA will have similar mitigation measures, the implementation of mitigations by PNW LNG in conjunction with other projects in the RAA will decrease demand for health infrastructure and services.

18.7 Follow-up and Monitoring

No follow-up and monitoring specific to Community Health and Well-Being is proposed.

18.8 Conclusion

The Project's direct and cumulative effects on community health and well-being are predicted to be not significant.

Changes are not expected to result in unacceptable changes to social determinants of health, physical and mental health conditions, recreational opportunities or diet and nutrition that directly and indirectly places increased demands on community and health services or infrastructure that exceeds current capacity, such that standards of service are routinely and persistently reduced below current levels for an extended period of time.

18.9 Reference

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18.9.1 Person Communications

- Gordon-Payne, Sheila; Health Service Administrator at Prince Rupert Hospital. 2013. Prince Rupert: One-on-one Interview.
- Non-Aboriginal male research participant. 2013. Prince Rupert: One-on-one Interview.
- Non-Aboriginal male fisherman research participant. 2013. Prince Rupert: One-on-one Interview.
- Provincial Health Office. 2013. Information Request via telephone.
- RCMP. 2013. Prince Rupert: Focus Group Discussion.

Rod & Gun Club. 2013. Prince Rupert: Focus Group Discussion.

Zeno Krekic; Prince Rupert City Planner. 2013. Prince Rupert: Participant Observation Stats & Touchstone Workshop.

18.10 Figures

Please see the following pages.



<ul style="list-style-type: none"> Local Assessment Area Regional Assessment Area ● Project Location Potential Shipping Route Project Component 	<ul style="list-style-type: none"> Airport ● City or Town Pilotage Station Electrical Power Transmission Line — Ferry Route — Highway International Boundary Railway 	<ul style="list-style-type: none"> Watercourse Indian Reserve Local Health Area 52 Municipal Boundary Protected Area United States of America Waterbody
<p>Pacific NorthWest LNG Community Health and Well-Being Local Assessment Area and Regional Assessment Area</p> <p><small>Sources: Government of British Columbia; Prince Rupert Port Authority; Government of Canada, Natural Resources Canada, Centre for Topographic Information; Progress Energy Canada Ltd.</small></p> <p><small>Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.</small></p>		
<p>DATE: 18-FEB-14 FIGURE ID: 123110537-425 DRAWN BY: K. POLL</p>	<p>PROJECTION: UTM - ZONE 9 DATUM: NAD 83 CHECKED BY: S. ROBERTS</p>	<p>PREPARED BY: </p> <p>PREPARED FOR: </p> <p>FIGURE NO: 18-1</p>