Comprehensive Study Report

Pursuant to the

Canadian *Environmental Assessment Act*

For the Proposed:

Fairview Terminal Phase II Expansion Project

in

Prince Rupert, British Columbia

Proposed by:

Prince Rupert Port Authority

and

Canadian National Railway Company

Prepared by:

Fisheries and Oceans Canada

Environment Canada

and

Canadian Transportation Agency

September 2012

Canadian Environmental Assessment Registry Reference Number 08-03-37956

Canada

EXECUTIVE SUMMARY

The Prince Rupert Port Authority (PRPA) and Canadian National Railway Company (CN) are proposing the construction and operation of a wharf extension and expanded container and intermodal facilities at the existing Fairview Terminal and the construction and operation of two sidings, a CN inspection road, a wye, and a port-dedicated road between the terminal on Kaien Island and Ridley Island, British Columbia. This project is referred to as the Fairview Terminal Phase II Expansion Project (the Project).

The purpose of the Project is to expand the existing Fairview Terminal (Phase I) and associated rail components in order to serve the growing needs of the shipping community in the Northwest, the Province, Canada and the Mid-West US. The new facility is expected to substantially alleviate congestion at existing West Coast ports and create significant economic opportunities for Canadian importers and exporters with the development of improved transportation connections to Asia. The Port of Prince Rupert and CN, as well as local and regional economies are expected to benefit from the expanded cargo handling and shipping facilities and increased level of commercial activity. At full build-out the marine and land-based Project components are designed to accommodate approximately 2 million TEU (twenty-foot equivalents) shipping containers per annum, with a Project design life of approximately 50 years or longer.

The proposed Project site is situated immediately north and south of the existing Fairview Terminal. The proposed Project will be constructed on 35 hectares (ha) of federal (PRPA/CN) and provincial Crown lands. The Project will be built in two stages. Stage 1 will include construction of the northern terminal expansion, one CN siding, and the Port-dedicated road. All remaining components (southern terminal expansion, yards, second CN siding, and wye) will be constructed as Stage 2, when market economies and traffic volumes require it.

An environmental assessment of the proposed Project is required under the Canadian *Environmental Assessment Act, 1992* (CEAA)[1] and the Canada Port Authority Environmental Assessment Regulations (CPAEAR). In particular, a comprehensive study pursuant to the Comprehensive Study List Regulations under CEAA is required. The Project is also subject to the British Columbia *Environmental Assessment Act.* Federal agencies and the British Columbia Environmental Assessment Office signed a Memorandum of Agreement regarding the assessment process. The Memorandum of Agreement establishes that the federal EA process for the Project will be equivalent to the provincial process under Section 27 of the British Columbia *Environmental Assessment Act.*

Paragraph 28(c) of the *Comprehensive Study List Regulations* under CEAA requires a comprehensive study for the proposed construction, decommissioning, or abandonment of a marine terminal designed to handle vessels larger than 25,000 dead weight tonnes unless the terminal is located on lands that are routinely and have been historically used as a marine terminal or that are designated for such use in a land use plan that has been the subject of public consultation. There is no land use plan designating the Project area for use as a marine terminal; therefore, a comprehensive study is required.

A Comprehensive Study Scope of Assessment (EC et al. 2009) for the Project was prepared by Fisheries and Oceans Canada (DFO), Environment Canada (EC), and the Canadian Transportation Agency (CTA), as Responsible Authorities (RAs) under CEAA. This Scope of Assessment establishes the terms of reference for the environmental assessment under CEAA. The Scope of Assessment (August 28, 2009) is included in the Environmental Assessment Track Report submitted to the Minister of Environment and

[1] The Canadian *Environmental Assessment Act, 2012* (CEAA 2012) came into force on July 6, 2012, replacing the Canadian *Environmental Assessment Act* S.C. 1992, c. 37 (former Act). CEAA 2012 sets out specific provisions for comprehensive studies, such as the Fairview Terminal Phase II Expansion Project, which were commenced under the former Act. For this project, the federal environmental assessment continued and was completed under the former Act. All references to federal environmental assessment legislation in this report reflect the requirements of the Canadian *Environmental Assessment Act* S.C. 1992, c. 37.

available in the Environmental Impact Statement (EIS) submitted for this Project [EIS Vol. 1 and Vol. 2 (PRPA, CN 2009)]. On November 2, 2009, the Minister of Environment determined that a comprehensive study was the most appropriate level of assessment for the Project.

Federal Regulatory Responsibilities

The DFO, EC, and CTA, as federal RAs, and the PRPA as a regulatory authority have prepared this report. Health Canada, Aboriginal Affairs and Northern Development Canada, Parks Canada and Transport Canada were consulted as federal authorities having specialist and expert information or knowledge. The Canadian Environmental Assessment Agency (CEA Agency) is the Federal Environmental Assessment Coordinator (FEAC) for the Project.

Fisheries and Oceans Canada

DFO has determined that the proposed Project would cause the harmful alteration, disruption or destruction of fish habitat, and will therefore require an Authorization under subsection 35(2) of the *Fisheries Act,* (R.S., 1985, c. F-14). This Authorization triggers a requirement to conduct an EA under Section 5 of CEAA (S.C., 1992 c. 37).

Environment Canada

PRPA proposes to dispose of dredged marine sediments at a previously permitted disposal site outside of Prince Rupert Harbour boundaries (Brown Passage). Utilization of this disposal site will require issuance of a permit by EC pursuant to subsection 127(1) of the Canadian *Environmental Protection Act* (CEPA). This permit triggers a requirement to conduct an EA under Section 5 of CEAA[1].

Canadian Transportation Agency

Construction of the rail sidings and wye will require issuance of a permit by the CTA pursuant to subsection 98(2) of the *Canada Transportation Act,* which triggers a requirement to conduct an EA under Section 5 of CEAA.

Prince Rupert Port Authority

As a Canada Port Authority and a federal Proponent for the Project, the PRPA, under the CPAEAR, must conduct an EA of the Project before exercising a power or performing a duty or function related to the execution of the project.

Environmental Assessment Scoping and Methods

Scope of the Project

The federal scope of the proposed Project considered within this Comprehensive Study Report (CSR) includes the construction, operation and decommissioning of the following:

- Infilling of approximately 11.1 ha of marine environment and the construction of the terminal wharf, container yard, and intermodal yard
- Construction, operation, modification, decommissioning or abandonment of an additional 14 rail tracks within the intermodal yard, for a total of approximately 14,000 m of rail
- Eastern re-alignment of the existing CN mainline across the proposed terminal site
- Dredging in front of the proposed caissons, and in relation to the containment berm and new wharf structure
- Disposal at sea activities at Brown Passage including transit to the site

- Construction of two CN Rail sidings and inspection road on the marine side of the existing mainline, requiring approximately 1 ha of infilling below the HWM and approximately 2 ha of riparian infilling above the HWM
- Construction, operation, modification, decommissioning or abandonment of the locomotive wye (turnaround) at Mile 88.55
- Operation of vessels while berthing and berthed at the marine terminal and while within harbour limits of the PRPA
- Operation of locomotives arriving/departing/idling in the intermodal yard and along the CN sidings and wye
- Construction of a Port-dedicated road between Fairview Terminal and Ridley Island, on the marine side of the CN sidings

The scope of the Project for this CSR was developed with public input, and is described in the Scope of Assessment.

Scope of the Assessment

The assessment considered the potential environmental effects of the proposed Project, as it is scoped, including physical, biological and human environments, taking into account measures that are technically and economically feasible to prevent or reduce any potential adverse effects of the Project to an acceptable level.

The scope of assessment also includes consideration of:

- Alternative means of carrying out the Project that are technically and economically feasible and the environmental effects of any such alternative means
- Effects of the environment on the Project
- Environmental effects related to accidents and malfunctions
- Potential cumulative environmental effects
- Comments from the public
- Measures that would mitigate adverse environmental effects and the significance of environmental effects
- Capacity of renewable resources that are likely to be significantly affected by the Project to meet the needs of the present and those of the future
- A follow-up program to verify the accuracy of the Project's environmental assessment, and to determine the effectiveness of any measures taken to mitigate the adverse environmental effects of the Project

This CSR fulfills DFO's, EC's, CTA's and PRPA's obligations to conduct an assessment of the Project's environmental effects in consultation with other federal authorities who have declared appropriate expertise. An important part of the EA process is the identification of a concise list of those components of the environment that are considered "valued" (socially, economically, culturally, and/or scientifically) to focus the assessment. This CSR presents the assessment of the Project's effects on the following components, presented as 13 Valued Environmental Components (VECs).

- Air Quality
- Noise and Vibration

- Light
- Vegetation Resources
- Wildlife and Wildlife Habitat
- Avifauna
- Freshwater Environment
- Marine Environment
- Socio-Economic Conditions
- Human Health and Safety
- Archaeological and Heritage Resources
- Current Traditional Use by Aboriginal persons
- Country Foods

This list of VECs was confirmed in the Scope of Assessment (EC et al. 2009).

Assessment Methods

The methods and approach used to prepare this CSR were developed to satisfy the factors to be considered in accordance with Sections 16(1) and 16(2) of CEAA and the specific requirements for comprehensive studies under Section 21 of CEAA. The assessment methods included an evaluation of the potential environmental effects for each VEC that may arise from each Project phase (construction, operation, decommissioning) as well as malfunctions and accidental events. Project-related effects were assessed within the context of temporal and spatial boundaries established for each VEC. The evaluation of potential cumulative effects with regard to other projects and activities included existing, approved and proposed activities that may interact with this Project.

A program of stakeholder engagement and public participation was carried out during the various stages of the EA process, which included components led by the Proponents, the RAs, and the CEA Agency. Aboriginal engagement was undertaken during the EA process by the Proponents, the RAs, and the CEA Agency. The goal of the Proponents' consultation program has been to inform Aboriginal Groups of the Project and nature of the proposed works to identify Aboriginal interests, issues and concerns related to the Project and to consider and address such interests, issues and concerns within the context of Project planning, assessment and design.

The CEA Agency formed the Fairview Project technical Working Group (WG) which includes the CEA Agency, RAs, federal authorities, Aboriginal Groups, PRPA, CN, and Stantec Consulting Ltd. as a cooperative forum. The role of the WG is to inform the conduct of the EA pursuant to CEAA.

Summary of Key Findings of the Assessment

DFO, EC, CTA, and PRPA have assessed the potential Project-related environmental effects. This review was completed on the basis of the information provided by the Proponents in their Environmental Impact Statement (EIS; Vol. I), Technical Data Reports (TDR; Vol. II), Mitigation Strategy Report (MSR) and supplemental submissions (i.e., responses to Information Requests); expert advice provided by Federal Authorities; results of WG discussions; and comments provided by Aboriginal Groups, stakeholders, and the public, through engagement and consultation.

Ratings of the significance of environmental effects after proposed mitigation measures are implemented (i.e., residual effects) were determined against the thresholds and other criteria established for each VEC.

Significant environmental effects are those which are considered likely to cause a change in the VEC that will alter its status or integrity beyond an acceptable level.

Air Quality

Local air quality may be affected by the release of air contaminants and pollutants during Project construction and operation activities; primarily through combustion emissions from ship and locomotive engines and operation of equipment at the Terminal. Dust generation is also an air quality issue of concern. Although ambient SO_2 concentrations may be affected by marine vessel traffic, the residual effects of the Project on air quality are, on the whole, of low magnitude and are expected to be local (site-specific) in nature. Project rail emissions have been evaluated for representative communities along the Project rail corridor from Prince Rupert through to Prince George, British Columbia. The incremental effect of the additional rail traffic associated with the Project is not expected to result in significant adverse environmental effects on air quality along the rail corridor. Greenhouse Gas (GHG) emissions from the Project are relatively small when compared to provincial and national inventories and are small compared to existing projects of similar type and scope due to the implementation of current technologies. The residual and cumulative effects of the Project on Air Quality are predicted to be not significant.

Noise and Vibration

Various marine-based and land-based (including rail) equipment will be in operation at the site during construction and operation contributing to ambient noise levels. Efforts will be made to reduce Project noise and transmission to sensitive receptors. Most environmental effects associated with construction of the Project can be mitigated through timing of activities as required (i.e., limiting night time construction). Construction of the CN siding(s) will reduce the need for Fairview trains to use the CN downtown yard, reducing noise from whistling. In consideration of the low magnitude of the potential Project-specific noise and vibration effects, the distance to most receptors, duration and frequency of the potential effects, and the mitigation measures that will be implemented, residual effects of the Project on Noise and Vibration are predicted to be not significant.

Light

Overall, facility lighting will be designed to provide the lighting necessary for safe work practices while avoiding nuisance glare beyond the active construction and operational areas. As a result of design mitigation and best management practices through Project design, facility lighting is not expected to result in a substantial increase in light trespass to surrounding communities and wildlife receptors, and as such, the potential effects of the Project on Light are predicted to be not significant.

Vegetation Resources

The environmental effects of the Project on Vegetation Resources was determined based on the assessment of three potential Project-related environmental effects (direct loss of vegetation, changes in abiotic conditions, and changes in the structure or composition of vegetation communities) on ecological communities of conservation concern (rare ecosystems), wetland ecosystems, riparian areas, rare plants, and old forest. There are no confirmed rare plant occurrences documented in or around the local study area. With the implementation of several prescribed mitigation measures, primarily reducing the footprint of disturbance on Vegetation Resources, the residual Project effect on Vegetation Resources is considered not significant.

Wildlife and Wildlife Habitat

Effects on Wildlife and Wildlife Habitat related to the Project include habitat loss or alteration due to vegetation clearing and construction activities, sensory disturbance due to increased noise and lighting levels, and direct mortality related to vehicle and train collisions. The Project will have adverse effects on Wildlife and Wildlife Habitat but all are considered to be low in magnitude and would not substantially affect wildlife populations in the region. Potential moose mortality from rail collisions has been a concern to regulators and stakeholders, and CN has committed to continued study of moose collisions in the Project area. A 1% increase in moose mortality is anticipated; this increase is not considered to be significant in the context of the sustainability of the overall population. Most environmental effects associated with this VEC can be mitigated through minimizing the footprint of disturbed area and educating workers on how to minimize potential human interaction with wildlife species. Many wildlife species are expected to habituate to the anticipated increase in sensory disturbance. Predicted residual effects, including cumulative effects of the Project on Wildlife and Wildlife Habitat are predicted to be not significant.

Avifauna

Project-specific effects on Avifauna include the loss and alteration of marine and terrestrial habitat, sensory disturbance, and direct mortality (i.e., through collisions with Project-related vehicles and infrastructure). There are three species federally listed under the *Species at Risk Act* which could potentially occur in the regional study area, although the local study area does not contain optimal habitat for these species. Based on the location and relatively small area of these activities within the region, the low magnitude of the potential Project-specific effects, and the mitigation measures that will be implemented (e.g., site clearing undertaken in compliance with the *Migratory Birds Convention Act* and spill prevention and contingency planning), Project residual effects are not expected to cause measurable effects to local and regional bird populations. Avifauna, are anticipated to habituate to the anticipated increase in sensory disturbance. Residual environmental effects of the Project on Avifauna are predicted to be not significant.

Freshwater Environment

Effects of the Project on the Freshwater Environment may include introduction of deleterious substances (i.e., sediment and high pH waste waters) into freshwater bodies, effects on habitat quality and availability (e.g., harmful alteration, disruption or destruction of fish habitat), or direct mortality of freshwater fish. Construction of the Project will result in a total loss of fish-bearing freshwater aquatic habitat of 2,300 m^2. In addition to these fish-bearing freshwater aquatic habitat losses, 15,527 m^2 of riparian habitat will be lost due to Project construction. Detailed mitigation measures will be in place during instream construction activities to minimize potential effects. A Fish Habitat Compensation Plan (HCP) is being developed to offset predicted aquatic habitat losses and ensure the Project meets the objectives of DFO's Policy for the Management of Fish Habitat. Overall, the CSR concludes that most environmental effects of the Project on the Freshwater Environment can be mitigated through environmental management planning, implementation of erosion and sediment control measures, fish salvage and environmental monitoring. The fish HCP will be developed and implemented for those environmental effects that cannot be mitigated in order to ensure that no significant adverse residual effects, including cumulative effects, are predicted to occur on the Freshwater Environment.

Marine Environment

Effects of the Project on the Marine Environment include habitat loss or alteration, acoustic disturbance, and direct mortality or physical injury. At full Project build-out, marine habitat alteration, disruption or destruction (HADD) is estimated to total 35.3 ha. This includes 16.975 ha of HADD resulting from construction of the terminal, and 18.323 ha of HADD resulting from construction of the rail sidings and Port-dedicated road. The assessment of the marine environment focused on the following resources: water quality; sediment quality; marine riparian habitat; eelgrass; bull kelp; marine benthos; Pacific salmon; humpback whale; and harbor porpoise. The assessment concludes that most adverse environmental effects on these resources can be mitigated through environmental management planning, sediment and erosion control methods and environmental monitoring. Disposal at sea of dredged marine sediments will be in accordance with the requirements of Environment Canada, and will be permitted in accordance with CEPA. In particular, preference will be given to construction technologies with reduced impacts to marine habitats such as vibratory pile driving where technically and economically feasible.

Marine mammal observers will be present during construction activities to ensure that adequate separation distances are maintained from potentially noisy activities. Habitat compensation measures are being developed for those environmental effects that cannot be mitigated. Based on the predicted low magnitude of residual effects, the duration and spatial extent of the potential alterations, the mitigation and compensation measures that will be implemented, Project residual effects are predicted to be not significant.

Socio-Economic Conditions

The effect of the Project on Socio-economic Conditions focuses on changes in land use as a result of Project construction and operations. Project construction will result in a permanent loss of informal recreational lands at the Terminal site and temporary loss of recreational land access during construction along the CN railway. The CN right-of-way is private property (as is the terminal) and any current use of these lands for informal recreational use is not permitted. The effects are predicted to be of low magnitude and not significant, affecting only a small portion of the local population. The development of the Phase II expansion will be on lands designated for such use through the port land use planning process. This consistent use is expected to result in important positive effects for the local and regional socio-economic environment such as increased demand for labour and economic activity.

Human Health and Safety

Public health and safety is addressed in this CSR with respect to assessment and management of several key Project emissions as required in the Scope of Assessment. These issues are addressed primarily in the Air Quality and Noise and Vibration VEC Sections. Based on the results of air quality and noise/vibration assessments and the expected application of worker health and safety plans and compliance with regulatory requirements, the residual environmental effects from all Project phases on Human Health and Safety are predicted to be not significant.

Archaeological and Heritage Resources

Previously recorded and newly recorded archaeological sites and archaeological potential of unrecorded sites were evaluated for this environmental assessment. Project activities will result in the destruction or disturbance of identified Archaeological and Heritage Resources. Monitoring for undiscovered Archaeological and Heritage Resources will be undertaken during construction along with documentation of resources found.

The Proponents will recover 100% of the Archaeological and Heritage Resources (artefacts and ancient human remains) in the project area. All artefacts and ancient human remains will be stored at the Museum of Northern British Columbia during construction and long-term storage and access will be arranged by the Proponents once all of the artefacts and human remains have been excavated and recorded. Full mitigation measures are detailed in the Archaeology Mitigation Plan, associated Addendum and Archaeology Implementation Plan. These actions will ensure the Archaeological and Heritage Resources and/or the knowledge associated with these resources are protected from construction related activities. Residual environmental effects are therefore predicted to be not significant.

Current Traditional Use by Aboriginal Persons

Five Aboriginal communities assert Aboriginal Rights to lands in the Prince Rupert Harbour area. These are the Metlakatla Band, Lax Kw'alaams First Nation, Gitxaala Nation, Kitselas Indian Band, and Kitsumkalum Band. For the purposes of this environmental assessment, and in this CSR, they are collectively referred to as the Tsimshian Nation. Potential environmental effects of the Project on the Tsimshian Nation includes consideration of current use of land, marine and resources for traditional purposes (i.e., hunting, fishing and gathering activities for subsistence purposes and use of lands and resources for social and ceremonial activities). It is expected that members of nearby Aboriginal communities will be able to reasonably continue their traditional resource use activities; however, locations of these activities may change to areas outside of the Project footprint, at least temporarily during construction. Signed impact benefit agreements are in place with all five of the potentially affected Aboriginal Groups. General mitigation includes, cultural awareness training for Project personnel, standard best management practices with respect to environmental management and response planning, and notification of Aboriginal Groups regarding construction activities, schedules and area closures.

Country Foods

Country Food resources include vegetation, wildlife, freshwater and marine species that may be used by local subsistence or recreational harvesters on Kaien Island and Prince Rupert Harbour. Project activities, such as dredging, could potentially result in a change of availability or contamination of country food resources. The Project is not predicted to have a significant effect on vegetation, wildlife, freshwater or marine environment, and likewise, is not predicted to result in a significant adverse effect on country food resources.

Assessment of Accidental Events

Accidents and malfunctions are unplanned, infrequent, and generally short-term in nature. Scenarios considered for the purposes of the environmental assessment include small-scale and worst-case (vessel collision) hazardous materials spills, spill of containerized material on land or water, and train derailment at the Skeena River. The environmental effects of any potential Project accidents or malfunctions that may occur in construction and operation of the Project can be addressed with appropriate environmental management and spill response planning. Provided that the mitigation outlined in the CSR is implemented, and provided that appropriate response plans are in place and are updated for the Project, as required, no significant environmental effects are likely to occur. In the extremely unlikely case of a vessel collision resulting in the release of a large amount of fuel, effects to Avifauna have the potential to be significant; however, an event of this scale is not likely to occur. It is concluded therefore, that significant Project-related environmental effects are not likely.

Effects of the Environment on the Project

Environmental factors which could potentially affect the Project include: slope instability; extreme weather; seismic activity and tsunamis; and climate change and sea rise. These factors could potentially result in an interruption of service or damage to infrastructure, or result in adverse effects to VECs. Based on a consideration of the various mitigative strategies applied through design criteria and the implementation of contingency planning effects of the environment on the Project are not likely to be significant.

Cumulative Effects

Residual effects of the Project have the potential to interact in a cumulative fashion with the residual effects of other past, present, or likely future projects in the area (i.e., Canpotex Potash Export Terminal, Ridley Terminals Inc., etc.). In general, adverse residual cumulative environmental effects are not expected to cause any long term measurable effects to local and regional habitats or populations, settings, or conditions (biophysical or socio-cultural). Adverse residual cumulative environmental effects are predicted to be not significant.

Follow-Up Programs and Monitoring

The Proponents have proposed monitoring programs, which will address the accuracy of environmental assessment conclusions, the effectiveness of mitigation measures, and whether or not mitigation measures were implemented (i.e., compliance monitoring). The Proponents have committed to carrying out all proposed monitoring programs as outlined in this CSR and in Section 8, Table 8-1 Summary of Design, Mitigation, Monitoring and Follow-up Commitments.

In addition to several VEC-specific monitoring programs, a qualified Environmental Monitor will oversee general construction activities and ensure compliance with environmental requirements. Habitat compensation monitoring will also be conducted to monitor effectiveness of compensation projects in the marine and freshwater environments. The Proponents will undertake to adaptively manage adverse environmental effects identified through monitoring.

Conclusion

Pursuant to the requirements of CEAA, the RAs (DFO, TC, CTA) along with PRPA have determined that, on the basis of the comprehensive study, and taking into account the CSR and the implementation of the proposed mitigation and commitments, the Fairview Terminal Phase II Expansion Project, including Kaien siding, is not likely to cause significant adverse environmental effects for any of the VECs. A positive effect is predicted on socio-economic conditions due to the development of port lands according to their planned use, as well as predicted local and regional economic benefits from the expanded cargo handling and shipping facilities and increase level of commercial activity.

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LIST OF ACRONYMS

AEUB .... Alberta Energy Utilities Board
AIA .... Archaeological Impact Assessment
AOA .... Archaeological Overview Assessment
ATWG .... Archaeological Technical Working Group
BC .... British Columbia
BCCDC .... British Columbia Conservation Data Centre
BCEAA .... British Columbia *Environmental Assessment Act*
BCMOF .... British Columbia Ministry of Forests
BMP .... Best Management Practice
CAC .... Criteria Air Contaminants
CCME .... Canadian Council of Ministers of the Environment
CEA Agency .... Canadian Environmental Assessment Agency
CEA .... Cumulative Effects Assessment
CEAA .... Canadian *Environmental Assessment Act, 1992*
CEPA .... Canadian *Environmental Protection Act*
CH_4 .... Methane
CMT .... Culturally Modified Tree
CN .... Canadian National Railway Company
CO .... Carbon Monoxide
CO_2 .... Carbon Dioxide
CO_{2e} .... Carbon Dioxide Equivalents
COSEWIC .... Committee on the Status of Endangered Wildlife in Canada
CP .... Lyngby's Sedge-Seaside Plantain
CPA .... Canada Port Authority
CPAEAR .... Canada Port Authority Environmental Assessment Regulations
CSR .... Comprehensive Study Report
CTA .... Canadian Transportation Agency
DFO .... Fisheries and Oceans Canada
EA .... Environmental Assessment
EAP .... Estuarine Arctic rush-Alaska Plantain
EC .... Environment Canada
EIS .... Environmental Impact Statement
EMP .... Environmental Management Plan
FA .... Federal Authority
GHG .... Greenhouse Gas
H_2S .... Hydrogen Sulphide
Ha .... hectares
HADD .... Harmful Alteration Disruption or Destruction
HAP .... Hazardous Air Pollutant

HCP .... Habitat Compensation Plan
HM .... Western Hemlock/Sitka Spruce–Lanky Moss
HPS .... high pressure sodium
HS .... Western Redcedar–Western Hemlock–Salal
IR .... Information Request
IFMP .... Integrated Fisheries Management Plan
KIR .... Key Indicator Resource
LS .... Shore pine-Yellow Cedar-Sphagnum
LSA .... Local Study Area
MSR .... Mitigation Strategy Report
N_2O .... Nitrous Oxide
NBCC .... National Building Code of Canada
NO_X .... Oxides of Nitrogen
PAH .... Polycyclic Aromatic Hydrocarbons
PCB .... Polychlorinated Biphenyls
PEL .... Probable Effects Level
PM_{10} .... Particulate Matter (inhalable)
$PM_{2.5}$ .... Particulate Matter (respirable)
PRPA .... Prince Rupert Port Authority
RC .... Western Redcedar–Sitka Spruce–Skunk Cabbage
RF .... Western Redcedar–Sitka Spruce–Sword Fern
RS .... Western Redcedar–Yellow Cedar–Salal
RSA .... Regional Study Area
RTG .... rubber tired gantry cranes
RTI .... Ridley Terminals Inc.
SARA .... *Species at Risk Act*
SD .... Western Redcedar/Sitka Spruce–Devil's Club
SO_2 .... Sulphur Dioxide
TC .... Transport Canada
TDR .... Technical Data Report
TEM .... terrestrial ecosystem mapping
TEQ .... Toxic Equivalent
TEU .... Twenty-foot Equivalent Units
TRIM .... Terrain Resource Inventory Mapping
ULCS .... ultra large container ship
US EPA .... United States Environmental Protection Agency
VEC .... Valued Environmental Component
WG .... Working Group
YG .... Western Redcedar-Yellow Cedar-Goldthread

1 INTRODUCTION

This Comprehensive Study Report (CSR) for the proposed Fairview Terminal Phase II Expansion Project (the Project), has been prepared by Fisheries and Oceans Canada (DFO), Environment Canada (EC), the Canadian Transportation Agency (CTA), and Stantec Consulting Ltd. (on behalf of the Prince Rupert Port Authority [PRPA]). This report fulfills DFO's, EC's and CTA's obligations as Responsible Authorities (RAs) established under the Canadian *Environmental Assessment Act, 1992* (CEAA)[2], to conduct an environmental assessment (EA) of the Project, with input from Federal Authorities with pertinent technical expertise. This report also fulfills the PRPA's obligation, as a Canada Port Authority, under the Canada Port Authorities Environmental Assessment Regulations (CPAEAR).

The purpose of the CSR is to provide a summary of information and analysis considered by the DFO, EC, CTA and PRPA in reaching their conclusion on whether the Project is likely to cause significant adverse environmental effects. The Minister of the Environment will consider this report and comments received from the public and Aboriginal groups in issuing the EA decision statement.

The Minister may request additional information or require that public concerns be addressed further before issuing the EA decision statement. Following the EA decision statement, the Minister will refer the Project back to EC, DFO and CTA in order for them to take the appropriate course of action.

The PRPA and Canadian National Railway Company (CN) are proposing the construction and operation of a wharf extension, expanded container and intermodal facilities at the existing Fairview Terminal, the construction of two sidings, a CN inspection road, a wye, and a Port-dedicated road between the terminal on Kaien Island and Ridley Island, British Columbia. On November 27, 2009, PRPA and CN submitted an Environmental Impact Statement (EIS) entitled *Environmental Impact Statement Fairview Terminal Phase II Expansion Project including Kaien Siding* to the Canadian Environmental Assessment Agency (the CEA Agency). The EIS was developed by the proponents to support preparation of a CSR as required for the Project under CEAA. Review of the EIS by Government, Aboriginal Groups and the Proponents resulted in a Project re-design that incorporated some important additional environmental mitigation elements. The key aspects of the re-design and the environmental implications were presented in a report titled *Mitigation Strategy Report for the Proposed Fairview Terminal Phase II Expansion Project in Prince Rupert, BC* (MSR; PRPA and CN 2011a). Key concerns that were raised with respect to the original Project design and the 2009 EIS submission included: disposal of waste sediment and terrestrial overburden at Brown Passage; loss of freshwater and intertidal habitat in and around Casey Creek; loss of wetland habitat in and around a tidal lagoon marsh, and loss of a seepage swamp. The MSR was intended to be a bridging document between the EIS and this CSR.

This CSR includes a summary of the proposed Project including potential Project-related environmental effects and cumulative environmental effects. The results of public and Aboriginal Groups consultations pursuant to this CSR are discussed including consultations conducted by the Government of Canada, the PRPA and CN Railway Company, and written input received during review of the Environmental Impact Statement (PRPA and CN 2009) and Mitigation Strategy Report (PRPA and CN 2011) prepared for the Project.

This CSR has been prepared in accordance with Section 16 of CEAA (Government of Canada 1992) and specific terms of reference contained in the Comprehensive Study Scope of Assessment for the

[2] The Canadian *Environmental Assessment Act, 2012* (CEAA 2012) came into force on July 6, 2012, replacing the Canadian *Environmental Assessment Act* S.C. 1992, c. 37 (former Act). CEAA 2012 sets out specific provisions for comprehensive studies, such as the Fairview Terminal Phase II Expansion Project, which were commenced under the former Act. For this project, the federal environmental assessment continued and was completed under the former Act. All references to federal environmental assessment legislation in this report reflect the requirements of the Canadian *Environmental Assessment Act* S.C. 1992, c. 37.

Proposed Fairview Terminal Phase II Expansion Project (including Kaien Siding) (Scope of Assessment) (EC et al. 2009). This CSR has been based extensively on the following documents:

- *Environmental Impact Statement, Fairview Terminal Phase II Expansion Project, including Kaien Siding* (referred herein as the Environmental Impact Statement or EIS [PRPA and CN 2009]);
- *Mitigation Strategy Report for the Proposed Fairview Terminal Phase II Expansion Project in Prince Rupert, BC* (PRPA and CN 2011a);
- Environmental Impact Statement Information Request Document (PRPA and CN 2011b); and
- Mitigation Strategy Report Information Request Document, November 2011 (PRPA and CN 2011c).

The EIS provides detailed information and technical studies in support of this CSR and also includes the Scope of Assessment. The MSR highlights key mitigative design changes undertaken in 2011.

2 PROJECT OVERVIEW

This section provides a description of the proposed Project. Additional information with respect to Project background and description is provided in the EIS Vol. 1 (Section 2 and Section 3.1) (PRPA, CN 2009) and the MSR (Section 2; PRPA, CN 2011).

2.1 Proponent Description

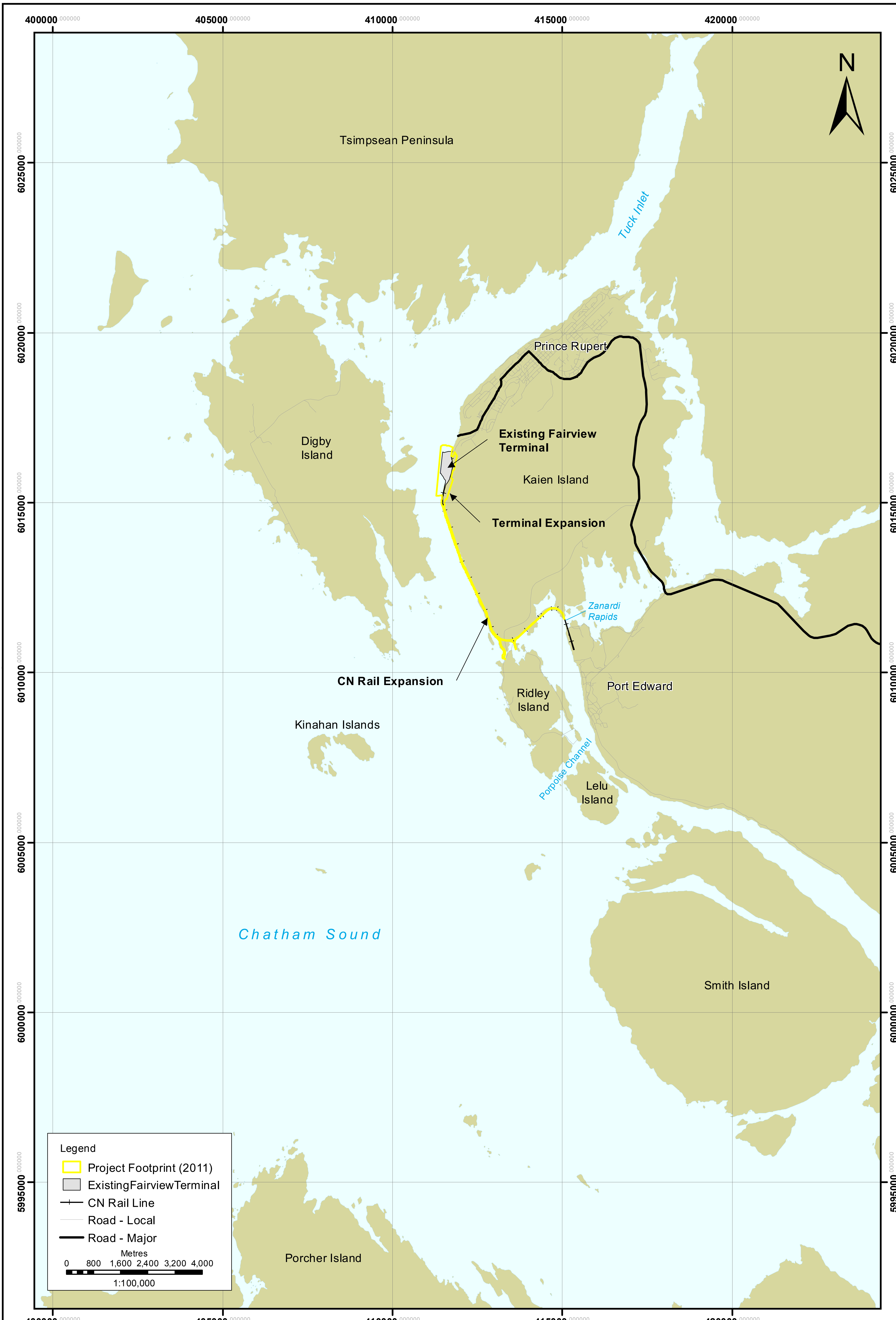
The Proponents for the proposed Fairview Terminal Phase II Expansion Project are the PRPA and CN. The PRPA is responsible for the overall planning, development, marketing, and management of the commercial port facilities within the Prince Rupert Harbour. The Project will be carried out as a public-private partnership. Maher Terminals of Canada Corp. (Maher, Terminal Operator), a private partner, will be responsible for final design, construction, operation and decommissioning of the Terminal. The PRPA will contractually bind the Terminal Operator to the mitigation and monitoring measures provided in this document. CN will remain as sole operator and owner of the rail component of the Project. Contact information is presented in Table 2-1.

Table 2-1 Proponent Contact Information

Contact	Address
Lorne Keller, VP, Project Development Prince Rupert Port Authority	200 – 215 Cow Bay Road Prince Rupert, BC V8J 1A2 Tel: 250.627.2503 Email: lkeller@rupertport.com
Luanne Patterson, System Manager – Environmental Assessment Canadian National Railway Company	13477 – 116 Avenue Surrey, BC V3R 6W4 Tel: 604.582.3608 Email: Luanne. Patterson@cn.ca

2.2 Project Location and Setting

The PRPA is proposing to construct a wharf extension and expand container and intermodal facilities at its existing Fairview Terminal, on Kaien Island in Prince Rupert, British Columbia (Figure 2-1). The proposed Project will be constructed on 45 hectares (ha) of CN lands and federal and provincial Crown lands (Figure 2-2). In order to facilitate the land-based movement of containers to and from North America, CN is proposing to construct two sidings, a CN inspection road, and wye adjacent to the existing mainline, between Fairview Terminal and Zanardi Rapids.



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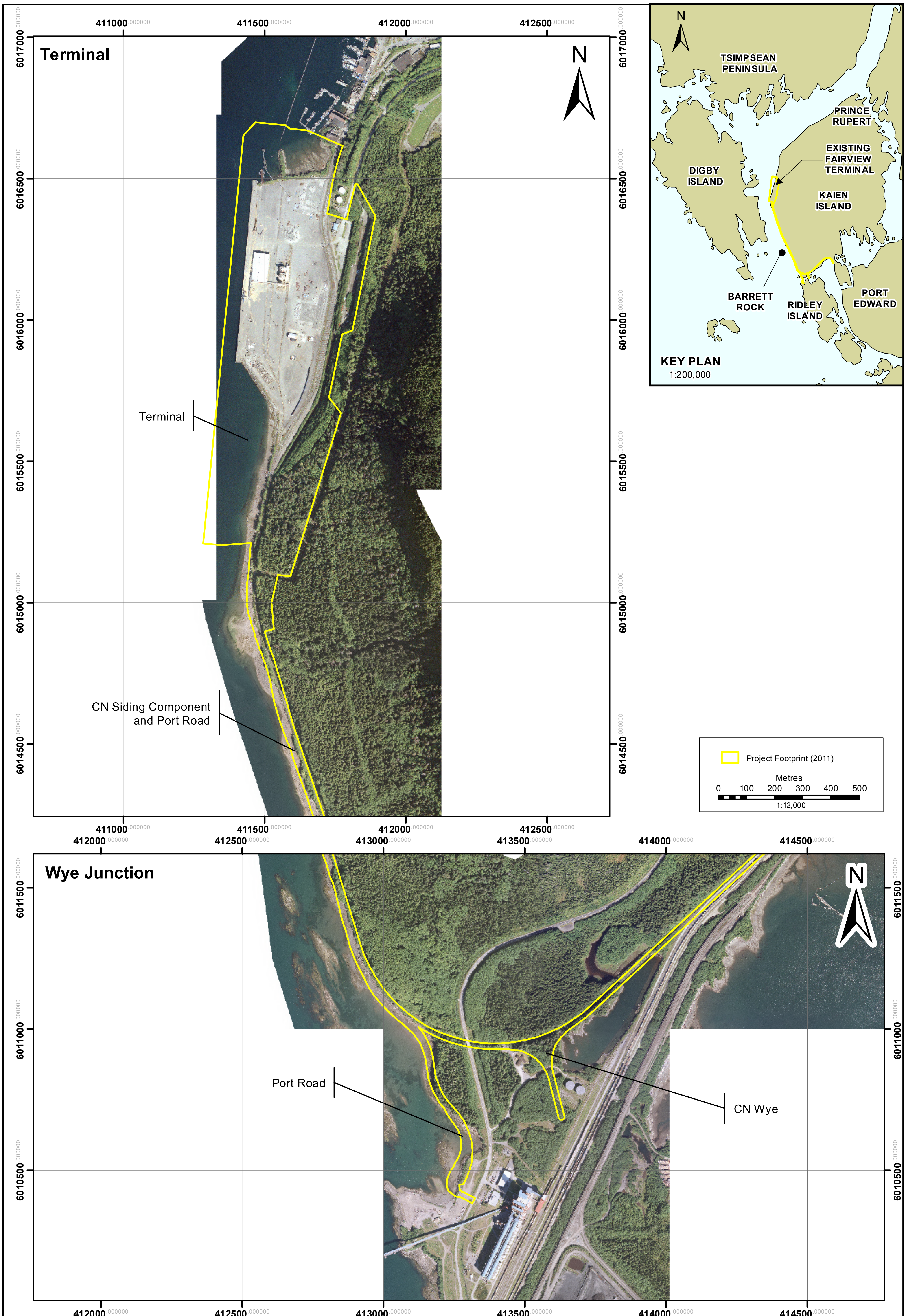
Stantec

PRINCE RUPERT PORT AUTHORITY

PROJECT LOCATION

PROJECTION	UTM - Zone 9	DRAWN BY	R Stohmann
DATUM	NAD 83	CHECKED BY	K Hewgill
DATE	05/12/2011	FIGURE NO.	2-1



PROJECTION	DRAWN BY
UTM - Zone 9	R Stohmann
DATUM	CHECKED BY
NAD 83	K Hewgill
DATE	FIGURE NO.
05/12/2011	2-2

Stantec

PRINCE RUPERT PORT AUTHORITY

PROJECT SITE
AND COMPONENTS

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The proposed Project site is situated within the Coastal Trough physiographic region, which is located between the Insular Mountains on the west and the Coast Mountains to the east (Holland 1976). Within this physiographic region, Kaien Island lies within the Hecate Lowland of the Hecate Depression. The topography is quite rough throughout most of the lowland and is characterized by long, deep fjords in the form of channels and inlets. The Hecate Lowland region consists primarily of metamorphic rock from the Paleozoic to Mesozoic era. Bedrock in the Prince Rupert area is predominantly a low-grade metamorphic rock composed of schists and gneisses associated with intruded igneous bodies. The soils of the Coastal Trough physiographic region are predominantly of the Organic Order, including organic materials such as mosses, sedges and other hydrophytic vegetation, as well as soils known as peat, muck, bog, or fen soils (Agriculture and Agri-Food Canada 1998). The coastal organic soils are, in general, poorly decomposed and consist mainly of peat moss.

Kaien Island is part of the Pacific climate region, a thin coastal strip of west-facing slopes, uplands and fjords. Moist, warm Pacific air streams carried by westerly winds from the Pacific drop large amounts of rain or snow as the warm air is forced up the Coast Mountains and cooled. The combination of cool and wet climatic conditions in the Prince Rupert area supports lush and diverse vegetation typical of temperate rainforests. Prince Rupert is Canada's wettest city, with an average annual precipitation of 2,593.6 mm of rainfall and 126.3 cm of snowfall.

The Project location is situated within the Coastal Western Hemlock biogeoclimatic zone, which occurs at elevations from sea level to 900 m on windward slopes along the south and mid-coast, and up to elevations of 330 m in the north (Meidinger and Pojar 1994). Western hemlock, amabilis fir, Western redcedar, Sitka spruce, and yellow-cedar dominate the forests of the wetter maritime subzones. Typical zonal stands are characterized by the Western hemlock/amabilis fir/Alaskan blueberry association. This vegetation association features well-developed shrub and moss layers, and a poorly developed herb layer.

Although less rich in species than the warmer, South Coast of British Columbia, the Prince Rupert region supports a considerable range of species unique to Canada and British Columbia, and breeding populations of world significance for a number of species. Mammal species that occur through much of the Prince Rupert region include the southern red-backed vole, and several species of coastal bats. Species that occur through much of the region, and reach their northerly limits at the Yukon, include the deer mouse, heather vole, least chipmunk and long-tailed vole. Typical species throughout the region include moose, marten, red squirrel, snowshoe hare, beaver, porcupine, short-tailed weasel, gray wolf, black-tailed deer and grizzly and black bear.

The majority of the Project area is sloped steeply westward along the base of Mount Hays in the direction of the Prince Rupert Harbour. The primary freshwater body in the Prince Rupert area is the Skeena River, a major fishing destination for locals and tourists. The Skeena has the second largest delta in British Columbia, and extends about 30 km west into Chatham Sound. There are several small watercourses and tributaries located within the Project area, some of which support populations of prickly sculpin (*cottus asper*), slimy sculpin (*Cottus cognatus*), Dolly Varden (*Salvelinus malma*) and coastal cutthroat trout (*Oncorhynchus clarki clarki*).

The Port of Prince Rupert is located within Fisheries Management Area 6 where fisheries related issues are regulated and managed under the *Fisheries Act*. The area contains diverse marine habitats, sea bird colonies, marine mammal foraging areas and significant marine fisheries. Aquatic organisms include, but are not limited to benthic species such as worms, clams, crabs, prawn, and shrimp; fish species such as sockeye, chum, coho, Chinook, pink salmon and steelhead trout, as well as halibut, yellow-eye rockfish, lingcod, herring, cod, and sole. Minke whales, killer whales, harbour porpoises, Dall's porpoises, grey whales, humpback whales, Pacific white-sided dolphins, Stellar sea lions and harbour seals are common to the area (Spalding 1998; Baird 2001a, 2003a, 2003b). In the vicinity of the Project site coastal water temperatures are approximately 12°C during the summer months and approximately 6°C in the winter months. A “fishing exclusion zone” extends through much of Prince Rupert Harbour for navigation and safety purposes. Despite this exclusion zone being in place, fishing is permitted unless fishing gear creates an obstacle or safety hazard to shipping and/or anchorage. Prince Rupert lies within an area that is closed to all bivalve shellfish harvesting. This includes a year-round closure due to potential presence of fecal coliforms in water, and occasional closures for paralytic shellfish poisoning.

The Project site is located within the claimed traditional territory of the Tsimshian Nation. Five Aboriginal communities assert Aboriginal Rights to lands in the Prince Rupert harbour area. These are the Metlakatla Band, Lax Kw’alaams First Nation, Gitxaala Nation, Kitselas Indian Band, and Kitsumkalum Band.

2.3 Purpose of the Proposed Project

Fairview Terminal was constructed in 1972 as a break-bulk cargo terminal, and was expanded to the south by approximately 100 m in 1989. With containerization becoming an increasingly important shipping method worldwide, Fairview Terminal, with its existing road and rail connections to the rest of North America, is well situated to link a fast-growing Asian market with North America. Fairview Terminal Phase I opened as a container terminal on October 31, 2007, with a design capacity of 500,000 twenty-foot equivalent units (TEU) per annum.

The purpose of the Project is to expand the existing container terminal and associated rail components in order to serve the growing needs of the shipping community in Canada and the US mid-west. The Port of Prince Rupert is located at the terminus of CN Rail, which is the only railroad in North America to cross the continent both east-west and north-south. At maximum build-out, the proposed terminal expansion will increase the capacity at Fairview Terminal to approximately 2 million TEUs per annum.

The expanded facility is expected to significantly alleviate congestion at existing West Coast ports and create significant economic opportunities for Canadian importers and exporters with the development of improved transportation connections to Asia.

2.4 Project Description and Components

The marine and land-based Project components have been designed to accommodate approximately 2 million TEU per annum, with a Project design life of approximately 50 years or longer.

The main components of the Project infrastructure are listed below and are expanded upon in the paragraphs following:

- Construction design and engineering (construction of the Project in two stages)
- Clearing, grubbing and stripping (15.7 ha) (some during Stage 1, majority during Stage 2)
- Site grading, including grubbing, stripping, and cut and fill (Stage 1 and 2)
- Large volume rock cuts in the existing viewing platform area (approximately 245,000 m^3 rock excavation). This material will be re-used in the northern reclamation (infill) area (Stage 1)
- Large volume rock cuts in the southern mountain area (Stage 2):
    - Approximately 256,000 m^3 overburden, of which 57,000 m^3 is organic (to be disposed of on land) and 198,750 m^3 is non-organic (up to 50 percent will be re-used on site, the remaining will be disposed of on land)
    - Approximately 390,000 m^3 rock excavation, of which all is proposed to be re-used within the southern reclamation (infill) area

- Total berth length of 1,200 m incorporating the extension of the existing Phase I (existing terminal) wharf apron structure, the southern wharf expansion and the northern wharf expansion
- On-site construction of eight concrete caissons (47.4 m long x 21.5 m wide x 21.5 m high) and one transition caisson for the southern wharf expansion (Stage 2)
- Construction of a reinforced concrete wharf structure supported by steel piles with a bored reinforced concrete socket into bed rock for the northern wharf expansion (Stage 1)
- Construction of a pile and deck wharf apron extension of the existing wharf at the north and south ends of the existing wharf caissons (Stage 1 and 2)
- Dredging in front of the northern expansion to provide adequate depth for the berth pocket (6,500 m^3) during Stage 1 of the Project; this material will be disposed of on land or re-used as fill (Stage 1)
- Dredging for the foundation of the proposed concrete caissons (180,000 m^3) as part of Stage 2 of the Project, and disposal at sea (Brown Passage) of this dredged material (Stage 2)
- Densification of the existing sea-bed overburden material for the extent of the proposed containment berm for the southern expansion (20,000 m^2) (Stage 2)
- Construction of rock berm and mattress for the southern expansion caisson wharf structure (Stage 2)
- In-filling (7.8 ha) behind the containment berm for the new terminal area for the southern expansion (Stage 2)
- In-filling (3.3 ha) behind the containment berm for the new terminal area for the northern expansion (Stage 1)
- Installation of caissons and construction of the wharf topside (Stage 2)
- Container and intermodal yard facilities construction (Stage 1 and 2)
- Construction of stormwater management and site drainage features (i.e., interception ditch) (Stage 1 and 2)
- Construction of two CN sidings, CN maintenance road and the Kaien-Ridley Island Road between the terminal and the southern end of Kaien Island (1 ha infilling below HWM; 2.2 ha infilling above the HWM for the sidings; 14.14 ha infilling for the northern expansion and road) (Stage to be determined)
- Construction of the locomotive wye (Stage to be determined)

The major components of the Project are described below and are shown in Figure 2-3.

2.4.1 Extension of Phase I Apron Berth Structure

The existing apron berth is to be extended to the north and the south for the full extent of the existing caisson wharf structure using a similar piled apron structure used for the existing apron berth.

The wharf structural system will consist of a pre-cast concrete deck apron attached to and extending out from the concrete caissons. Both cast-in-place and pre-cast concrete elements will be used for the wharf extension. The apron will be supported at the inshore edge on the existing cope wall and at the offshore edge by a new concrete pile-cap supported on a continuous row of vertical steel pipe piles. The pile cap will also act as the offshore crane rail beam. Precast, pre-stressed concrete box girders will span between the offshore pile cap/crane beam and the caisson cope wall. A cast-in-place concrete deck slab will be placed over the box girders.

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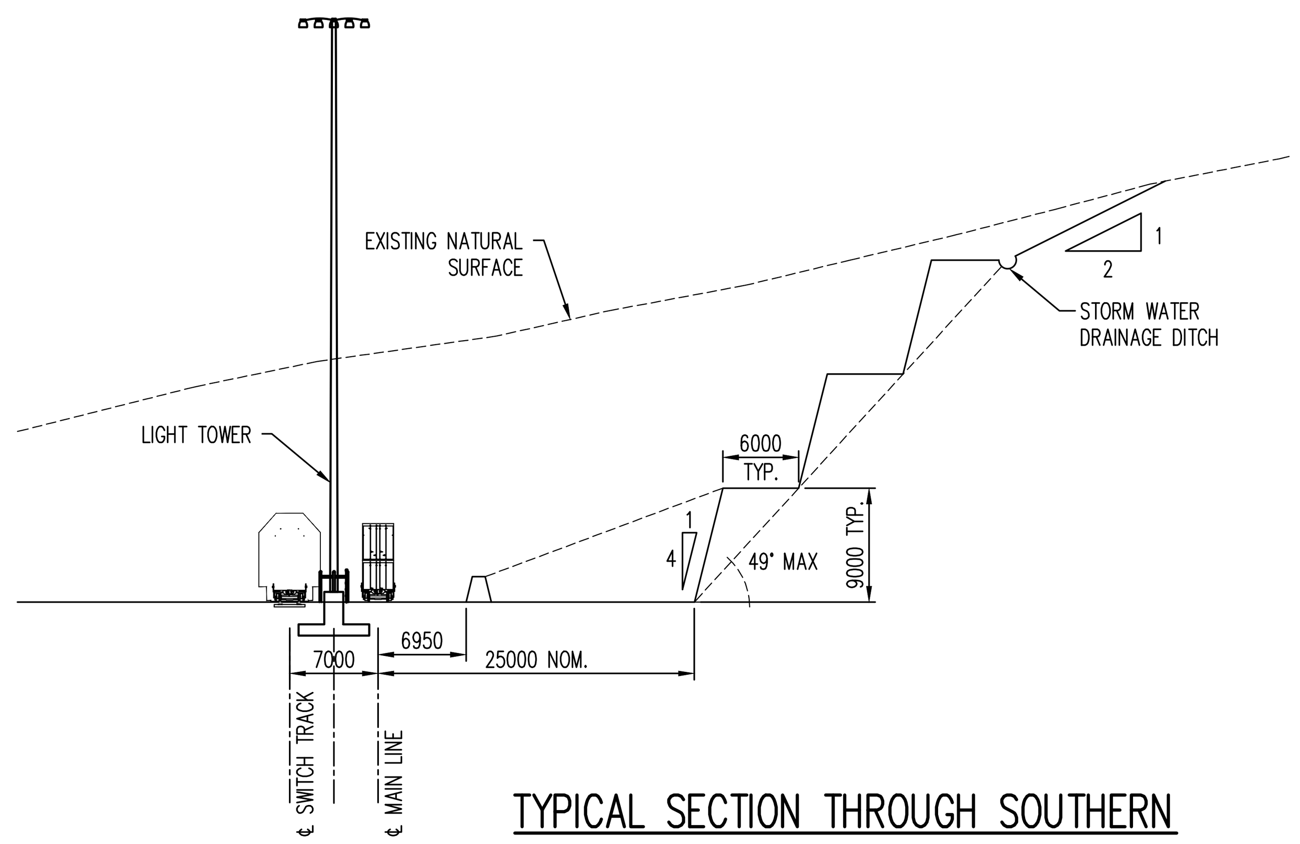
TOTAL TERMINAL AREA: 45.43 HECTARES
(WITHIN FENCE LINE)

MAIN TERMINAL AREA = 42.16 HECTARES
EMPTY PARK AREA = 2.11 HECTARES
CAR PARK, SUB-STATION AND ADMINISTRATION AREA = 1.16 HECTARES



TYPICAL SECTION THROUGH SOUTHERN EXCAVATION

RAIL YARD CAPACITY

	TRACK TYPE	No. OF TRACKS	TOTAL No. OF 325' CARS	TOTAL TRAIN FEET
PHASE 2 LONG TERM	WORKING	12	90	29,250
	STORAGE	2	3	975
	SWITCHING	1	15	4875
	TOTAL	15	108	35,100

GROUND SLOT QUANTITIES

TGS	TGS	MT	TOTAL
LONG TERM	4608	466	5074

KEY:

- NEW QUAY STRUCTURE
- AREA OF RECLAMATION
- ZONE OF DREDGING
- TERMINAL CONSTRUCTION FOOTPRINT

FOR INFORMATION

GENERAL NOTES

Rev'n	Description	Date
8	FOR INFORMATION (SL)	19.07.11
7	FOR INFORMATION (SL)	01.06.11
6	FOR INFORMATION (SL)	14.04.11
5	FOR INFORMATION (ALC)	25.03.11
4	FOR INFORMATION (ALC)	24.02.11
3	FOR INFORMATION (CAD)	23.02.11
2	FOR INFORMATION (ALC)	18.02.11

Designed	SEG	Approved	-
Drawn	ALC	Date	20.01.11
Checked	SEG	Scale	1:2500

CULLEN GRUMMITT & ROE (UK) LTD.
Company Number: 5208523
Chartered Civil Engineers
Consulting Engineers – Harbour, Civil & Structural
145 London Road, Kingston
Surrey KT2 6NH, United Kingdom.
Phone: 44 208 439 7588
Fax: 44 208 546 4975
Email: cgr.uk@cgrgroup.com
Internet: www.cgrgroup.com

Client: MAHER TERMINALS

Project: PRINCE RUPERT PORT PHASE 2 – TERMINAL EXPANSION

Discipline/Title: FAIRVIEW CONTAINER TERMINAL PHASE 2 TERMINAL EXPANSION LONG TERM

Sheet	Drawing number	Revision
A1	MHT-001-025	8

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2.4.2 Phase II Berth—Northern Expansion

Berth Structure

The Phase II northern berth expansion will consist of a precast and in situ reinforced concrete wharf structure supported by steel tube piles with a bored reinforced concrete socket into existing sea-bed and bedrock. The supporting piles will be spaced in an approximate 6 by 6 m grid. The concrete wharf structure will incorporate both the waterside crane rail and the landside crane rail as integral concrete beams supported directly on the steel piles. The overall length of the northern berth expansion will be approximately 155 m, and the overall width of the northern berth expansion will be approximately 40 m. Dredging of the overburden seabed material within the berth pocket will be required for the northern expansion to provide sufficient berth depth. It is proposed that the dredged material (6,500 m^3) be re-used on site if appropriate, or disposed of at the PRPA disposal site on Ridley Island.

Berth design has taken into consideration the potential for seismic displacements. This is discussed in detail in Section 6.15 (Effects of the Environment on the Project).

Armour Rock

The revetment slope underneath the northern berth expansion will be constructed at 1V:1.75H, and protected with primary and secondary rock armor against erosion from vessel prop wash and bow thrusters. The armor will consist of a 1.2 m thick layer of large diameter rock placed over a layer of filter rock.

2.4.3 Phase II Berth—Southern Expansion

Berth Structure

To facilitate the transition from Phase I to Phase II at the southern expansion, the existing rock mattress will be extended sufficiently from the existing caisson 18 to provide bearing for the new caisson 19.

The Phase II berth will consist of eight concrete caissons and one transition caisson constructed on a supporting rock mattress. Each of the eight caissons is approximately 47.4 m long and combined with the approximately 20 m long transition caisson provide roughly 450 m of new berth length. Dredging of overburden seabed material will be required at the berth down to dense till or bedrock followed by placement and densification of a rock mattress.

Drainage holes will be provided at the bottom of the caisson cross walls to permit water flow between groups of cells when ballasting during floatation and sinking into position. Fish refuge openings will be incorporated into the front face to provide aquatic habitat value.

In Phase I the large drafts associated with Ultra Large Container Ship (ULCS) vessels together with the high tidal range in Prince Rupert required the original berth line to be offset into deeper water. In order to match the Phase I berth line and water depth, the Phase II concrete caissons will be larger than the original caissons. The new caissons will be approximately 21.5 m wide by 21.5 m tall by 47.4 m in length. These are approximately 4 m wider, 6 m taller, and 4 m longer than the original caissons. Caissons will be constructed at an on-site batch plant.

Rip Rap Scour Protection

To mitigate the risk of erosion of the caisson mattress fills from vessel prop wash and bow thrusters, rip rap scour protection will be placed over the exposed face of mattress fills. Scour protection will consist of a 1.2 m thick double layer of rip rap placed over a layer of filter rock.

2.4.4 Container Yard Rubber Tired Crane Runways

The container yard layout for Phase II includes six blocks of containers stacked six wide and up to five high. Container handling in the container yard will be performed with Rubber Tired Gantry Cranes (RTGs) in the long term. The RTGs will run directly on the pavement structure design specifically for wheel loading from this equipment. It is expected that reach stacker operations will continue in the short term within the container yard and the northern expansion pavements will be designed accordingly.

2.4.5 Rail Works (Terminal)

CN Mainline

The CN mainline currently parallels the west shoreline of Kaien Island, along the east side of the existing terminal and extends north to the City of Prince Rupert and south to Ridley Island, across Zanardi Rapids. The Phase II expansion will require an eastern realignment of 950 m of mainline at the terminal, between the northern side of Casey Creek to a position matching the existing alignment at the east of the terminal, and connecting to the existing alignment south of the existing electrical substation. The realigned track will be constructed to CN mainline standards.

Drainage along the CN mainline will be provided to the east of a rail maintenance track which will be sloped towards the east to allow drainage of surface water away from the mainline and into a ditch immediately adjacent to the landslide catch basin.

Switching Tracks

A switching track will run the length of the terminal parallel to the mainline and with connections to the mainline at approximately CN Mile 91.25 to the south at Casey Creek and Mile 92.76 to the north. The switching track will function as a locomotive escape route and terminal run-around, providing access to all working and storage tracks. Both inbound and outbound CN intermodal trains will access the terminal tracks from the south, via the switching track.

Working Tracks

The existing Phase I working tracks (Tracks 1 to 6) will remain as working tracks in Phase II. An additional three working tracks will be provided to the east of each pair of tracks to provide three triple sets serviced by Mi-Jax container handling equipment. The existing working and storage tracks (Tracks 7, 8 and 9) will be upgraded to provide a fourth set to be serviced by Mi-Jax container handling equipment. This will require the removal of the existing storage tracks 10 and 11. All four sets of three tracks will be extended to the south, tying into the new switching track at the southern extents of the terminal. The working tracks will be arranged in four sets of three tracks, and will provide a total capacity of 24,645 train feet (based on 325 ft. car length).

The intermodal yard will be paved throughout the working track area. At dedicated crossing locations an asphalt track support structure will be incorporated.

Storage Tracks

The existing Phase I storage tracks have been modified to allow for the fourth set of working tracks. The existing storage tracks (Tracks 12 and 13) will remain as storage tracks in the final Phase II arrangement. The total capacity of the remaining storage tracks and the switching track providing approximately 5,565 train feet (based on 325 ft. car length).

2.4.6 Rail Works (Sidings and Wye)

The projected volume of containers moving through Fairview Terminal upon completion of the Project cannot be effectively handled on the existing single line operated by CN; therefore two sidings adjacent to the existing mainline have been proposed to accommodate the anticipated shipping volumes.

The two sidings are proposed to be constructed from the southern extent of Fairview Terminal to the southern end of Kaien Island. These sidings will be built immediately adjacent to the existing mainline (on the marine side), and will extend from Mile 89.11 to 91.79 (Siding 1) and Mile 89.17 to 91.76 (Siding 2), for a total rail construction length of 2.68 and 2.59 miles, respectively (approximately 4.25 km) (Figure 2-1). An access road for train inspections will be constructed alongside the sidings.

Modifications in the area of the existing Highway overpass at the south end of Kaien Island will be required to accommodate the sidings. The main line will be shifted over to make room for the sidings beneath the existing bridge structure. Scaling (and possibly blasting) will be required to cut the rock beneath the bridge, which will steepen the cut to almost 90 degrees but will maintain bridge stability and not require changes to the bridge superstructure.

Preliminary designs for the rail sidings and access road indicate the following components:

- Infilling of foreshore habitat (including marine riparian habitat) along Chatham Sound (1 ha below high water mark; 2.2 ha, above high water mark)
- Extension of existing culverts

In addition to the two sidings and access road, CN will require the construction of a rail wye in order to allow for turnaround of locomotives (Figures 2-1 and 2-2). The wye will be located in the CN bunkhouse area, at Mile 88.55 (approx.), at the southern end of Kaien Island. Construction at this location minimally affects watercourses, and does not affect any wetlands or marine habitat.

2.4.7 Terminal Access

The terminal access will remain as it currently operates. Access to the terminal area will be via the existing level crossing access from Scott Road. The existing administration building and car park will be utilized for the purposes of terminal operations.

The existing Scott Road will remain in its current form, but may be required to be upgraded pending future terminal traffic generation.

The PRPA will be constructing a Port-dedicated road for transport trucks entering and leaving the Terminal. This road will connect Fairview Terminal directly with Ridley Island, for transload, export, and border inspection purposes. Rather than traveling a 20+ km route from the Terminal through downtown Prince Rupert and around to Ridley Island (and beyond), trucks will travel along this 5 km private road. The Port-dedicated road will be constructed adjacent to the CN sidings, on the marine side.

2.4.8 Site Services

2.4.8.1 Storm Drainage

The Phase II storm drainage system will use a dual drainage concept to address on-site and off-site drainage. The on-site drainage system will be designed to have free flow events up to a 1-in-10 year return period. All terminal drainage will be routed through oil-water separators before being discharged into the ocean.

Off-site drainage will be designed for a 100-year storm. Landslide barriers and catch basins will be constructed to contain landslide events. One of the two main functions of the catch ditches is to intercept and transport runoff from the adjacent rock cut and mountainside to a downstream diversion channel. The catch ditches and the diversion channel will collect the runoff and discharge into the ocean through four 2.4 m wide by 1.5 m high reinforced concrete box culverts at the south of the Phase II site.

As the Phase II expansion will interfere with the off-site drainage system and the south end of the Phase I terminal, an open channel will be incorporated along the west toe of the landslide catch ditch berm to transport Phase I off-site runoff. This channel will also collect surface runoff from the CN mainline right-of-way. It is expected that off-site runoff will be free of contamination and will not have to be routed through an oil-water separator.

Approximately 15 existing culverts will be modified in order to accommodate the two rail sidings and access road, between the southern terminus of Fairview Terminal and the southern end of Kaien Island.

2.4.8.2 Water and Sewer Services

The approach to water supply for Phase II is to extend the Phase I network to the northern and southern limits of the terminal and for a loop system to minimize pressure drop due to head losses. With respect to fire protection, hydrants will be provided adjacent to each high mast light pole which are spaced at approximately 100 m.

A sewage treatment plant was built for Phase I to handle on site sanitary requirements. Capacity for the system was based on full build out of Phase I and II. The treatment system is a Rotating Biological Contact secondary treatment system, and the plant is in compliance with, and monitored in accordance with, the guidelines and criteria of the Provincial Waste Discharge Permit. A sanitary sewer forcemain will be installed in Phase II to service new building facilities. The sewer is designed to handle a population of 300.

2.4.9 Terminal Buildings

The Phase II Expansion will include construction of the following buildings: rail maintenance / south amenities building; RTG maintenance building; wharf amenities building; Canada Border Services Agency office.

2.4.10 Power, Lighting and Cold Ironing

Total power demand of the Phase II Terminal is estimated to be approximately 12,000 MVA and will be powered from the 69 kV substation installed as part of Phase I. Total loads for Phase II include: eight container gantry cranes, 216 reefer outlets, high mast lighting over the entire terminal area, and various building facilities.

High mast lighting for the Phase II terminal will be provided in coordination with the existing Phase I area lighting systems. This will include extension of the lighting power and control system to cover the increased terminal area and additional high mast poles with associated fixtures and lowering assemblies.

Cold ironing (cold docking) is a process where ships shut down their diesel-powered engines and use shore-based power for their electrical needs while at berth. Cold ironing conduits and a cable pit for the Phase II terminal will be included under Phase II. These ducts will connect into spares provided in the Phase I duct system and will allow future cables to be run from the 69 kV substation out to the cold ironing pit.

2.5 Project Construction, Operation and Decommissioning

2.5.1 Project Construction

The Fairview Terminal Phase II Expansion Project will be constructed in two stages: a Northern Expansion (Stage 1) and a Southern Expansion (Stage 2).

Stage 1 will be constructed immediately following completion of the EA and subsequent permitting process (fall 2012), and will include construction of the northern portion of the terminal, the proposed road between the terminal and Ridley Island, and at least one CN siding. Construction of Stage 1 is anticipated to take between 30 and 36 months. The target date for operation of Stage 1 is 2015.

Stage 2 is development of the area south and east (upland) of the existing terminal. PRPA and Maher Terminals will assess market demand and terminal volume once Stage 1 is operational and if required will proceed with construction of Stage 2. Construction of Stage 2 is anticipated to take between 36 and 48 months.

The second CN siding, maintenance/inspection road and wye will be constructed as necessary, when terminal volumes require it.

The primary construction activities include:

- Demolition
- Clearing, grubbing and stripping
- Rock cut and earth works
- Dredging and disposal at sea
- Perimeter berm construction and land reclamation (e.g., terminal, rail sidings, Port-dedicated road)
- Ground improvement / densification
- Track construction

Construction will involve the use of heavy machinery, most of which will be between 600 and 1000 horsepower and will use diesel or diesel/electric engines.

Demolition

Demolition and reconfiguration to accommodate the expansion is limited to:

- Removal and relocation of the south track switches in the intermodal yard, to allow for the extended working and storage tracks
- Re-alignment of a portion of the CN mainline to the east
- Re-routing existing storm water outfalls on the Phase I (existing terminal) south slope such that they discharge in front of the new berth
- Localized concrete demolition at an existing transition caisson to accommodate the new piled wharf apron and the transition with the new berth structure
- Demolition and removal of the existing barge ramp and timber dolphin structures at the north end of the existing terminal
- Removal of the old breakwater as part of the filling works within the northern reclamation area (material to be re-used where possible)

Clearing, Grubbing and Stripping

The terminal expansion will require approximately 14.5 ha of existing land be cleared of vegetation. Construction of the sidings and wye will require the clearing of approximately 1.5 to 2.0 ha of vegetation.

Rock Cut and Earth Works

The terminal expansion will require excavation into the existing hillside with large volumes of rock cut and fill expected. A single rock cut profile will be established along the length of the Phase II terminal where rock excavation is required, matching the existing rock cut profile east of the terminal. Rock cut benches will be constructed to accommodate maintenance work along each level. Runoff from the face of the rock cut will be collected in a continuous catch ditch along the toe. At the toe of the rock cuts, a landslide catch ditch and containment berm will be provided.

Shoring and drainage measures will be implemented where necessary to stabilize the overlying overburden materials. Ongoing maintenance of the rock cuts will be required. Estimates of terminal earthworks cut quantities are:

- Overburden (including stripping volume): 256,000 m^3
- Rock excavation: 390,000 m^3 (southern mountain excavation)
- Rock excavation: 245,000 m^3 (existing viewing platform)

It is expected that the rock cut and earth works will take 18 to 24 months to complete, and will require the use of explosives (i.e., one to two blasts per week is estimated).

Construction of the rail sidings will require approximately 30,000 m^3 of excavation. Construction of the wye will require approximately 5,000 m^3 of excavation.

Common excavation will be dug by an excavator and placed in trucks. Material will be removed from site or disposed of as fill in areas isolated from water. Blast rock and material from the wye and at/near the overpass will be moved by truck, and used as fill as required. CN will not be disposing of their common excavation material at Ridley Island, but at an approved land-based location. Confirmatory sampling of overburden soils prior to removal will be undertaken, to verify soil quality. Should contaminated soils be identified, it will be disposed of at an approved location, and in accordance with applicable legislation.

Dredging

Dredging is required to:

- Remove soft seabed deposits prior to installation of the caisson berth structure and the perimeter containment berm
- Accommodate placement and performance of imported mattress rock fills and imported berm rock fills

Dredging requirements are anticipated to be: dredging in front of the northern expansion (6,500 m^3) to provide adequate depth for the berth pocket during Stage 1; and dredging for the foundation of the proposed concrete caissons (180,000 m^3) during Stage 2.

The total volume of dredge material to be disposed of at sea is the 180,000 m^3, comprised entirely of the marine sediment removed to accommodate the concrete caissons (Stage 2). Dredging equipment will likely consist of clamshell dredges.

Disposal at Sea

An alternatives assessment for disposal at sea associated with the Fairview Project was submitted in April 2010. It was concluded in that report that Brown Passage was the preferred disposal site for the following reasons:

- It had been used historically as a disposal site
- There was limited overlap with commercial fisheries and no known overlap with Aboriginal fisheries
- It was not considered a navigational hazard

Subsequent to the preparation of the alternatives assessment being complete, the Metlakatla First Nation provided information to DFO summarizing their current use of Brown Passage for fishing, and that information has been taken into consideration during disposal at sea planning.

It was the opinion of the Proponents that from an environmental and economic perspective it would be preferable to permit a site that had been used historically for disposal at sea, rather than developing a new site. The only previously permitted site within the vicinity of the Project (i.e., within 30 km of the Project site) is Brown Passage. From a cost perspective, it was determined that pursuing a previously permitted site would be more economical, and potentially less likely to have adverse environmental effects, than pursuing a new site, which would require additional characterization work.

It is intended that all of the 180,000 m^3 of dredged material will be disposed of at sea at Brown Passage (Figure 2-4), in accordance with the disposal at sea provisions of CEPA. The Brown Passage disposal site is approximately 30 km west of Prince Rupert, in Chatham Sound, approximately one nautical mile in diameter, with water depths of approximately 200 m. It has been used for the disposal of dredged and other material on seven occasions since 1972, most recently in 2006/2007 during the construction of Fairview Phase I. Stantec, on behalf of the PRPA conducted a full assessment of the proposed disposal at sea activities for the Project, based on original estimates of volumes of material proposed for disposal at sea. This assessment addressed potential concerns through a discussion of baseline conditions at Brown Passage, fate of the disposed material, potential effects on sediment, water quality, marine biota, and human uses, and alternative locations that might be used for disposal. This assessment is presented in a report entitled *Assessment of Disposal at Sea Activities for the Fairview Terminal Phase II Expansion, Prince Rupert, BC* (Stantec 2010). An updated fate of disposal report based on the revised Project design (including substantially less disposal at sea) has been prepared to demonstrate the anticipated extent of disturbance during and following disposal of the 180,000 m^3 of dredged material.

Based on an estimated seven return barge trips per day (from Fairview Terminal to Brown Passage) at a capacity of 1,500 to 2,000 m^3 per barge load, it is expected to take between 20 and 25 working days to transport the disposal material to the proposed Brown Passage disposal site. Disposal at sea of material at Brown Passage will not occur for several years (i.e., not before 2015 at the earliest); therefore the Disposal at Sea permit will not be required until that time. PRPA will develop a Dredge Material Disposal Plan in consultation with EC following approval for a Disposal at Sea permit. The Dredge Material Disposal Plan will include procedures to accurately measure or estimate quantities of dredged material disposed of, vessel and barge tracking, and a schedule for use of the disposal site. The PRPA has considered upland disposal for the dredge material; however, upland disposal is not preferable for the following reasons.

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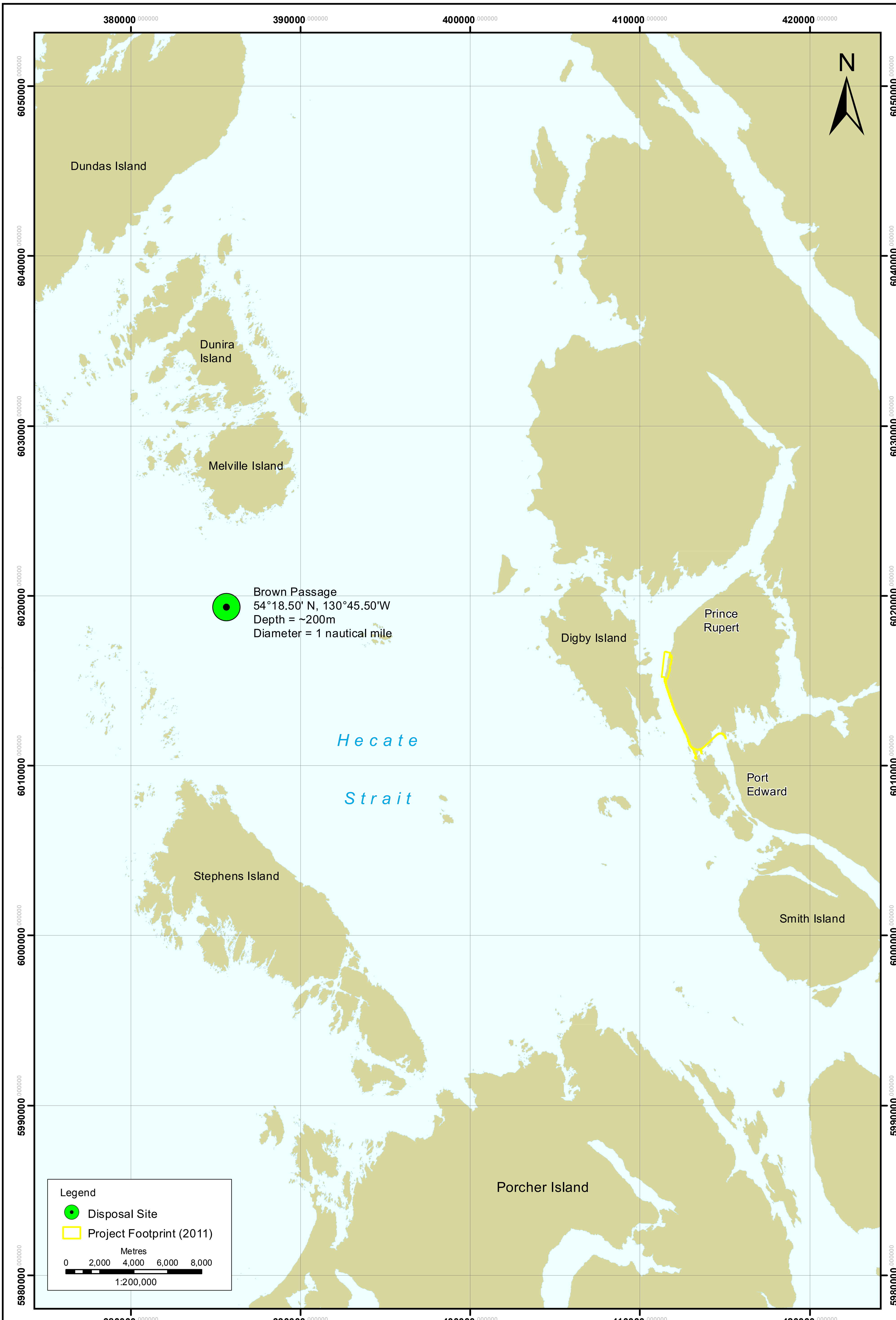

Stantec

PRINCE RUPERT PORT AUTHORITY

PROPOSED OCEAN DISPOSAL SITE

PROJECTION	UTM - Zone 9	DRAWN BY	R Stohmann
DATUM	NAD 83	CHECKED BY	K Hewgill
DATE	05/12/2011	FIGURE NO.	2-4

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Opportunities for upland disposal, which must be deemed "economically feasible", are limited within the geographic area (hilly terrain and coastal location). Disposal options at land disposal sites would provide disproportionate costs (transportation costs), thus favoring the more feasible option of disposal at sea. The only known, existing disposal sites within an economically feasible area, are located on Ridley Island: one site is intended for contaminated dredgeate; the other is intended for organics. Therefore, neither of these sites is considered technically feasible, as the material for disposal is neither contaminated, nor organic. The PRPA has also considered options for reducing and re-using the dredge material:

- Volume Reduction: In 2011, the PRPA, together with CN, undertook a mitigative re-design process, whereby the terminal layout was substantially altered. The mitigative re-design eliminates the large volume of terrestrial excavation work that was originally required, reducing the volume of material for disposal at sea by 87 percent (from over 1,300,000 to 180,000 m^3). The material proposed for disposal at sea is comprised entirely of marine sediments. No terrestrial overburden will be disposed of at sea. As detailed design of the Project continues for Stage 2 of the Project (the southern expansion, which requires the Disposal at Sea permit), opportunities to further reduce the volume will be pursued where economically and technically feasible.
- Re-use of Material: Initial sampling work and results of historical geotechnical studies at the site indicate that the material proposed for disposal at sea is likely not appropriate for construction purposes. Typically the Phase II southern expansion (Stage 2) area seabed consists of 3 m of soft/loose silt and organics over top of a thin discontinuous layer of denser glacial till and clayey silt. The composition of both layers makes for unsuitable material and is required to be removed prior to any construction. However, as detailed design and geotechnical studies continue for Stage 2 of the Project, opportunities for re-use will be further explored. Further characterization of the dredged material and the assessment of beneficial uses will be conducted during the permitting stage, and preferred options for re-use or disposal of the material will be identified during permitting, in consultation with Environment Canada.

Land-Based Disposal

The dredge material from the northern expansion berth pocket (6,500 m^3) is proposed to be re-used on site, disposed of at the PRPA Disposal Site on Ridley Island, or disposed of at the City of Prince Rupert's landfill. Due to the relatively small quantity of material requiring disposal from the northern expansion, it is estimated that only five barges will be required to transport the material to the PRPA disposal site on Ridley Island.

Land Reclamation and Perimeter Berm Construction

Approximately 11 ha of the proposed terminal expansion will be created by infill. The land fill operation into the ocean involves construction a perimeter berm with an upper sheet pile bulkhead wall to contain a large volume of general site fill. A portion of the perimeter berm will be formed by the new caisson wharf structure. Estimated quantities of fill material are shown below (Tables 2-2 and 2-3):

Table 2-2 Estimated Quantities of Fill Material and Sources (North Expansion–Stage 1)

Item	Estimated Volume	Source
Containment Berm Fill	87,000 m^3	75% imported; 25% on-site quarry
General Fill	216,000 m^3	On-site quarry
Select Subgrade Fill	29,500 m^3	70% imported; 30% on-site quarry
Rip Rap Slope Protection	21,200 m^3	Imported

Table 2-3 Estimated Quantities of Fill Material and Sources (Southern Expansion–Stage 2)

Item	Estimated Volume	Source
Caisson Mattress Rock	175,000 m^3	Imported
Caisson Ballast Rock	135,000 m^3	On-site quarry
Berm Rock	500,000 m^3	80% imported; 20% on-site quarry
General Fill	750,000 m^3	On-site quarry
Select Subgrade Fill	200,000 m^3	On-site quarry
Rip Rap Slope Protection	75,000 m^3	Imported

The existing PRPA quarry, located within the bounds of the Project, will be used to provide the fill required for the containment berm and general fill (to create the base for the terminal). Only the volume of material required for construction fill purposes will be excavated. A Rock Management Plan will be in place prior to construction that will outline which rock is suitable for use in the intertidal area, which rock is suitable for subtidal use, and which rock is not suitable for quarrying and use in-water. Material that is not suitable for construction will not be quarried. Use of this quarried rock is for construction purposes only; there will be no material excavated that needs to be disposed of.

It is anticipated that five barges per day will be required over 200 days to complete the marine infilling for the Terminal.

Infilling for rail bed purposes (to support the sidings) is expected to be 155,000 m^3 of infilling. Rip rap volumes to stabilize filled sections of shoreline are anticipated to be 27,000 m^3 for the sidings.

Ground Improvements

The stability and performance of general fills for the infill areas will be controlled by a densified berm constructed around the perimeter and the proposed caisson wharf structure. Densification is required to minimize settlement, control horizontal displacements, and to provide the required bearing capacity for the caissons. A rock berm will be installed immediately behind the caissons and will be densified using land based vibro-densification techniques. In addition, the upper site fills to a distance of approximately 30 m behind the caisson rear wall will be densified using a combination of land based vibro-densification and dynamic compaction techniques.

Caisson Construction and Installation

A temporary concrete batch plant will be constructed at or immediately adjacent to the existing Fairview Terminal in order to construct the caissons. Following caisson fabrication, the caissons will be sunk onto the prepared base and ballasted. Precast covers and key slabs will be placed as appropriate, and fill material will be placed behind the caissons, up to the containment dyke.

Track Construction

Once construction of the railway grade is complete, ties will be distributed and placed in proper line and spacing. Ballasting, final surfacing, distressing, and thermite welding will complete track construction. Signals and switching equipment will be installed as required.

Phase II Northern Berth Structure (Stage 1)

Pile drilling is required to construct the Phase II wharf structure for the northern expansion. Pile drilling will be completed from a temporary platform, or floating equipment, using a vibro-hammer where technically feasible to set the piles.

Apron Berth and Southern Berth (Stage 2)

Pile drilling is required to construct both the existing apron berth structure extension and the new berth structure at the southern expansion. Pile drilling will be completed from the land side, using a vibro-hammer where technically feasible to set the piles.

2.5.2 Project Operations

Terminal Operations

Fairview Terminal operations consist of the loading and unloading of container ships, container storage, and container transfer to and from road and rail transport. The Project has been designed to allow for the efficient transfer of containerized cargo between vessels and the shore. The Terminal will be operated by Maher Terminals of Canada Corp., and will be supported by CN.

The expansion of the Fairview Container Terminal is proposed to be completed in two Stages, with the Northern Expansion being Stage 1 and the Southern Expansion being Stage 2 (maximum build out). The northern expansion of the terminal will increase terminal capacity from 500,000 TEUs per annum to approximately 1,250,000 TEUs per annum. The southern expansion will increase the terminal capacity to 2,000,000 TEUs plus per annum.

Once containers are unloaded from ships by super post-Panamax container cranes, the containers are moved by tractor trailers and bomb carts to the container storage yard. In the interim northern expansion stage, container handling within the container yard will be performed with reach stacker equipment as per the current operation. Once the southern expansion has been completed, container handling within the container yard will be modified to be performed with RTGs. The container stacking layout in the container yard will vary depending on the type of equipment. From storage, containers will be moved to the intermodal yard for rail transport. A mix of reach-stacker equipment and Mi-Jack gantry cranes will be adopted to load containers onto the rail cars in the interim stage.

The container yard storage capacity will be approximately 33,891 TEUs and the rail yard storage capacity will be 134 TEUs.

Upon completion of Stage 1 (northern expansion), up to 10 vessels will arrive at the terminal per week. With completion of Stage 2 (southern expansion), a maximum of 14 vessels will arrive at the terminal per week under full operating capacity (2 million TEUs annually). Currently, two vessels arrive per week. Vessels will be accompanied by tug escorts.

Rail and Truck Operations

With completion of Stage 1, maximum daily train traffic will increase to a total of six train movements per day (three inbound / three outbound, including existing train movements). With completion of Stage 2, maximum daily train traffic will increase to a maximum of ten train movements per day (five inbound / five outbound, including existing train movements). The trains into and out of Fairview Terminal will be priority trains, which do not stop in Prince George, Terrace, or any of the other surrounding area communities, except to change crews.

It is anticipated that there will be approximately 1,570 trucks movements per week at completion of Stage 1, and up to 2,500 truck movements per week at completion of Stage 2. To alleviate truck traffic through downtown Prince Rupert, a Port-dedicated road will be constructed between the terminal and Ridley Island. These trucks include trucks for transload and export purposes, as well as trucks bound for the Canada Border Service inspection facility on Ridley Island.

2.5.3 Project Decommissioning

The design life of the Fairview Terminal will be approximately 50 years or longer with proper maintenance and equipment replacement. It is unlikely that the rail components and marine structures will ever be decommissioned and removed. Should decommissioning and abandonment be required at any time in the future, it will be undertaken in accordance with the regulatory requirements applicable at the time of such activities. In the event that the terminal components are dismantled an abandonment plan and, if required, a site restoration and rehabilitation plan, would be developed and implemented.

At a minimum, a decommissioning plan would include a schedule for structure and equipment decommissioning and disassembly. Such a plan would indicate the approximate time required to remove and dispose of all abandoned structures, facilities, and installations for which on site reuse is not possible, and to reinstate the site to a quality necessary for subsequent industrial use.

Decommissioning planning will be developed in consideration of environmental goals for the Project area in place at the time. Activities that support such planning may include a review of baseline and follow up monitoring data; terminal record keeping; adherence to applicable standards and guidelines in place during Project operations; and development of a site rehabilitation plan.

Disposal of waste will be conducted in accordance with provincial and federal waste management regulations and guidelines in place at the time. Removal of buildings and installations is expected to have similar environmental effects and considerations as construction and will be conducted in accordance with regulatory requirements applicable at the time of removal.

2.6 Alternatives Assessment

Under Section 16 (2)(b) of CEAA a comprehensive study must consider alternative means of carrying out the project that are technically and economically feasible and the environmental effects of any such alternative means. To fulfill this requirement, the Proponents have identified potential alternatives and assessed the viability of alternatives that would minimize effects to the environment.

Additional information is provided with respect to alternatives in the EIS Vol. 1 (Section 3.2) (PRPA, CN 2009) and in the EIS and MSR Information Request Documents (PRPA, CN 2011b and c).

2.6.1 Alternative Means of Carrying out the Project

Examining alternative means of carrying out a project involves addressing the following questions:

- What are the alternatives?
- Are these alternatives technically and economically feasible?
- What are the environmental effects associated with the feasible alternatives?
- What is the rationale for selecting the preferred alternative?

Several alternative means of carrying out the proposed Project were identified in the Scope of Assessment document and considered by the Proponents. The alternatives considered were:

- Terminal location
- Terminal layout and construction methods
- Number of required rail sidings
- Placement of rail sidings and access road
- Wye configuration and location
- Disposal at sea

To assess alternative means of carrying out the Project, the Proponents applied economic/commercial and technical criteria, prior to any environmental criterion. After economically/commercially and technically viable alternatives were identified, environmental, technical, social, and economic criteria were applied to the evaluation. If an alternative was deemed to be technically or economically unfeasible, further assessment of that alternative using other criteria (safety, environmental and/or socio-economic considerations) was not considered as per CEAA requirements.

Table 2-4 provides a summary of the assessment alternatives, and includes the environmental benefits and costs for each alternative considered.

As the purpose of the Project is to expand the existing Fairview Terminal, the alternatives considered with respect to terminal location were limited to the land immediately south and north of the existing wharf. No sites away from the Fairview area were considered, as it would not be economically feasible to construct an entirely new container terminal separate from the existing, operational, and rail served Fairview Terminal.

Table 2-4 Summary of Assessment of Project Alternatives

Alternatives	Technical Feasibility	Economic Feasibility	Safety Considerations	Environmental and/or Socio-Economic Considerations	Preferred Option	Aboriginal and Public Concerns
Alternative Sites						
North of Existing Fairview Terminal	Not considered feasible to the extent considered in the EIS; portion of wharf expansion to the north is considered feasible. Proposed infilling to the north will occur within the PRPA's existing water lot. Expansion northward has been included in the overall Project in order to avoid impacts to the area in and around Casey Creek, however, the northern portion of the work will be minimal compared to what the extent would be if the entire terminal were expanded to the north (as described in the EIS)	Not considered feasible to the extent considered in the EIS; portion of wharf expansion to the north is considered feasible—does not adversely affect existing businesses	n/a	Full expansion (wharf and terminal yards) of the Terminal closer to Prince Rupert potentially causing noise and light nuisances. The area north of the existing Terminal (beyond the PRPA waterlot) is home to several existing operations including a fish processing facility, a cold storage operation, terminals for both Alaska and BC Ferries, as well as moorage locations for Coast Guard emergency response vessel(s) and the pilotage boat. These businesses would be affected by full northern expansion	✓ (portion of expansion to the North; Stage 1)	Concern with respect to proximity to existing operations, moorages, and businesses
South of Existing Fairview Terminal	Considered feasible	Considered feasible; Expansion primarily to the south avoids disturbance to marine-based businesses (i.e., terminals, marinas	Greater distance from residential communities and other existing land uses	Greater distance from residential communities and other existing land uses	✓ (Stage 2)	Concerns with respect to habitat loss
Alternative Methods of Construction						
Pile and Deck	Considered feasible but more complex and greater engineering uncertainties	$6.5 million more	More complex engineering required for seismic reliability	More noise and vibration associated with pile-driving		
Concrete Caisson	Considered feasible with robust design and advantage during seismic loading	Considered feasible	Behaviour of caissons during seismic event is more reliable	Larger marine footprint and associated habitat compensation requirements	✓	N/A
Alternative Rail and Port-road Locations						
Rail Siding(s) and Port-road Placement: Marine Side	Considered feasible, less rock excavation and stabilization required	Considered feasible	Constructability is more feasible, with less safety concerns with rock falls	Larger marine footprint and associated habitat compensation requirements but smaller terrestrial and freshwater footprint	✓	Concerns with respect to habitat loss
Rail Siding(s) and Port-road: Upland Side	Currently not preferred due to higher risk of instability, derailment and maintenance; safety risk to people and environment. Trucks would need to cross the mainline if the road were constructed upland	Considered feasible	Concerns regarding constructability and terrain stability	Greater terrestrial and freshwater habitat footprint but smaller marine footprint; construction noise; construction duration and air emissions; additional use of downtown rail yard; greater archaeological impact; Trucks needing to cross the mainline - increases possibility of an incident between train and truck. When the mainline and sidings are in use, the trains would block truck crossings, potentially at either end of the road. At these times the trucks wouldn't be able to access the terminal or the Ridley Island road until the crossing(s) are clear, thus affecting productivity and increasing emissions		Concerns with respect to loss of a greater number of archaeological sites
Alternative Rail Layouts						
Proposed Two Rail Sidings	Considered feasible	Considered feasible	Does not interfere with existing mainline	Larger Project footprint	✓	N/A
One Rail Siding	Does not allow Terminal to meet 2M TEU plans	Does not allow Terminal to meet 2M TEU plans	n/a	n/a		N/A

Alternatives	Technical Feasibility	Economic Feasibility	Safety Considerations	Environmental and/or Socio-Economic Considerations	Preferred Option	Aboriginal and Public Concerns
Alternative Wye Locations and Configurations						
Use of Existing Wye	Longer distance for trains to run; higher emissions and noise to community. Results in poor efficiencies and congestion for other rail traffic	Longer distance for trains to run; higher emissions and noise to community. Results in poor efficiencies and congestion for other rail traffic	n/a	n/a		Existing public concern with respect to rail traffic and noise
Construction of Wye at Mile 88 Skeena Subdivision	Considered feasible, although there are restrictions due to geology and geometry of mainline track	Considered feasible	No particular safety concerns	Located on rock bench in wetland; large wetland impact		Wetland habitat loss
Construction of Wye at Mile 88.55	Preferred choice	Considered feasible	n/a	Smaller footprint as it would shorten tracks; avoid additional whistling in Prince Rupert; improve public safety; and reduce air emissions over the Prince Rupert Yard	✓	No concerns
Alternatives to Disposal at Sea						
Proposed disposal at sea; Brown Passage	Considered feasible; previously managed disposal at sea site	Considered feasible	No particular safety concerns. Site is currently marked as disposal area to minimize effects on navigation	Site is previously impacted and has been previously used for disposal; use would require a permit under subsection 127(1) of CEPA	✓	Strong opposition - Concern with respect to impact on traditional fishing areas
Disposal within PRPA harbour limits (eight alternate sites assessed)	Potentially feasible; further investigation required	Considered feasible	Site would need to be located in area to avoid conflict with navigation	Disposal at sea activity proposed for use within PRPA limits would require a permit under subsection 127(1) of CEPA. Would require establishment of new disposal site (new marine footprint). Creation of a new disposal site would affect a previously undisturbed portion of the benthic and marine environments		
Ridley Island Disposal Site	Not considered feasible for large scale disposal of inorganic material. The limits of this disposal site were established in 1978 by Environment Canada Fisheries and Marine Resource Services Branch	unknown	n/a	n/a		N/A
Potential new disposal sites (8), including sites within PRPA jurisdiction	Some sites may not have the capacity to accommodate the proposed volume of material	Considered feasible	Safety will be further assessed if Brown Passage not permitted	Would require creation of a new disposal site (new marine footprint); Rockfish conservation areas; commercial fisheries; presence of species at risk		Concern with respect to impact on traditional fishing areas

NOTE:
n/a not applicable if alternative is not technically or economically feasible

As shown in Table 2-4, the preferred alternatives are technically, economically and environmentally feasible. The preferred alternatives comprise the proposed Project as it is assessed further in the EIS and MSR.

2.7 Project Schedule

Terminal construction for Stage 1 (northern expansion) is scheduled to begin in the summer/fall of 2012 and is expected to take about 30 to 36 months with commissioning in spring 2015. Stage 2 (southern expansion) will not be built until the capacity of the terminal with Stage 1 is being reached. This is expected to be within 5 to 10 years from the completion of Stage 1. CN will commence construction on the one siding following completion of the EA and permitting processes. Construction of the second siding and wye will occur when traffic volumes require additional capacity. The Project life is anticipated to be approximately 50 years.

3 REGULATORY OVERVIEW

3.1 Federal Legislation and Policy

An EA of the proposed Project is required under CEAA and CPAEAR. In particular, a comprehensive study pursuant to the Comprehensive Study List Regulations under CEAA is required. The Project is also subject to the British Columbia *Environmental Assessment Act* (BCEAA). These are discussed further in the following sections. Additional information is provided with respect to regulatory aspects of the Project in the EIS Vol. 1 (Section 1.5) (PRPA and CN 2009).

The history of the EA for the Project includes the following:

- Scope of Assessment provided by the RAs to the Proponents in August 2009
- EIS submitted by the Proponents to the CEA Agency in November 2009
- EIS Information Request process between the WG and the Proponents during 2010
- Submission of the MSR by the Proponents to the CEA Agency in August 2011
- MSR Information Request process between the WG and the Proponents in fall 2011
- Preparation of the CSR by the RAs in late 2011 / early 2012

3.1.1 CEAA Environmental Assessment Process

Under subsection 5(1) of CEAA, a federal EA may be required when, in respect of a project, a federal authority:

- Is the proponent
- Makes or authorizes payment or any other form of financial assistance to the proponent
- Sells, leases, or otherwise disposes of lands, or
- Issues a permit, licence, or other form of approval pursuant to a statutory or regulatory provision referred to in the Law List Regulations

A Federal Authority (FA) may be any agency or department of the Government of Canada, or Minister of the Crown in right of Canada. An FA that proposes to undertake one of the above actions is a Responsible Authority (RA) and is required to ensure that a federal EA is conducted in accordance with the CEAA.

In relation to the proposed Project, DFO, EC, and the CTA have identified themselves as RAs and have determined that an EA is required. Specifically, the following authorizations and/or permits will be required:

- Issuance by DFO of an Authorization pursuant to subsection 35(2) of the *Fisheries Act* for the harmful alteration, disruption or destruction of fish habitat
- Issuance of a permit by EC for disposal of dredged material at sea pursuant to subsection 127(1) of the CEPA
- Issuance of a permit by the CTA for the construction of a railway line pursuant to subsection 98(2) of the *Canada Transportation Act*

Expert federal authorities are FAs that are identified through the Federal Coordination Regulations process as having existing knowledge or expertise relevant to the EA of a project. FAs are consulted during the scoping process and during review of EA information submitted by the Proponent and any other material relating to the CSR. Each FA is consulted prior to the submission of the CSR to the Minister of the Environment (and Minister of Transport, with respect to CPAEAR). FAs do not however have decision making responsibilities in relation to a comprehensive study. The expert federal departments consulted for this EA process are Parks Canada Agency, Health Canada, and Transport Canada.

On November 2, 2009, following recommendation from DFO, EC, CTA and the PRPA, the Minister of Environment determined that a Comprehensive Study was the most appropriate level of assessment for the Project. Paragraph 28(c) of the Comprehensive Study List Regulations under CEAA requires a Comprehensive Study for the proposed construction, decommissioning, or abandonment of a marine terminal designed to handle vessels larger than 25,000 dead weight tons unless the terminal is located on lands that are routinely and have been historically used as a marine terminal or that are designated for such use in a land use plan that has been the subject of public consultation.

The Canadian Environmental Assessment Agency (CEA Agency) is the Federal Environmental Assessment Coordinator (FEAC) for the Project. The FEAC facilitates the participation of FAs and RAs in the comprehensive study process and coordinates communication and cooperation among them, as well as with other participants and jurisdictions.

3.1.2 CPAEAR Environmental Assessment Process

The Canada *Marine Act*, which came into force with respect to the PRPA on May 1, 1999 led to 18 former port corporations and harbour authorities becoming Canada Port Authorities (CPA). Revisions to the Act also led to the development of EA regulations that would govern CPA projects.

Under the CPAEAR, a CPA must conduct an EA of a project before exercising a power or performing a duty or function described in paragraphs 5(1) (a) to (c) of CEAA. This responsibility is reaffirmed in subsection 9(1) of CEAA. This section indicates that an EA is required if the CPA administers federal lands that are leased or otherwise disposed of for the purpose of enabling a project to be carried out in whole or in part.

Pursuant to subsection 5(b) of the CPAEAR and Section 21 of CEAA, a comprehensive study is required if a project is described in the Comprehensive Study List Regulations under CEAA. In accordance with Section 16(1) (a) of CPAEAR, this CSR is being submitted to the Minister of Transport.

Pursuant to Section 6 of the CPAEAR, the PRPA is responsible for determining the scope of the project for which an EA must be conducted, and, pursuant to Section 17, for establishing the scope of factors to be taken into consideration during a comprehensive study. Similarly, under subsection 15(1) of CEAA, the scope of the project in relation to which an EA is to be conducted pursuant to CEAA, and under Section 16 of CEAA, the factors to be considered and the scope of those factors, will be determined by the RAs.

The PRPA, under the CPAEAR, has agreed to accept the scope of the assessment in the approved Comprehensive Study Scope of Assessment document.

Section 9 of the CPAEAR allows the PRPA to delegate its functions and duties to any person. The PRPA has delegated the preparation of the CSR for the Project to Stantec.

3.2 Other Applicable Federal Legislation

It is understood that the legislative framework established by the Canada *Marine Act* (subsection 28[2]), the PRPA's Letters Patent (article 7.1[h][i] and 7.1[j][ii]), and the Port Authorities Operations Regulations (Section 3[a]), exempt the PRPA from the *Navigable Waters Protection Act* (with respect to the navigable waters of a port, works and activities in a port, and the property managed, held or occupied by the PRPA), and further gives the PRPA the authority to construct, establish, maintain, and operate a waste and dredge disposal site within the Prince Rupert Port. Therefore, the Project is expected to be exempt from the requirements of the *Navigable Waters Protection Act*. However, as it is anticipated that dredged material will be disposed of offshore and outside the port boundary, a permit pursuant to Section 127(1) of CEPA will be required.

3.3 Canada-British Columbia Agreements on EA Cooperation

The Project is also subject to the BCEAA*.* A Memorandum of Agreement was signed by federal agencies and the BC Environmental Assessment Office establishing that the federal EA process for the Project will be equivalent to the provincial process under Section 27 of BCEAA. This cooperative approach avoided unnecessary duplication of effort by all parties and stakeholders.

3.4 Species at Risk

The purposes of the federal Species *at Risk Act* (SARA) are to:

- Prevent Canadian indigenous species, subspecies and distinct populations of wildlife from being extirpated or becoming extinct
- Provide for the recovery of wildlife species that are extirpated, endangered, or threatened as a result of human activity
- Manage species of special concern to prevent them from becoming further endangered or threatened

The RAs are required to consider impacts to federally listed species at risk and whether any other federal permits may be required. The RAs are also required to consider whether impacts to the species at risk can be sufficiently mitigated as proposed by the Proponent, have been sufficiently addressed through other regulations or processes, or whether additional mitigation measures may be required.

If a species is listed under Schedule 1 of SARA as extirpated, endangered or threatened, that species has legal protection related to the species' residence and critical habitats as well as recovery planning. For species of special concern, there is not a similar legal prohibition per se; however, recovery planning is likely to include the development of a management plan specific to that species.

4 INFORMATION DISTRIBUTION AND CONSULTATION

The CEA Agency and federal RAs are responsible for ensuring Project information is adequately distributed and that the public is consulted at key stages of a project EA.

Additional information with respect to information distribution and public consultation is provided in the EIS Vol. 1 (Section 4.2.1) (PRPA, CN 2009).

4.1 Public Participation Regarding Proposed Scope of Project

Subsection 21(1) of CEAA, indicates that for a comprehensive study, RAs must ensure public consultation on the proposed scope of the Project, the proposed factors to be considered in the EA, and the ability of a comprehensive study to address issues relating to the Project. For the Project, the CEA Agency, on behalf of the RAs and the Proponents conducted a public consultation period for the Comprehensive Study Scope of Assessment document from May 26, 2009 to June 26, 2009. Notice of the public consultation period appeared in daily and weekly newspapers with local and provincial distribution, and was advertised on local radio stations, as well as being placed on the Canadian Environmental Assessment Registry internet site. Copies of the Comprehensive Study Scope of Assessment were also available in printed form in viewing centres in Prince Rupert, British Columbia (Public Library, City Hall) and Terrace, British Columbia (Public Library). Copies of the Scope of Assessment document were also forwarded to the following key stakeholders:

- Fairview Phase II Environmental Assessment Working Group
- Mayor and Council of Prince Rupert, British Columbia
- Mayor and Council of Terrace, British Columbia
- Skeena–Queen Charlotte Regional District office
- Masset-Haida Television
- Port Clements Village office
- Port Edward District office
- Queen Charlotte Village office
- Regional District of Kitimat Stikine office
- Hazelton Village office
- Mayor and Council of Kitimat, British Columbia
- New Hazelton District office
- Stewart District office

The CEA Agency, on behalf of the RAs and Proponents also invited the public to attend open houses in Prince Rupert, Terrace, Kitkatla, and Kitsumkalum, in June 2009. Twenty-seven written comments were received from local individuals and businesses during the public consultation period. Public feedback and expert advice helped the RAs and Proponents finalize the Comprehensive Study Scope of Assessment document and the Track Report (*Environmental Assessment Track Report, Fairview Phase II Terminal Expansion Project.* Prepared by Environment Canada, Fisheries and Oceans Canada, and the Canadian Transportation Agency. August 2009).

A second opportunity for the public to comment on the Project was on the Mitigation Strategy Report (PRPA, CN 2011). A notice inviting public comment on the Mitigation Strategy Report for the Project was posted in the *Northern Connector* on September 30 and October 18, 2011 by the PRPA. A similar notice was posted on the CEA Agency's Registry internet site on October 18, 2011 and the Mitigation Strategy Report was made available in both English and French. The public comment period ran from September 30 through November 19, 2011.

Participant Funding Program recipients were confirmed on November 3, 2009. The CEA Agency has awarded a total of $99,050 to the Gitxaala Nation and the Kitsumkalum First Nation, to support their participation in the comprehensive study of the Project. PRPA and CN offered capacity funding to the five Aboriginal Groups.

4.2 Public Access to the Comprehensive Study Report

The third of three required public comment periods in the comprehensive study process will be the opportunity for public review of this CSR document. Pursuant to Section 22(1) of CEAA, the CEA Agency will facilitate public access to the CSR, including administering a formal public comment period. All comments submitted will be provided to the RAs and will become part of the project file for the Project. The RAs will be asked by the CEA Agency to advise whether their conclusions have been altered as a result of the public comments received.

4.3 Aboriginal Consultation Summary

4.3.1 Introduction

Consultation and the Canadian *Environmental Assessment Act*, 1992

One purpose of the CEAA, pursuant to sub Section 4(b.3), is to promote communication and cooperation between RAs and Aboriginal peoples with respect to EA. The CEAA works to ensure that projects are considered in a careful and precautionary manner before federal authorities take action in connection with them, in order to ensure that such projects do not cause significant adverse environmental effects. Included within the definition of environmental effect is any change that the Project may cause on the environment and any effect of any change to the environment on:

- Health and socio-economic conditions
- Physical and cultural heritage
- Current use of lands and resources for traditional purposes by Aboriginal persons, or
- Any structure, site or thing that is of historical, archaeological, paleontological, or architectural significance

In addition, the CEAA provides that community knowledge and Aboriginal traditional knowledge may be considered in conducting the EA. Consultation with Aboriginal groups during the EA process should be sufficient to allow RAs to conclude on any potential environmental effect as listed above.

4.3.2 Aboriginal Consultation and the Fairview Phase II EA

When the Government of Canada contemplates conduct that may have potential adverse impacts on asserted or established Aboriginal or treaty rights, it has a legal duty to consult with Aboriginal groups before making a decision to proceed with the proposed conduct. This legal duty is a Crown obligation and as such, departments must work with other levels of government and Crown agencies to uphold the honour of the Crown through its consultation and accommodation activities. The focus of this summary is on contemplated Crown decisions for the Project that also trigger an EA under CEAA.

According to the multi-party Project Agreement which was signed in 2009, all of the Parties to the federal regulatory process (which includes the EA, regulatory review and Aboriginal consultation and engagement processes) for the Project committed to a "whole of government" approach to Aboriginal engagement and consultation. Transport Canada lead the co-ordination of Crown consultation activities on behalf of the federal Crown for the Project.

Efforts to actively engage Aboriginal groups in a process of consultation with respect to their concerns as a result of developments at the Port of Prince Rupert began in 2004 around the planning and approval of the Fairview Phase I project, and eventually expanded under the coordination and direction of Transport Canada in 2007 to include consultation with respect to the Fairview Terminal Phase II project.

The approach applied to meeting the Government of Canada's overall consultation obligations with respect to the Project has been twofold:

- First, Transport Canada established a process for consultation and accommodation with respect to concerns raised by Aboriginal groups about potential adverse impacts to their claimed Aboriginal rights and title as a result of the proposed Phase II Fairview Terminal expansion. This Crown consultation process also addressed outstanding issues related to Phase I and Phase II, as well as other future contemplated developments
- Second, the EA process for comprehensive studies integrates engagement with Aboriginal groups, to meet the statutory requirements of CEAA*,* as outlined in Section 1 above

The 2009 Project Agreement acknowledged that Aboriginal Groups' participation in the Project EA process would be conducted in parallel to the process of Crown consultation established by Transport Canada.

Potential Impacts to Aboriginal Rights

The proposed Project is situated within the asserted traditional territories of the following Aboriginal Groups: Metlakatla First Nation (Metlakatla), Lax Kw'alaams First Nation (Lax Kw'alaams), Kitselas First Nation (Kitselas), Kitsumkalum First Nation (Kitsumkalum) and Gitxaala Nation (Gitxaala). Each of these Aboriginal Groups assert claims of Aboriginal title to the lands affected by the footprint of the Project, as well as (or in the alternative) to Aboriginal rights related to the use of the land, marine and other resources affected by the Project for traditional purposes (i.e., hunting, fishing and gathering activities for subsistence purposes, and use of lands and resources for social and ceremonial activities).

The Fairview Phase II Crown consultation process coordinated by Transport Canada is not the only way in which these Aboriginal groups have learned about the Project and presented their views to the federal government about, among other things, the nature and scope of their potential Aboriginal rights, the adverse effects that the Project may have on those rights, and appropriate measures to avoid or mitigate such effects as they relate to potential environmental effects resulting from the Project. Some of the information on potential impacts on asserted rights can be gleaned from the long history of consultation between the parties during the EA of Fairview Phase I, starting as far back as 2004. In addition, the Aboriginal Groups have made numerous oral and written submissions to federal officials outlining the evidence to support their asserted claims, and providing details on the nature of the concerns.

The information gathered has been used to inform decisions under CEAA and to inform the Crown's understanding of the need for mitigation measures or accommodation of potential impacts on asserted Aboriginal rights.

Duty to Consult

The scope of the Crown's duty to consult and, if appropriate accommodate, is proportionate to:

- Preliminary assessment of the strength of the case supporting the existence of the right or title
- Seriousness of the potentially adverse impact upon the asserted right or title

While the five Tsimshian communities asserting unextinguished Aboriginal rights and title to the Prince Rupert Harbour area have varying strengths of claim (based on the existing evidence), an early assessment of the potential adverse impacts of the Project informed Transport Canada's decision to pursue "in-depth" consultation with each community.

In order to adequately meet its duty to consult, Transport Canada has been mindful of the legal and best practice principles that have emerged from case law over the years. In all communications and consultation-related activities undertaken with Aboriginal groups for this Project, they have endeavoured to uphold the principles of meaningful consultation, responsiveness, good faith, and reasonableness in order to maintain the honour of the Crown.

Fairview Phase II Crown Consultation Process

Over the course of four years, starting in early 2008, the Crown consultation process for the Project resulted in active and in-depth engagement with each of the Aboriginal Groups listed above. Consultations with each group were conducted in accordance with individual framework agreements, which outlined the scope of consultation agreed to by the parties. PRPA, as the key proponent of the Project, was an active participant in the negotiations throughout this consultation process.

The concerns of the Aboriginal groups were identified and options for recommendation were discussed throughout 2008 to 2011. Over the course of 2010 and 2011, each of the Aboriginal Groups accepted Canada and PRPA's proposals for accommodation and successfully concluded the drafting of final agreements in late 2010 and late 2011. Impact benefit agreements have now been ratified and executed by Canada, PRPA and each of the Aboriginal Groups, and implementation is on-going.

The Crown consultation process for Fairview Phase II concluded in advance of the EA process. The parties agreed that the Aboriginal Groups were at liberty to continue to raise their concerns and issues around the “environmental effects” of the Project through their participation in the EA Working Group until that process was successfully concluded. However, by entering into these impact benefit agreements, each of the Aboriginal Groups acknowledge that they have now been adequately consulted and accommodated by Canada and PRPA in relation to the potential adverse impacts of the Project on their asserted Aboriginal rights and title within their traditional territory.

Engagement Integrated into the EA Process

In the EA process, the five Aboriginal Groups listed above were invited to participate in the federal EA as members of the technical working group. Throughout the EA process, the Crown has actively sought meetings with the potentially impacted Aboriginal Groups, responded to and offered solutions to address any issues raised by Aboriginal Groups, and provided Aboriginal Groups the opportunity to review and provide comments and input on various documents including the Scoping Document, the Environmental Impact Statement, the Mitigation Strategy Report, and the Comprehensive Study Report.

One of the activities of concern to Aboriginal Groups involved in the EA Working Group is the disposal at sea of dredged marine sediment at Brown Passage. This activity could result in loss of or damage to traditional marine harvest areas for seaweed, halibut, salmon, and shellfish among other resources used for food, social and ceremonial purposes. These concerns prompted a redesign of the project, which was submitted by the Proponents in the Mitigation Strategy Report. The redesign resulted in an 87 percent reduction in the amount of material to be disposed at sea. In addition, alternative disposal at sea sites have been assessed through a Technical Working Group that has included the participation of interested Aboriginal Groups. DFO has concluded that the residual effects of the disposal at sea activity at Brown Passage will not be significant. Ongoing involvement of concerned Aboriginal Groups in the Disposal at Sea permitting process has been identified as part of the follow-up commitments for the EA.

Another environmental effect of concern is the potential loss of freshwater and marine habitat in the project footprint area, which could result in the loss of traditional harvest areas for seaweed, salmon and shellfish among other resources used for food, social and ceremonial purposes. As a result, a draft Conceptual Habitat Compensation Plan has been created by the Proponents for both freshwater and marine habitats, in consultation with DFO and Aboriginal Groups. This work will continue into the regulatory phase of the Project.

A significant amount of work has been done through an Archaeological Side Table, to identify the archaeological impacts of the Project, as well as mitigation measures. This information is documented in a separate section (Section 6.11). Other concerns of note to Aboriginal Groups have included the cumulative effects of the increase in rail and marine traffic, and other cumulative environmental effects.

4.3.3 Information Sources

Millennia Research Ltd., on behalf of the PRPA and CN, has conducted two Archaeological Overview Assessments (AOA) and three Archaeological Impact Assessments (AIA) (two for the terminal portion of the Project and one for the rail portion). A compilation of archaeological, mythological/oral history and contemporary traditional use of the Prince Rupert Harbour area, particularly near the northern end of the original Fairview Terminal, was reviewed by Millennia (2007a, b) as part of the AOA process. The results of the AOAs and AIAs (Millennia Research Ltd. 2007a, b, c, d, e) have been distributed to and reviewed by the British Columbia Archaeology Branch and Registry Services Branch, and the Tsimshian Nation communities of Gitxaala, Lax Kw'alaams, Kitselas, Kitsumkalum and Metlakatla.

4.3.4 Ongoing Federal-Aboriginal Discussions

The site currently proposed by the Proponent for disposal at sea of dredged marine sediments is considered technically feasible to EC. Should the information on environmental impacts change during the detailed design phase of the Project, the final disposal at sea site may be different than what has been presented to date. Disposal at sea of dredged marine sediments will be in accordance with the requirements of EC, and will be authorized in accordance with CEPA. EC will engage further with Aboriginal groups during the detailed design and regulatory phases of the project, if significant variations are made to the plans proposed herein. In addition, EC will ensure that concerned Aboriginal Groups are informed when the disposal at sea activity is set to occur (which may be some years into the future), that they are provided an opportunity to review the disposal and dredge plans, and, should monitoring activities be approved for funding, that Aboriginal Groups are invited to participate in these activities, where possible. The fish habitat compensation plan (HCP) represents the fish habitat compensation required to offset the worst case scenario for proposed impacts to fish habitat that cannot be mitigated with other methods. Aboriginal Groups will be provided an opportunity to review and comment on the final fish habitat compensation plan during the regulatory (permitting) phase of the Project, prior to the issuance of a *Fisheries Act* subsection 35(2) Authorization.

4.3.5 Implementation and Follow-Up

Each RA will be responsible for implementation and follow up of the elements of the project described above which fall under their respective mandates. Transport Canada will continue to monitor the implementation of the impact benefit agreements with the five Aboriginal Groups described under Section 4.3.2.

4.3.6 Adequacy of Crown Consultation for the Purposes of the EA Decision

Each of the Aboriginal Groups listed above have acknowledged, by entering into the above-mentioned impact benefit agreements with Canada and the PRPA, that they have been adequately consulted and accommodated by Canada and PRPA in relation to the potential adverse impacts of the Project on their asserted Aboriginal rights and title within their traditional territory.

4.4 EA Technical Working Group

Technical working groups are used by the CEA Agency as the primary source of policy and technical expertise for considering issues identified during project assessments. The CEA Agency has formed the Fairview EA Technical WG which includes the CEA Agency, RAs, FAs, Aboriginal Groups, PRPA, CN, and Stantec as a cooperative forum. The role of the WG is to inform the conduct of the EA pursuant to the CEAA.

The WG members, in general, are responsible for:

- Participating in WG and associated meetings to supply information and actions which must be taken to meet the needs of the EA
- Reviewing and commenting on the work plan and roles and responsibilities
- Responding to CEA Agency requests and determinations in respect of EA coordination activities in a timely manner
- Bringing forward for consideration by the WG additional information relevant to the EA

All WG members have reviewed the EIS and Technical Data Reports (TDRs), the MSR and the associated information request (IR) documents, and provided comments that were used to finalize these documents including this CSR.

In addition to the above, roles and responsibilities unique to the Aboriginal Group members include:

- Communicating the views and concerns of the Aboriginal Groups with respect to issues raised during the EA
- Providing information regarding the current uses of lands and resources for traditional purposes and archaeological resources, and to identify impacts on any such use of resources that may arise from the Project (i.e., Archaeology Mitigation Plan)

4.5 Summary of Issues Identified

Table 4-1 provides a summary of the issues raised during consultation with public stakeholders and Aboriginal Groups. Review periods include review of the Scope of Assessment document, the 2009 EIS, the 2011 MSR, and this CSR.

Key issues that were heard through review of the EIS include:

- Rationale for selection of Brown Passage as preferred site for disposal at sea
- Concern regarding noise associated with train volumes
- Effects of increased rail and vessel traffic within or in proximity to ecologically productive and culturally significant areas that support Aboriginal food, social and ceremonial activities
- Concerns regarding archaeological and heritage resources
- Concerns regarding habitat loss and alteration
- Concerns regarding potential effects to marine mammals as a result of increased vessel traffic during operation of the terminal
- Assessment of cumulative effects

The key issues have been addressed through the mitigative re-design, through ongoing communication with the Technical EA Working Group, and through the information request process.

Table 4-1 Issue Summary / Key Issues Raised during Public Consultation

Issue Summary/Key Issues	Originated by	Issue Addressed In
Issues Raised during Aboriginal and Public Review of the Scope of Assessment		
Mortality of moose and other wildlife (e.g., scavengers) due to increased rail traffic	Aboriginal Groups	EIS Section 10
Ocean disposal at Brown Passage	Aboriginal Groups, Public stakeholders	EIS Section 13
Potential decrease in air quality in communities along CN rail corridor approaching Prince Rupert	Environment Canada	EIS Section 6
Air emissions and carbon footprint of Project, including air emissions from rail traffic	Public stakeholders, Aboriginal Groups	EIS Section 6
Train whistle noise and intermodal operations noise	Public stakeholders	EIS Section 7
Effects of noise and vibration on human health	Aboriginal Groups	EIS Section 7, Section 15
Light trespass	Public stakeholders, Aboriginal Groups	EIS Section 8
Effect on viewscape	Public stakeholders	EIS Section 8
Effect of light on marine life, migratory birds and wildlife, including fish species	Aboriginal Groups	EIS Section 8, Section 10, Section 11, Section 13
Interruption of rail service to existing businesses	Public stakeholders	No interruption of rail service expected
Truck traffic access	Public stakeholders	EIS Section 2.4.2
Capacity of utilities infrastructure	Public stakeholders	EIS Section 14
Spill in marine environment	Aboriginal Groups	EIS Section 21
Leaks and spills of hazardous materials and measures to protect ecological communities (wildlife and wildlife habitat)	Aboriginal Groups	EIS Section 21
Capacity of renewable resources, including consideration of resources that affect Aboriginal culture, health and traditional economy	Aboriginal Groups	EIS Section 19
Noise effects (including underwater noise) on marine wildlife and birds	Aboriginal Groups, Environment Canada	EIS Section 7, Section 11, Section 13
Use of cleared vegetation	Aboriginal Groups	EIS Section 2.3.2
Invasive/ non-indigenous species (terrestrial and aquatic), including non-indigenous species from ballast water	Aboriginal Groups	EIS Section 9, Section 13
Hydrological and water quality effects	Aboriginal Groups	EIS Section 12, Section 13
Hydrogeological effects of the Project	Aboriginal Groups	EIS Section 5.1.3, Section 12

Issue Summary/Key Issues	Originated by	Issue Addressed In
Impacts to community infrastructure	Aboriginal Groups	EIS Section 14
Disturbance to Aboriginal reserve lands	Aboriginal Groups	EIS Section 17
Limited access to traditional fishing grounds on Skeena River	Aboriginal Groups	EIS Section 17, Section 18
Adverse effects to fish and fish habitat as a result of train derailments and cargo spills	Aboriginal Groups	EIS Section 21
Effects on Skeena River watershed	Aboriginal Groups	EIS Section 12,Section 21
Effects on cultural heritage sites	Aboriginal Groups	EIS Section 16
Effects on human health	Aboriginal Groups	EIS Section 15
Effects of increased rail and vessel traffic within or in proximity to ecologically productive and culturally significant areas that support Aboriginal food, social and ceremonial activities	Aboriginal Groups	EIS Section 17, Section 18
Environmental effects as a result of changes to topography, soil and bedrock conditions, terrain and slope stability, acid rock drainage and metal leaching	Aboriginal Groups	EIS Section 20
Vegetation assessment should extend beyond SARA Schedule 1 species list (e.g., include provincial and federal conservation lists) and also include species identified as being important by Aboriginal Groups	Aboriginal Groups	EIS Section 9
Wildlife assessment should extend beyond SARA Schedule 1 species list (e.g., include provincial and federal conservation lists) and also include species identified as being important by Aboriginal Groups	Aboriginal Groups	EIS Section 10, Section 11
Key indicator species should include consideration of species that are significant to Aboriginal Groups and representative of key wildlife groups that may be affected by the Project	Aboriginal Groups	EIS Section 4.2.2
Effects on oceanography and coastal processes	Aboriginal Groups	EIS Section 13
Effects on marine sediment quality	Aboriginal Groups	EIS Section 13
Effects on marine invertebrate abundance, distribution and habitat quantity and quality	Aboriginal Groups	EIS Section 13
Effects on marine vegetation, including species that provide significant fish habitat and vegetation used by Aboriginal Groups	Aboriginal Groups	EIS Section 13, Section 18
Effects on marine fish, habitat and fisheries including species of ecological, commercial or cultural significance	Aboriginal Groups	EIS Section 13, Section 18
Effects of noise, habitat degradation, pollution and vessel collision on marine mammals	Aboriginal Groups	EIS Section 13

Issue Summary/Key Issues	Originated by	Issue Addressed In
Cumulative effects on Aboriginal Groups, including consideration of effects pre-development of Prince Rupert Port (pre-1975)	Aboriginal Groups	EIS Section 17, Section 18
Effects on traditional use and ecological knowledge and Aboriginal rights and interests	Aboriginal Groups	EIS Section 17
Consideration of land use and resource management plans and integrated coastal management initiatives	Aboriginal Groups	EIS Section 14
Capacity of infrastructure, including capacity to response to environmental emergencies	Aboriginal Groups	EIS Section 21
Impacts to populations, demographics, employment, business development, traditional economic activities and capacity of Aboriginal Groups to benefit from the Project	Aboriginal Groups	EIS Section 14
Training opportunities for Aboriginals	Aboriginal Groups	EIS Section 14
Ecological health and risk considerations	Aboriginal Groups	EIS Section 9, Section 10, Section 11, Section 12, Section 13
Effects on archaeological and heritage resources	Aboriginal Groups	Section 16
Consideration of current traditional use should also include past and future Aboriginal use and occupancy	Aboriginal Groups	EIS Section 17
Cumulative effects assessment should include consideration of cumulative effects of ocean disposal (Brown Passage) and spills in Prince Rupert Harbour and Skeena River	Aboriginal Groups	EIS Section 13
Effects on environment should consider natural debris flows (Skeena River) and extreme weather	Aboriginal Groups	EIS Section 20
Development of an ecosystem management plan and adaptive management strategy	Aboriginal Groups	EIS Section 6-18
Restriction of access to Skeena River	Aboriginal Groups	CN right-of-way is private property. Crossing where road crossings are not provided is considered trespassing and highly dangerous. The right-of-way is not a travel corridor and should not be used as one
Concerns regarding CN traffic and condition of the rail line	Aboriginal Groups	EIS Section 2.2, Section 21
Organic waste disposal	Aboriginal Groups	EIS Section 13
Effects on navigation	Aboriginal Groups	EIS Section 5.7
Economic opportunities for Aboriginal Groups	Aboriginal Groups	EIS Section 14

Issue Summary/Key Issues	Originated by	Issue Addressed In
Concern regarding extension of wharf to Casey's Point with respect to interactions with marine transmission line	Aboriginal Groups	There will be no Project interaction with the marine transmission line once the sub-sea cables are relocated
Issues Raised during Working Group Review of the EIS		
All issues raised during the Working Group's review of the EIS are tracked in the document: Environmental Impact Statement Information Request Document (PRPA and CN 2011b)	Working Group (RAs, Aboriginal Groups, Federal Authorities, CEA Agency)	Environmental Impact Statement Information Request Document (PRPA and CN 2011b)
Issues Raised during Public Review of the MSR		
Noise pollution from train whistling, shunting and engines	Public stakeholder (Brian Denton)	Letter titled "Fairview Terminal Phase II Expansion Project, including Kaien Siding – Responses to Public Comments on the Mitigation Strategy Report (Nov. 2011)
Noise pollution from train whistling, shunting and engines	Public stakeholders (Robert and Judy Warren)	Letter titled "Fairview Terminal Phase II Expansion Project, including Kaien Siding – Responses to Public Comments on the Mitigation Strategy Report (Nov. 2011)
Interference of rail traffic with access to other existing terminals and facilities within Prince Rupert	Public stakeholder (Brian Denton)	Letter titled "Fairview Terminal Phase II Expansion Project, including Kaien Siding – Responses to Public Comments on the Mitigation Strategy Report (Nov. 2011)
Concern regarding disruption to the travelling public and ferry schedules as a result of increased rail traffic	State of Alaska Department of Transportation and Public Facilities	Letter titled "Fairview Terminal Phase II Expansion Project, including Kaien Siding – Responses to Public Comments on the Mitigation Strategy Report (Nov. 2011)
Excessive noise caused by the blowing of train whistles at crossings north of the Fairview container port	Public stakeholders	Letter titled "Fairview Terminal Phase II Expansion Project, including Kaien Siding – Responses to Public Comments on the Mitigation Strategy Report (Nov. 2011)
Issues Raised during Working Group Review of the MSR		
All issues raised during the Working Group's review of the EIS are tracked in the following document: Mitigation Strategy Report Information Request Document (PRPA and CN, 2012)	Working Group (RAs, Aboriginal Groups, Federal Authorities, CEA Agency)	Mitigation Strategy Report Information Request Document (PRPA and CN, 2012)
Issues Raised during Public Review of the CSR		

5 ENVIRONMENTAL ASSESSMENT SCOPING AND METHODS

EA is a process for predicting, evaluating, mitigating, monitoring and managing environmental effects of a proposed project. It is used as a planning tool to help guide decision making, as well as project design and implementation. EA is a process whereby:

- A scope of project and scope of assessment are defined
- Interactions between a project and appropriate VECs are identified
- The potential environmental effects of the project on the VECs are predicted and described
- Mitigation measures are identified to minimize environmental effects
- The residual environmental effects that exist after the application of mitigation are determined
- The significance of the residual environmental effects is determined
- Environmental monitoring and follow up programs are designed and implemented as required

The following sections of the CSR describe how the federal review team, including PRPA (as a regulator under CPAEAR) implemented the EA process. Additional information is provided with respect to the EA scoping and methods in the EIS Vol. 1 (Section 4) (PRPA and CN 2009).

5.1 Scope of the Project

The "scope of the project" refers to the proposed undertakings (in relation to physical works) or activities considered in EA. The scope of the Fairview Terminal Phase II Expansion Project was determined pursuant to Section 15 of CEAA and Section 6 of the CPAEAR, and was issued to the Minister of the Environment on August 28, 2009. The scope of the Project, for the purposes of the EA are those Project components and activities described in Sections 2.4 and 2.5

The scope of the Project for this CSR was developed with public input, and is described in the Comprehensive Study Scope of Assessment (EC et al. 2009)

5.2 Scope of the Assessment

The RAs are required to consider the factors specified in subsections 16(1) and 16(2) of CEAA, taking into consideration the definitions of environment, environmental effect, and Project, prior to making a decision regarding whether to take action (e.g., grant funding, dispose of land, or issue a permit, authorization or licence) that would permit the Project to proceed.

As defined under CEAA, "environmental effect" means, in respect of a project:

- Any change that the project may cause in the environment, including any change it may cause to a listed species, its critical habitat or the residences of individuals of that species, as those terms are defined in subsection 2(1) of the *Species at Risk Act,*
- Any effect of any change referred to in paragraph (a) on
    - Health and socio-economic conditions
    - Physical and cultural heritage
    - The current use of lands and resources for traditional purposes by aboriginal persons, or

- Any structure, site or thing that is of historical, archaeological, paleontological or architectural significance, or

- Any change to the project that may be caused by the environment, whether any such change or effect occurs within or outside Canada

Factors considered in the EA are as follows:

- The environmental effects of the Project, including the environmental effects of malfunctions or accidents that may occur in connection with the project and any cumulative environmental effects that are likely to result from the Project in combination with other projects or activities that have been or will be carried out in the foreseeable future
- The significance of the environmental effects referred to above
- Comments from the public and Aboriginal groups that are received in accordance with CEAA
- Measures which would mitigate any significant adverse environmental effects that are technically and economically feasible
- The purpose of the Project
- Alternative means of carrying out the Project that are technically and economically feasible and the environmental effects of any such alternative means
- The need for, and the requirements of, any follow up programs in respect of the Project
- The capacity of renewable resources that is likely to be significantly affected by the Project to meet the needs of the present and those of the future
- Consideration of the need for the Project and alternatives to the Project that the RAs may require to be considered
- Specialist or expert advice received from other federal authorities and/or provincial departments participating in the review process

The scope of assessment as presented has been developed in a manner that is consistent with the requirements of the CPAEAR and CEAA, CEA Agency guidance, and the federal legislative intent to make CPAs responsible for EAs within the confines of a port. This scope of assessment is provided by the PRPA under the authority granted to it by Sections 6, 10, 16 and 17 of the CPAEAR. This scope of assessment is also provided by DFO, EC, and the CTA pursuant to the authority granted to those bodies under Section 15 and subsections 16(1), 16(2) and 16(3) of CEAA. The scope of the assessment for this CSR was developed with public input, and is described in the Comprehensive Study Scope of Assessment (EC et al. 2009)

5.3 Scope of the Factors to be Considered

The scope of factors to be considered during the assessment of the Project was developed with public input, and is described in the Comprehensive Study Scope of Assessment (EC et al. 2009). For the purpose of this comprehensive study the scope of factors to be considered has been addressed under the following 13 VECs:

- Air Quality
- Noise and Vibration
- Light
- Vegetation

- Wildlife and Wildlife Habitat
- Avifauna
- Freshwater Environment
- Marine Environment
- Socio-Economic Conditions
- Human Health and Safety
- Archaeological and Heritage Resources
- Current Traditional Use by Aboriginal persons
- Country Foods

Some of the VECs listed above include key indicator resources (KIRs) which further break down the VECs into species or other representative components.

In addition to the above VECs, the following factors have been considered in the CSR.

Effects of the Environment on the Project

In addition to evaluating the environmental effects of the Project on the environment, changes to the Project that may arise as a result of the environment are also considered. This analysis includes consideration of natural hazards such as extreme weather events, landslides, and natural seismic events. Proposed mitigation, including design strategies, are considered in the evaluation of the effects of the environment on the Project and the determination of their significance.

Environmental Effects of Accidents and Malfunctions

Pursuant to CEAA, consideration of the environmental effects of any potential Project-related accidents or malfunctions is required. The Proponents' assessment includes consideration of the potential accidents, malfunctions and unplanned events that could occur in any phase of the Project, the likelihood and circumstances under which these events could occur, and the environmental effects that may result from such events, assuming contingency plans are not fully effective.

Capacity of Renewable Resources

In accordance with CEAA, the CSR considers the capacity of renewable resources that are likely to be significantly affected by the Project to meet the needs of the present and those of the future.

Cumulative Effects Assessment

Under CEAA, the comprehensive study must consider cumulative environmental effects that are likely to result from the Project in combination with the environmental effects of past, present or future projects or activities that have been or will be carried out. The detailed approach and methods used by the Proponents to identify and assess cumulative environmental effects are provided in Section 4.6 of the EIS (Volume 1).

5.4 Spatial Boundaries

An important aspect of the EA scoping and preparation process is the determination of boundaries, as boundaries help focus the scope of the EA and allow for a meaningful analysis of potential effects associated with the Project. Boundaries have been established in part based on the requirements as described in the Comprehensive Study Scope of Assessment document.

Local Study Areas

Local Study Areas (LSAs) have been defined for each VEC; these are described in Section 6 of this CSR. An LSA is defined as encompassing those areas within which the VECs are likely to interact with, or be influenced by, the Project. The Proponent considers that this provides a representative area that allows the assessment of all potential direct effects from Project-related activities.

Regional Study Areas

Regional Study Areas (RSAs) have been defined for each VEC and are described in Section 6 of this CSR. An RSA is intended to encompass indirect and regional-scale Project related effects as well as some potential cumulative effects. The RSA is also intended to address Project interactions with VECs having a wide geographic distribution (e.g., air quality; migratory species), or regional or national socio-cultural and economic systems.

5.5 Temporal Boundaries

The temporal boundaries of the Project are referred to in Section 4.5.1 of the EIS. These include three phases: the construction phase, which will last 30 to 36 months for construction of Stage 1, and 36 to 48 months for Stage 2; the operation phase, which is expected to be 50 years or more; and the decommissioning phase. Potential accidents and malfunctions that could occur during any Project phase have also been considered, along with the likelihood and circumstances under which these events could occur.

5.6 Environmental Assessment Methods

The assessment method focused on the requirements of a comprehensive study under Section 16 of CPAEAR and Sections 16 and 21 of CEAA, and stressed an assessment focused on environmental components of greatest concern to potentially affected parties. In general, the methodology was designed to:

- Focus on issues of greatest concern
- Address regulatory requirements
- Address issues raised by the public and other stakeholders
- Integrate engineering design, mitigation, and monitoring programs into a comprehensive environmental management planning process
- Integrate a cumulative effects assessment into the overall assessment of residual environmental effects

The EA method used by the Proponent includes an evaluation of the potential effects, including cumulative effects, of each Project phase as well as malfunctions and accidents, with regards to VECs. Project related environmental effects were assessed within the context of temporal and spatial boundaries established for each VEC. The evaluation of potential cumulative effects with regard to other projects and activities includes existing, approved, and likely future projects and activities that will interact temporally or spatially with the Project.

The specific terms of reference for the EA were provided in the Comprehensive Study Scope of Assessment (EC et al. 2009).

5.6.1 Valued Environmental Components

In the Proponents' EIS, VECs were identified through scoping activities that included:

- The approved Comprehensive Study Scope of Assessment document
- A review of CEAA requirements
- Discussions with technical experts from various federal government agencies
- Aboriginal and public consultation (i.e., WG meetings)
- A review of listed species and/or species at risk found within the Project area
- A review of recent EA documents for similar projects in Canada
- The professional judgment of the study team

VECs are defined as broad components of the biophysical environment that if altered by the Project, would be of concern to regulators, Aboriginal Groups, resource managers, scientists, and the general public. The 13 VECs evaluated are related to physical, biological, or human components as reflected by the scope of the factors assessed in this CSR. In addition to VEC, KIRs were used in the assessment. KIRs are species groups, resources and ecosystem functions used as representative components of the broader VECs.

Table 5-1 Potentially Affected Valued Environmental Components

VEC	Rationale
Air Quality	▪ Intrinsic importance to the health and well-being of humans, wildlife, vegetation and other biota ▪ Important pathway for the transport of contaminants to the freshwater, terrestrial, and human environments
Noise and Vibration	▪ Sound emissions in the form of noise (unwanted sound) may adversely affect ambient sound quality in the vicinity of the Project with potentially adverse consequences for a variety of human and ecological receptors ▪ Vibration waves have the potential to interact with nearby structures causing structural vibration and/or low frequency sound. These effects have the potential to cause annoyance or, in extreme cases, property damage
Light	▪ Controlling light is important for ecological and aesthetic reasons ▪ Provision of adequate lighting is important for worker safety and productivity and to help ensure a high quality of work
Vegetation Resources	▪ Contribution to landscape, community and species-level biodiversity ▪ Function as an indicator of overall ecosystem health ▪ Dependence of wildlife, plant communities and hydrological processes on the condition and characteristics of terrestrial vegetation ▪ Aesthetic, socio-economic, and cultural values, that may be recognized at a site-specific scale or more broadly across a region ▪ Direct interaction of the construction and operation of the Project with Vegetation Resources ▪ Provincial and federal regulations and policies that offer various levels of protection to Vegetation Resources
Wildlife and Wildlife Habitat	▪ Ecological, aesthetic and recreational importance of wildlife resources to the public and Aboriginal Groups ▪ Direct interaction of the construction, operation, and decommissioning of the Project with Wildlife and Wildlife Habitat ▪ Provincial (BC *Wildlife Act*) and federal (SARA) regulations that offer various levels of protection to wildlife

VEC	Rationale
Avifauna	▪ Social, cultural, and aesthetic value to society ▪ Contribution to local and global biodiversity ▪ Direct interaction of the construction, operation, and decommissioning of the Project with Avifauna ▪ The potential for significant environmental effects on Avifauna as a result of accidents and malfunctions (i.e., spills) ▪ Provincial (BC *Wildlife Act*) and federal (*Migratory Birds Convention Act*) regulations that offer various levels of protection to migratory and non-migratory birds
Freshwater Environment	▪ Ecological, aesthetic, and recreational importance of the freshwater environment to the public and Aboriginal Groups ▪ Direct interaction of the Project with freshwater streams and ponds, some of which support fish ▪ Potential for significant environmental effects on the freshwater environment as a result of accidents and malfunctions ▪ Federal (*Fisheries Act*) regulations and federal and provincial policies that offer various levels of protection to fish and fish habitat
Marine Environment	▪ Economic, recreation and cultural importance ▪ Direct interaction of the construction, operation, and decommissioning of the Project with the Marine Environment ▪ The potential for significant environmental effects on the Marine Environment as a result of accidents and malfunctions ▪ The specific regulatory requirements of the *Fisheries Act*
Socio-Economic Conditions	▪ The definition of “environmental effect” in CEAA includes any effect of any change that the project may cause in the environment that could result in an effect on health and socio-economic conditions
Human Health	▪ A change in the environment caused by the Project may affect human health (including the health of members of the public and workers at the Project)
Archaeological and Heritage Resources	▪ Federal lands and lands used by a federally regulated railway: The federal Treasury Board defines heritage value as: a value determined by assessing the aesthetic, historic, scientific, cultural, social or spiritual importance or significance for past, present and future generations. The associated value does not in itself constitute heritage value, though it does contribute to determining the significance of the asset ▪ The Project will disturb known and previously unidentified Archaeological and Heritage Resources (i.e., artefacts and ancient human remains), as well as traditional sites and materials identified during construction activities
Current Traditional Use by Aboriginal Persons	▪ The Project footprint is located within the claimed traditional territory of the Tsimshian Nation. Five Aboriginal Group communities assert Aboriginal Rights to lands in the Prince Rupert Harbour area, and have expressed an interest in the Project: Metlakatla Band; Lax Kw’alaams First Nation; Gitxaala Nation; Kitselas Indian Band; and Kitsumkalum Band
Country Foods	▪ Potential for Project activities or physical works to affect resources that are used by local harvesters (e.g., hunters, gatherers, trappers or fishers) on Kaien Island and within Prince Rupert Harbour

As RAs, DFO, EC, CTA and PRPA (as a regulator under CPAEAR) consider that the VECs and KIRs, as scoped and described in the Comprehensive Study Scope of Assessment document, are adequate for the scope of the assessment of the environmental effects of the Project.

Environmental effects assessment matrices are used to summarize the analysis of environmental effects by Project phase. This allows for a comprehensive analysis of all Project-VEC interactions in a matrix format. The Project-Environment Interaction Matrix is presented in Appendix A.

5.6.2 Characterization of Environmental Effects

Several criteria were taken into account in the characterization of the nature and extent of environmental effects. These characterization criteria include (CEA Agency 1994):

- Magnitude
- Geographic extent
- Duration and frequency
- Reversibility
- Ecological, socio-cultural, and economic context

Appendix A provides a table (Table A-2) summarizing the effects characterization (magnitude, geographic extent, duration, etc.) and residual effects rating criteria for each VEC. These definitions are reiterated in the key notes associated with Tables A-3 through A-27. In general, the definitions for effects characterization are selected based on professional judgment and experience with similar EAs approved by the government over many years.

The evaluation criteria recommended by the CEA Agency (1994; 1999, Internet site) were used to assist in the determination of significance and to frame specific definitions for the determination of significance for each VEC. These significance thresholds determine at which point the VEC would experience environmental effects of sufficient geographic extent, magnitude, duration, frequency and/or reversibility to affect its integrity. These CEA Agency evaluation criteria helped to frame significance thresholds that reflect the sensitivity of the VEC to perturbation and its ability to recover. In addition to CEA Agency guidance, significance thresholds are based on regulatory thresholds, where available, professional judgment, and stakeholder concern.

5.6.3 Significance of Effects

Upon completion of the evaluation of environmental effects, the residual adverse environmental effects (those effects remaining after the application of approved mitigation measures), including cumulative environmental effects, are assigned an overall rating of significance for each of the Project phases (construction, operations, decommissioning), including accidents and malfunctions for the Project overall. The contribution of the Project to cumulative environmental effects is evaluated, as applicable.

The rating of significance is determined by the aggregate consideration of the Project-related environmental effects and those of other present, approved, and proposed projects against the thresholds that have been established for the specific VEC, and within the defined boundaries established for each VEC. Significant environmental effects are those which are considered to be of sufficient magnitude, duration, frequency, geographic extent, and/or reversibility to cause a change in the VEC that will alter its status or integrity beyond an acceptable level. Taking into consideration the analyses conducted a phase-by-phase and an overall rating of “significant” or “not significant” is assigned. Where significant adverse residual environmental effects are predicted, a level of confidence and likelihood of occurrence rating were also given for each prediction. Assessment tables summarizing the level of residual effect (i.e., the level of magnitude, duration, frequency, etc.) for each VEC are presented in Appendix A (Tables A-3 through A-27). These tables also include a summary of proposed mitigation measures as well as any follow-up and monitoring.

The EA method used in preparation of the EIS and the CSR has been drawn from the method described by Barnes et al. (2000).

5.6.4 Monitoring and Follow-Up Programs

The CEA Agency's *Operational Policy Statement Follow-Up Programs* differentiates between environmental compliance monitoring and an EA follow-up program under CEAA as follows:

- Environmental compliance monitoring verifies whether required mitigation measures were implemented
- A follow-up program determines the accuracy of the conclusions of the EA and the effectiveness of the mitigation measures

The Proponents have committed to undertaking environmental compliance monitoring and follow-up programs as described in Section 6 of this CSR. Under the federal EA process, and under paragraph 16(2)(c) of CEAA*,* the RAs must consider the need for, and the requirements of, a follow-up program in respect of the Project. Monitoring and follow-up is presented within each of the VEC sections, where considered applicable.

An Environmental Management Plan (EMP) will also be developed for the Project. The draft EMP Framework has been appended to this CSR (Appendix B). The EMP will be developed prior to Project construction, and in accordance with permitting requirements.

6 ENVIRONMENTAL EFFECTS ASSESSMENT

6.1 Air Quality

This section provides an overview of the potential Project-related environmental effects, proposed mitigation, and conclusions related to Air Quality. Additional details are provided in the Proponents' EIS and associated TDRs (EIS Vol. 1 [Section 6] and Vol. 2 [Terminal Air Quality TDR; Rail Air Quality TDR; PRPA, CN 2009]), and the MSR (Section 3.1; PRPA, CN 2011).

Air Quality was selected as a VEC because of its intrinsic importance to the health and well-being of humans, wildlife, vegetation and other biota. The atmosphere is an important pathway for the transport of contaminants to the freshwater, terrestrial, and human environments.

Project activities result in the release of substances that, owing to their physical and chemical properties, are classed as air contaminants. These substances are activity-dependent (e.g., dust is raised during construction activities; combustion gas is emitted during operations). For this assessment criteria air contaminants (CACs), hazardous air pollutants (HAPs), and greenhouse gases (GHGs) were selected as the key substances of interest. Criteria air contaminants include sulphur dioxide (SO_2), oxides of nitrogen (NO_X), carbon monoxide (CO), and particulate matter (inhalable [PM_{10}] and respirable [$PM_{2.5}$]). Hazardous air pollutants include volatile organic compounds (VOCs). Greenhouse gases include carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) and are expressed in terms of carbon dioxide equivalents (CO_{2e}).

The following sections provide discussion on the dispersion modelling that was completed for the 2009 EIS. The results summarized for the modelling were prepared based on the 2009 Project design. As described in the MSR and in Section 1 (Introduction) of this CSR, the numbers of equipment, vessels, trains and trucks has changed. A qualitative assessment of these changes was presented in the MSR. This CSR section provides information on the 2009 dispersion modelling as well as the qualitative results presented in the MSR. While changes to the Project design altered the levels of emissions, the mitigation and conclusions of the effects assessment remain valid.

6.1.1 Study Area

For the purposes of assessing the effects of the Project on air quality, an LSA was selected to encompass virtually all air quality effects from project emission sources. The LSA is the area over which dispersion modelling was completed. For this Project, a 30 by 30 km study area centered on the Fairview Terminal was selected as the LSA. For purposes of this VEC the LSA and RSA are the same.

6.1.2 Existing Environment

6.1.2.1 Baseline Climate

An understanding of baseline climate is required as it can influence the construction, operation, and decommissioning phases of the Project. As an example, extreme ambient air temperatures are important factors to consider for the selection of construction materials and equipment, and extreme precipitation is an important factor to consider for the design of drainage systems. Climate parameters also influence the transport and dispersion of air emissions from the Project. Specifically, wind speed, wind direction, and atmospheric turbulence are major climatic elements that influence the dispersion of air emissions. The climate baseline considers measurable parameters at the nearest regional climate stations in the Project area.

To determine the possible effect of existing climate on the Project, patterns of air temperature, precipitation, humidity, and wind were detailed in the Fairview Terminal Air Quality TDR (EIS Volume 2; PRPA, CN 2009).

Prince Rupert is located on the North Coast of British Columbia, which extends from just north of Vancouver Island to Stewart, British Columbia. This region is characterized by frequent cloud cover and substantial precipitation (Nav Canada 2001). Ambient temperatures and precipitation type are primarily influenced by the Pacific Ocean; however, outflow winds from the inland valleys can carry air from the interior, resulting in extremely variable precipitation types, particularly during the winter (Nav Canada 2001).

6.1.2.2 Baseline Air Quality

To determine baseline air quality in the Project area, monitoring data from several stations was reviewed and analysed. In particular, concentrations of sulphur dioxide (SO_2), total reduced sulphur, as hydrogen sulphide (H_2S), plus inhalable particulate matter (PM_{10}) in the Project area are detailed in the Fairview Terminal Air Quality TDR (EIS Volume 2; PRPA, CN 2009).

In general, the existing air quality in the Project region is good. Air quality in this region is influenced primarily by industrial air emissions. The monitoring results show that of the substances under consideration, only H_2S concentrations have a history of exceeding the applicable regulatory objectives and standards. All monitored concentrations of SO_2 and PM_{10} are below the applicable regulatory objectives for ambient air quality.

6.1.3 Potential Project Effects

During the EA process the Proponents, the public, WG members, Aboriginal Groups and federal agencies identified three Project-related emissions that are considered to be substantive: CACs; HAPs; and GHGs.

6.1.3.1 CACs and HAPs

An analysis of CACs and HAPs was completed in the 2009 EIS (see Vol. 1, Section 6; PRPA, CN 2009) for both project construction and operations. Construction emissions were calculated and compared to existing emissions in the LSA. Emissions associated with operations activities were calculated and dispersion modelling was used to predict ground-level concentrations associated with them. Since the 2009 EIS analysis was completed, there have been changes to both the Project (2011 MSR) and to regulations that affect the analysis completed in the original EIS. The three main changes with respect to air quality are:

- Change in the project footprint
- Change in operational equipment numbers, as well as trucks, vessels and trains
- Change in emission standards

The MSR (Section 3.1; PRPA, CN 2011) details all of the proposed changes and how they affect the original assessment on air quality. Some key points of the MSR are detailed in the following sections.

6.1.3.2 Construction

Criteria air contaminant and HAP emissions from construction activities could have a temporary effect on local air quality. These emissions are associated with land clearing, ground excavation, cut and fill operations, and equipment traffic on the site. Generally, construction CAC and HAP emissions are proportional to the disturbed land area and the level of construction activity and are limited to periods when the construction activities take place.

The Project construction emissions were calculated in the 2009 EIS (see Vol. 1, Section 6; PRPA, CN 2009). The Project, as described in the MSR involves decreasing the Project footprint compared to the original EIS. This is the key Project change affecting construction emissions. A decreased footprint reduces the clearing, grubbing, excavation, dredging, and disposal activities associated with Project construction. Therefore, the construction emissions associated with the Project re-design will be less than those presented in the EIS. As mentioned in the EIS, construction emissions are low when compared to the existing emissions in the LSA. This statement remains valid. Construction emissions were not included in the 2009 dispersion modelling study as they are short-term, transient and will not contribute measurably to any regional cumulative airshed issues of concern.

6.1.3.3 Operations

Criteria air contaminant and HAP emissions during the operations phase are expected to occur from marine vessels, land-based terminal equipment, truck traffic, and rail traffic. Effects on air quality with respect to operations emissions of CACs and HAPs are expected to occur primarily in the immediate vicinity of the Terminal or on the proposed Kaien-Ridley Island Road.

The analysis of air quality effects related to CACs and HAPs during operations was completed through the use of dispersion modelling. The modelling results are summarized in EIS Vol. 1, Section 6 (PRPA, CN 2009) and were based on emissions associated with the 2009 Project design.

Since this modelling was completed, the Project has undergone a re-design and new marine emissions standards have been introduced. Both of these changes would affect the 2009 EIS dispersion modelling predictions, as discussed in the following sections.

Change in Equipment Numbers

Change in equipment numbers associated with the re-design will have an effect on air quality during operations. A summary of the updated equipment list is provided in the MSR. The largest change with respect to land-based equipment is the inclusion of 2,500 truck movements per week. Project trucking was not considered part of the scope of the Project when the original emission calculations and dispersion modelling were completed. As shown in Table 6-1, there is an increase in most equipment numbers which, barring any other changes will cause an increase in air emissions.

Table 6-1 Summary of Equipment Numbers

	Number of Units	
Equipment	**2009 EIS**	**2011 Redesign [a]**
Marine		
Ultra-Large Container Ship (ULCS)	6 per week	14 per week
Tugboats	12 per week	28 per week
Rail		
Trains	9 per day (based on annual train count)	10 per day
Land-based Equipment [b]		
Reach Stackers	6 [c]	18 [c]
Bomb Cart Trucks	60 [c]	0
Top Lifts	4 [c]	0
Yard Hustler	0	44 [c]
Empty Handler	0	6 [c]
Lift Trucks	0	4 [c]
Pick-up Trucks	0	33 [c]
Trucks (Transload and CBSA Trips)	0	2500 per week

NOTES:
[a] Includes Stage 1 and Stage 2 combined.
[b] Electric land-based equipment was not considered since they have no emissions.
[c] Assumed to operate 16 hours per day.

Change in Emission Standards

Since 2009 there have been changes announced related to marine vessel emission standards that will result in emission decreases. In 2008, the Marine Environment Protection Committee of the International Maritime Organization approved amendments to the MARPOL (short for “marine pollution”) Annex VI regulations to reduce harmful emissions from ships. At the 57th session of the Marine Environment Protection Committee (March 31 to April 4, 2008) the following was disclosed (International Maritime Organization 2008, Internet site):

> The main changes would see a progressive reduction in sulphur oxide (SO_X) emissions from ships, with the global sulphur cap reduced initially to 3.50 percent (from the current 4.50 percent, effective from January 1, 2012; then progressively to 0.50 percent, effective from January 1, 2020, subject to a feasibility review to be completed no later than 2018.
>
> The limits applicable in Emission Control Areas would be reduced to 1.00 percent, beginning on March 1, 2010 (from the current 1.50 percent); being further reduced to 0.10 percent, effective from January 1, 2015.

The United States Environmental Protection Agency (US EPA 2009) announced a joint proposal with Canada to establish an Emission Control Area for both nations’ coastlines. On March 30, 2009, the US EPA (2009) announced:

> One component of EPA’s coordinated strategy for addressing emissions from oceangoing vessels is the designation of an Emission Control Area. The United States submitted a joint proposal with Canada to the International Maritime Organization on March 27, 2009, to designate specific areas of our coastal waters as an Emission Control Area.

Given the MARPOL Annex VI amendment and ongoing actions respecting the North American Emission Control Area, it is expected that by 2015, sulphur in fuel will be 0.1 percent, which is a reduction of 96 percent (1/27th) from the 2.7 percent fuel sulphur content assumed for the original EIS. This reduction will drastically reduce sulphur dioxide (SO_2) and particulate matter (PM) emissions associated with the ULSCs.

Furthermore, the US EPA is in the process of finalizing new oxides of nitrogen (NO_X) Tier II and Tier III emission standards for marine vessel engines which will represent a 20 and 80 percent reduction below the current Tier I standards, respectively (US EPA 2010).

Updated Emissions

Emissions associated with Project operations have been re-calculated based on the revised equipment list and the reduced fuel sulphur standard discussed above. Table 6-2 shows the percent change for each species when the revised emissions are compared to those presented in the 2009 EIS.

Table 6-2 Maximum and Annual Average Emissions Comparison

Species	2009 EIS				2011 Redesign				Change (%)
	Marine	Rail	Land	TOTAL	Marine	Rail	Land	TOTAL	
Maximum CAC and HAP Emissions (g/s) [a]									
SO_2	19.6	0.138	0.561	20.3	0.771	0.153	0.597	1.52	-93
NO_X	23.4	7.45	5.27	36.1	23.9	8.28	6.37	38.6	7
CO	1.78	2.20	5.09	9.07	1.83	2.44	12.7	17.0	87
PM_{10}	0.498	0.224	0.304	1.03	0.068	0.249	0.363	0.680	-34
$PM_{2.5}$	0.398	0.224	0.304	0.926	0.054	0.249	0.363	0.666	-28
VOC	0.644	0.545	0.811	2.00	0.663	0.606	1.31	2.58	29
Average CAC and HAP Emissions (g/s) [b]									
SO_2	17.1	0.138	0.561	17.8	1.49	0.153	0.597	2.24	-87
NO_X	21.8	7.45	5.27	34.5	50.4	8.28	6.37	65.0	88
CO	1.85	2.20	5.09	9.14	4.27	2.44	12.7	19.4	112
PM_{10}	0.710	0.224	0.304	1.24	0.080	0.249	0.363	0.692	-44
$PM_{2.5}$	0.568	0.224	0.304	1.10	0.064	0.249	0.363	0.676	-38
VOC	0.870	0.545	0.811	2.23	2.01	0.606	1.31	3.92	76

NOTES:

[a] The maximum (short-term) emission rates were based on hotelling (auxiliary engine) emissions only and assume that the ULCSs are at the berth continually for a 24-hour period. The short-term emission rate does not consider maneuvering (main propulsion engine) emissions.

[b] The annual average (long-term) emission rates consider emission from both maneuvering and hotelling. The long-term emissions calculation assumes that 25% of maneuvering and 100% of hotelling occurs at the jetty and considers the actual number of hours in one year that the hotelling and maneuvering events occur. Based on this calculation methodology, the maximum emission rates for marine vessels can be less than the average rates in some cases.

SOURCE:

Emission Rates – 2009 EIS and 2011 MSR.

The 2009 dispersion modelling predicted an exceedance of the ambient air quality objective (AAQO) for SO_2 and $PM_{2.5}$. Due to the new marine vessel emissions standards, the SO_2, PM_{10}, and $PM_{2.5}$ emissions (both maximum and average) decrease considerably compared to the original EIS emissions. Because of the emissions reductions, the ground-level concentrations of SO_2, PM_{10}, and $PM_{2.5}$ are expected to decrease. Therefore, based on the updated emissions, there will be an improvement to ambient air quality predictions with respect to the original EIS for SO_2, PM_{10}, and $PM_{2.5}$.

Maximum and annual average emissions of NO_x, CO, and VOCs associated with the re-design increase compared to the original EIS emissions. This will result in an increase to the predicted ground-level concentrations of NO_2, CO, and VOCs associated with dispersion modelling. Due to the increase in annual average emissions, there will be an increase in the predicted annual average ground-level concentrations of NO_2 (118 µg/m^3), CO and VOCs; this represents an exceedance of the annual NO_2 objective of 100 µg/m^3. There is no annual average AAQO for CO or for total VOCs.

For the short-term averaging periods (i.e., 1-hour, 8-hour, and 24-hour), maximum emissions from the ULCSs were applied in the modelling. The increase in ULCSs, rail and land-based equipment will result in increased emissions of NO_X, CO and VOCs. Overall, the increase in these emissions as a result of the Project is expected to be very small or negligible. No exceedance of the AAQO is expected for NO_X or CO. There are no ambient air quality objectives for 1-hour or 24-hour total VOC.

6.1.3.4 GHGs

During construction, GHG emissions will follow the same trend as described above for CACs and HAPs (i.e., emissions will decrease).

The operations GHG emissions were estimated and considered in the provincial and federal context. The effects of the Project on climate considered mitigation and adaptive management of GHG emissions, and the application of Best Available Technology Economically Achievable. The updated emissions are summarized in Table 6-3, along with the 2009 EIS emissions for comparison. Although the total CO_{2e} emissions associated with Project operations has increased compared to the original EIS, this value is still only a fraction of the Canadian and Provincial (i.e., British Columbia + Territories) GHG emissions projections for 2015.

Table 6-3 Annual GHG Emissions Comparison

Species	2009 EIS				2011 Redesign (Current Project)			
	Marine	Rail	Land	Total	Marine	Rail	Land	Total
CO_2	41,651	14,848	35,675	92,174	97,186	16,501	42,089	155,776
CH_4	1.67	0.816	1.72	4.21	3.89	0.907	2.01	6.81
N_2O	0.183	5.98	3.20	9.36	0.428	6.65	14.7	21.8
CO_{2e}	41,743	16,719	36,703	95,165	97,400	18,582	46,695	162,677

6.1.4 Mitigation

A number of mitigation measures for the protection of air quality have been identified for this Project. The intent of these mitigation measures is to ensure compliance with federal and provincial air quality guidelines for relevant CACs and HAPs throughout all phases of the Project. Best Available Technology Economically Achievable to reduce CACs, HAPs and GHG emissions will be incorporated into Project design wherever technically and economically feasible to reduce emissions at the source. These approaches will be particularly important during the operations phase of the Project.

The Proponents will implement the following mitigation measures to reduce or eliminate Project residual effects on air quality:

- *Equipment maintenance:* Follow equipment maintenance schedules and ensure that vehicles and off-road construction equipment are properly tuned and maintained
- *Low sulphur fuel:* Use low sulphur fuel for equipment when available. PRPA and CN will comply with all new Canadian standards for use of ultra-low sulphur diesel fuels as it applies to their operation and control

- *Electric Equipment*: Use of electric land-based equipment during terminal operations will reduce combustion-related emissions
- *Dust suppressants:* Dust will be controlled through the use of dust suppressants (i.e., water, not oil), minimizing the area of activity, and paving once construction is complete. Access and onsite roads will be watered as required to control fugitive dust emissions
- *Scheduling:* Minimizing activities that generate large quantities of dust during high winds
- *Minimize disturbance:* Minimize the area of activity
- *Erosion control structures:* Install erosion control structures such as silt fences and coffer dams
- *Site paving:* paving of the site as construction is completed
- *Cover trucks:* Cover truckloads of materials which could generate dust, as necessary
- *Cold ironing:* Shore power infrastructure (i.e., cold ironing conduits) will be installed to allow properly-equipped ships to use shore power while at the berth. Cold ironing reduces local air emissions while the ship is being loaded or unloaded
- *Minimize ship idling:* Ship idling time will be minimized when at berth during the unloading and loading phases during both construction and operation. Tug operator(s) will tie off to a buoy and shut engines down or return to home base and power down the engine, if not in operation for a period of 30 minutes or longer
- *Locomotive shut down:* When ambient conditions permit, it is standard procedure for locomotive engines to be shut down when not in motion
- *New Technology:* New diesel-powered equipment will meet the highest regulated emissions standards at the time of purchase. At such time when terminal throughput reaches sufficient volume to render the purchase of electric RTG and RMGs economically feasible and/or diesel-powered equipment must otherwise be replaced, the purchase of new electrified equipment will be preferentially considered
- *New Technology:* Due to the international nature of CN's rail infrastructure it cannot be determined if the locomotive units will always be newest low emission locomotives; however, the intermodal nature of Fairview traffic generally requires newer locomotive units that will rarely be used for switching activities. CN complies with the US EPA tiered locomotive standards for new purchases and major overhaul of locomotives with the long-term goal of shifting the locomotive fleet to lower emission standards
- *New Technology:* CN locomotive units are being equipped with SmartStart technology which will automatically shut off or power up units based on time idling and temperature conditions. The newer units typically used in the Intermodal trains already have this technology, while the remainder are being upgraded
- *Monitoring:* PRPA, in consultation with the Province, will implement monitoring to validate predicted results and prevent potential human health impacts.
- *Monitoring:* If there are concerns with respect to Air Quality identified at sensitive receptors (i.e., Port Edward Elementary School), the Proponents will investigate and implement actions as necessary
- *Monitoring:* PRPA will develop an Air Quality Action Plan for follow-up air quality monitoring. The plan will include a description of data collection and interpretation and actions to be taken based on results

The PRPA is currently working with the Province of British Columbia to ascertain the appropriate type and number of permanent ambient air quality monitoring stations for the Prince Rupert area. The first stage of this initiative began in January 2012, with the installation of a met station in Prince Rupert. Data from this station will be collected until January 2013. Establishment of an ambient air quality monitoring station(s), in consultation with the Province, will allow the PRPA to conduct follow-up monitoring to verify the accuracy of the air quality EA.

6.1.5 Residual Effects

Residual effects are those that remain after the implementation of mitigation and compensation measures.

For Air Quality, a significant residual environmental effect occurs when ambient concentrations of air contaminants are likely to exceed relevant regulatory criteria for ambient air quality and are of concern relative to the geographical extent of predicted exceedances, and their frequency of occurrence.

The residual effects associated with the construction of the Project are predicted to be of low magnitude, largely site-specific and short-term. The largest of these effects will occur in an industrial context.

During Project operations the 2009 dispersion modelling exercise predicted exceedance of some CACs albeit infrequently and highly localized to the site area (i.e., the exceedances are not of concern relative to the geographic extent of predicted exceedances).

6.1.6 Government, Public and Aboriginal Comments and Proponent's Response

Health Canada raised some concerns regarding the potential for air quality issues as a result of the Project and requested that monitoring programs be established to track air quality during operation of the Project. PRPA has committed to implementing a passive monitoring program that will monitor levels of SO_2, NO_x, and O_3. Additionally, if there are numerous concerns with respect to air quality identified at sensitive receptors (i.e., Port Edward Elementary School), the Proponents will investigate and implement actions if deemed necessary.

The full list of comments, concerns and recommendations from provincial governments, federal authorities and public and Aboriginal consultations is included in the following two IR documents:

- Environmental Impact Statement Information Request Document (PRPA and CN 2011b)
- Mitigation Strategy Report Information Request Document, November 2011 (PRPA and CN 2011c)

These IR documents include the dissenting perspectives, Proponent responses, and commitments. Table 9-1 of this CSR also provides a detailed list of all of the Proponent commitments.

6.1.7 Conclusions on Significance of Effects

During this comprehensive study, the RAs have considered those documents outlined in Section 6.1. Assessment and significance conclusions were based on the criteria defined in Table A-2, in Appendix A. Based on the information summarized in this CSR and provided that the Proponents implement the mitigative actions as described, the Project residual environmental effects on air quality are considered to be not significant.

6.2 Noise and Vibration

This section provides an overview of key aspects of the existing Noise and Vibration sources in the study area as well as a summary of potential Project-related environmental effects, proposed mitigation, monitoring and follow-up measures. Additional detail with respect to Noise and Vibration is provided in the Proponents' EIS and associated TDRs (EIS Vol. 1 [Section 7] and Vol. 2 [Rail Noise TDR; Terminal Noise TDR] [PRPA, CN 2009]), and the MSR (Section 3.2; PRPA, CN 2011).

Noise and Vibration was selected as a VEC because:

- If not properly managed, sound emissions in the form of noise (unwanted sound) from the Project may adversely affect ambient sound quality in the vicinity of the Project with potentially adverse consequences for a variety of human and ecological receptors; and because
- Vibration waves have the potential to interact with nearby structures causing structural vibration and/or low frequency sound. These effects have the potential to cause annoyance or, in extreme cases, property damage

Section 6.2.3 (Potential Effects) provides a discussion on the modeling that was completed for the 2009 EIS. The results summarized for the modelling were prepared based on the 2009 Project design. As detailed in the MSR, the number of trains, vessels, and trucks has changed. The re-design resulted in a smaller terrestrial footprint, but higher operational efficiencies result in increased vessel, train, and truck movements at full build out. The anticipated effects to noise and vibration are slightly higher than those quantified in Section 6.2.3, unless otherwise noted. While the Project re-design results in an increased number of train movements and vessel calls, the mitigation and conclusions of the effects assessment and mitigation remain valid.

6.2.1 Study Area

The spatial boundary of the Noise and Vibration assessment extends from the northern end of Fairview Terminal to Mile 97 Bulkley Subdivision, east of Kitselas, British Columbia.

Potential sound and vibration effects associated with the Project are expected to be limited to the local area around the sources because sound and vibration levels decay with distance. The technical assessment of the Project was therefore limited to critical receptors near the Terminal or within a few hundred meters of the rail line. Critical receptors represent those locations receiving the highest potential Project-related sound level. It is assumed that if compliance is reached at these critical receptors, compliance will be achieved overall.

For assessment of noise from Terminal operations, the study focused on the nearest or most impacted residence which also captured representative conditions. The critical receptor chosen was located approximately 2 km from the centre of the Phase II expansion area. For assessment of rail noise and vibration, the study focused on five populated areas between the Terminal and Kitselas, British Columbia. Approximately 7 percent of the receptors used in the rail study area are located within 55 m of the rail line.

Typical emission levels for Noise and Vibration within the Project area was obtained from literature reviews, information provided by CN, and ambient noise and vibration monitoring.

6.2.2 Existing Environment

Typical ambient sound sources within the Project area include sounds from the existing terminal, rail and marine traffic, and residential sounds. Ambient noise studies were conducted within the communities of Prince Rupert, Port Edward, Kitsumkalum, and Kitselas, British Columbia. Existing vibration sources are primarily limited to vibrations from existing rail traffic along the CN rail line. Ambient vibration was monitored at receptor locations along the CN rail line east of Port Edward, British Columbia.

Ambient noise monitoring at a representative residential location close to Fairview Terminal indicated that existing one-hour equivalent sound levels range from 44.55 to 57.59 dBA during daytime and 34.86 to 44.77 dBA during the night.

Ambient noise monitoring indicated that existing minimum one-hour equivalent sound levels along the rail line, away from the Terminal, range from 35 to 56 dBA during the daytime and 28 to 45 dBA during the night.

6.2.3 Potential Project Effects

During the EA process, the Proponents, the public, Aboriginal Groups, WG members, and federal agencies identified the following potential environmental effects and key issues concerning potential effects of the Project on Noise and Vibration:

- Changes to the existing noise levels in the Project area
- Changes to the existing vibrations experienced in the Project area

These potential effects are described further in the following sections.

6.2.3.1 Changes to Existing Noise Levels

Noise associated with construction and operation of the Terminal was compared against the Alberta Energy Utilities Board (AEUB) permissible sound limits, while rail noise was compared against Health Canada sound criterion. The AEUB guidelines are appropriate for the assessment of stationary noise sources found within the terminal operational boundaries and have been adopted by the BC Oil and Gas Commission. No other relevant guidelines exist for British Columbia.

During Project construction, acoustic modeling predicted that some nearby residents (i.e., up to 1.4 km away) would likely experience Project-related noise above the AEUB directive night-time permissible sound limits (AEUB 1999). These noise levels would be experienced during night-time summer construction activities at the Terminal. Noise influence modeled for the construction phase and assessed against the daytime and winter night-time permissible sound levels were within the limits defined by the AEUB directives. Construction of the sidings and wye were not predicted to have any adverse effects at nearby receptors due to the limited nature of the construction, equipment proposed, and distances to the nearest receptors.

During operation of the Terminal, as with the construction phase of the Project, noise exceedances above those set in the AEUB directive were predicted against the summer night-time permissible level, but not for winter night-time or daytime periods.

The assessment of the increased rail traffic during operation of the Terminal predicted that the absolute Health Canada (2005) sound level criterion (i.e., 75 dBA) was exceeded at some receptors within approximately 55 m of the affected rail line (less than about 7 percent of all potential receptors). Although the levels exceed the criterion at some receptors, the perceived change between current and future sound levels due to rail traffic is not predicted to be great (i.e., less than 2 dBA) at any receptor, nor are they predicted to cause annoyance (i.e., the change in highly annoyed persons is less than 6.5 percent) at all receptors, per Health Canada (2005). During operation, the trucks related to transload and export operations, as well as trucks bound for the Canadian Border Services Association facility on Ridley Island will be directed along the new road between the Terminal and Ridley Island. This will reduce the effect of truck-related noise on residents and businesses within Prince Rupert. There are no residents in close proximity to this Port-dedicated road.

Train whistling and shunting noise has been identified by the public as an existing noise that is causing disturbance and annoyance. This relates in particular to Fairview trains that are utilizing the CN downtown yard under current operations. Maher Terminals Inc. (Terminal Operator) uses the CN downtown yard due to congestion problems in and around the terminal. Construction of the CN siding(s) will reduce the need for Maher Terminals Inc. to use the downtown yard, thus reducing the noise from whistling. It should be noted that whistling occurs in particular at two locations, for safety reasons: Mile 92.96 Ferry Crossing and Mile 92.70 Highway 16 Crossing.

6.2.3.2 Changes to Existing Vibrations

There are no applicable criteria for rail vibration levels; therefore an actual measurement of annoyance could not be completed. Anticipated vibration levels were compared to CN's criterion for residential developments adjacent to rail lines. Anticipated vibration levels were also compared to the ISO 2613 standard. Vibration was assessed at nearby receptors for the construction of the siding and the wye. Vibration was predicted to produce no noticeable change in effects at nearby sensitive receptors (e.g., representative residential communities).

Vibration was assessed at nearby receptors for the increased rail traffic during operation of the terminal. Predictions determined that receptors closer than 75 m to the rail line may experience vibration levels over the applicable CN guidelines resulting in perceptible vibrations. It should be noted that the CN guidelines with respect to vibration relate to new track, not changes in train volume on existing track; however those guidelines have been used here in absence of any other means of comparison. However, overall these levels are not predicted to result in a noticeable change from the existing conditions considering current and ongoing CN train operating conditions. Vibration will not increase, but the frequency of events will. The vibration levels of each train passing can vary (i.e., no two trains tend to generate exactly the same effect).

6.2.4 Mitigation

6.2.4.1 Noise

To address the predicted exceedance of the night-time summer permissible sound level value at the nearby residences during construction and operation, the following measures will be undertaken where technically and economically feasible with regard to the Terminal:

- *Construction Timing:* avoid construction during night-time hours and on weekends where practical.
- *Community Advisement:* advise nearby residents of significant noise-causing activities. PRPA and CN will set up a passive public notification website or email system to advise of construction activities and potential night-time or intensive construction.
- *BMPs:* standard BMPs will be implemented (i.e., internal combustion engines fitted with appropriate muffler systems) and equipment will be regularly inspected and maintained.
- *Welding Method:* ensuring that the new sidings are continuously welded rail to avoid additional noise from jointed rail.
- *Ship Idling:* ship idling time will be minimized when at berth during the unloading and loading phases (during both construction and operation). Many vessels do not yet have cold ironing capability, and although the terminal is equipped for cold ironing, some vessels may need to idle.
- *Construction of Sidings:* the sidings proposed, with one planned for construction starting in 2012, will provide additional operational capacity and efficiencies with Fairview Terminal. This will reduce the need for Fairview rail traffic to use the CN downtown yard. Trains that provide service

to VIA and other customers will continue to receive trains as before, but additional increases of trains are not anticipated.

- *Reduced train whistling:* Mile 92.96 Ferry Crossing and Mile 92.70 Highway 16 Crossing are proposed to be upgraded with additional safety features in 2012/2013. Additionally, the City of Prince Rupert is planning to implement the necessary noise bylaws, allowing CN to make application to Transport Canada to have these crossings designated as anti-whistling.
- *Port-dedicated Road:* the Port-dedicated road between Fairview Terminal and Ridley Island will reduce truck traffic, and associated noise, in the downtown core of Prince Rupert.

Although there are some exceedances of the Health Canada (2005) day-night sound level limits during operations (at receptors close to the affected rail line), no mitigation measures are recommended along the length of the rail line as the exceedence is expected to result in a negligible change in sound levels from existing levels, and only a marginal potential for annoyance.

6.2.4.2 Vibration

The vibration measurements performed show that the existing levels of traffic along the line are within acceptable limits at the receptor locations assessed. Similarly, future potential levels are also expected to be within acceptable limits (PRPA, CN 2009c). It is expected that for receptors closer than 75 m to the rail, any change in vibration impact due to the Project will be unnoticeable in the context of current train vibration levels. Based on this, specific mitigation measures are not considered to be necessary; however, it is likely that the mitigation measures described above for noise will also reduce vibration effects to some degree.

6.2.5 Residual Effects

Residual effects are those that remain after the implementation of mitigation and compensation measures. The definition of significance applied to this VEC and a summary of the anticipated residual effects are provided in the following paragraphs.

6.2.5.1 Residual Effects Rating Criteria

For Noise a *significant* residual environmental effect is a combination of the following: noise that is high in magnitude, for medium-term duration and occurring at regular intervals for sensitive receptors (e.g., residential areas). A *significant* residual environmental effect resulting from Vibration would be associated with intermittent levels that are high in magnitude, or persistent vibrations with medium-term duration that occur at sensitive receptor buildings.

6.2.5.2 Changes to Existing Noise and Vibrations

The proposed Project will temporarily contribute to noise and vibrations during construction, and will contribute longer term noise and vibrations during operations. Noise and vibration modeling, however, indicates only limited exceedances of standards with the greatest concern around night-time summer activities. Mitigation will be implemented to reduce potential Project-related noise nuisance for nearby receptors. No mitigation is suggested or is necessary for the effects of vibrations. In conclusion, based on the definitions provided in Table 5-1, in Section 5.6, and on the results of the EIS, residual effects of the Project on the acoustic environment are predicted to be low to moderate in magnitude, local extent, short to medium term in duration, and reversible.

6.2.6 Follow-Up and Monitoring

Noise complaints related to traffic will be logged and investigated to assess whether they are linked with Project activities. PRPA will maintain its existing 24/7 complaint phone line that residents can use to notify PRPA of noise and/or other disturbances. If numerous complaints are received from a receptor, the Proponents will examine the validity (i.e., through monitoring if appropriate) and options available to mitigate.

6.2.7 Government, Public and Aboriginal Comments and Proponent's Response

The primary concern raised by the public was regarding train whistling and shunting within Prince Rupert. Construction of the rail sidings will reduce the need for the Terminal Operator to use the CN downtown yard, which will consequently reduce whistling. Additionally, a joint effort by CN, PRPA and the City of Prince Rupert to make the Mile 92.96 Ferry and Mile 92.70 Highway 16 Crossings anti-whistling will reduce noise disturbances.

Health Canada raised the issue of noise during construction and potentially effects on residents. A website will be developed which informs the general public of planned construction activities and provide information for asking questions or registering concerns. If numerous complaints are received from a receptor, the Proponents will examine the validity (i.e., through monitoring if appropriate) and options available to mitigate.

The full list of comments, concerns and recommendations from provincial governments, federal authorities and public and Aboriginal consultations is included in the following two IR documents:

- Environmental Impact Statement Information Request Document (PRPA and CN 2011b)
- Mitigation Strategy Report Information Request Document, November 2011 (PRPA and CN 2011c)

These IR documents include the dissenting perspectives, Proponent responses, and commitments. Table 9-1 of this CSR also provides a detailed list of all of the Proponent commitments.

6.2.8 Conclusion on Significance of Effects

During this comprehensive study, the RAs have considered those documents referenced in Section 6.2. Assessment and significance conclusions were based on the criteria defined in Table A-2, in Appendix A. Based on the information summarized in this CSR and provided that the Proponents implement the mitigative measures as described above the Project will not likely result in significant adverse effects on ambient Noise and Vibration in the Project area.

6.3 Light

This section provides an overview of key aspects of Light in the study area as well as a summary of potential Project-related environmental effects, proposed mitigation, monitoring and follow-up measures. Additional detail with respect to Light is provided in the Proponents' EIS (EIS Vol. 1 [Section 8] [PRPA, CN 2009]).

Light was selected as a VEC because of the potential for adverse environmental effects associated with Project-related changes in lighting at the proposed Project site. Controlling light is important for ecological and aesthetic reasons; however, the provision of adequate lighting is important for worker safety and productivity and to help ensure a high quality of work (El-Rayes and Hyari 2005).

Additional light from Terminal lighting systems is expected during the construction and operation phases of the Project. A high mast terminal lighting system will be provided in coordination with the Phase I Terminal lighting facilities. Voltage for the main and perimeter lighting will be 347/600V.

Guidance on the assessment of Light has been based on Guidelines outlined by the Canada Labour Code (Department of Justice Canada 2008) and BMP outlined in the Design Criteria prepared by Westmar (2006) (EIS Volume II).

Effects of increased Terminal lighting on wildlife, avifauna and fish species are addressed in Sections 6.5 (Wildlife and Wildlife Habitat), 6.6 (Avifauna) and 6.8 (Marine Environment), and are not considered further in this VEC Section.

6.3.1 Study Area

The spatial effects of Light were considered in the Project footprint, the LSA (1 km area around the Terminal footprint on the marine and terrestrial sides) and the RSA (includes Kaien Island and Prince Rupert Harbour). No additional Light emissions are expected as a result of CN siding and wye construction because the majority of the rail construction work will be conducted during daylight hours. The railway right-of-way is unlit under operations. As a result, only the effects of Terminal lighting are considered in the assessment.

6.3.2 Existing Environment

The Project site is located in an industrial area of Kaien Island, adjacent to the existing Fairview Terminal (Phase I), and faces west towards Digby Island, near Casey Cove. Industrial developments near the Project include the Northlands, Atlin, Ridley Island Coal and Prince Rupert Grain Terminals, among others. Cow Bay and the cruise ship district are located 4 km north of Fairview Terminal.

The Project is located more than 1 km from populated areas of the City of Prince Rupert and 3 km south of the City centre, all of which fall within the RSA. Port Edward is 15 km south of the Project and is separated from the Project site by a number of small hills and mountains (Mount Oldfield 1,500 m, Mount Hays, 2,000 m, etc.). Recreational hiking trails exist within a municipal park about 500 m east of the Terminal. Local topographic features (the steep hills and wooded areas to the east of the Terminal) may help to reduce the spillover of Project light into the surrounding community.

Existing light installations at Fairview Terminal consist of high pressure sodium (HPS) lamps and metal halide lamps.

6.3.3 Potential Project Effects

Light conditions in the neighborhoods surrounding the Terminal could potentially be affected by the presence of additional Project related lighting. Additional light is also referred to as spillover light, light trespass or luminance. Spillover light can be a nuisance that detracts from the enjoyment of a naturally-lit atmosphere, and can reduce the ability to enjoy the night sky. Glare can lead to annoyance, discomfort or loss of visual performance due to lighting in excess of what the eyes of the observer are adapted to. In severe cases, light trespass can cause sleep disturbance, anxiety, and consequent health effects (El-Rayes and Hyari 2005).

Lighting will be required during Project construction. Potential effects of light trespass will likely occur during nighttime construction activities. Low cloud cover may cause backlighting that may be observed from some populated areas during some climatic conditions. Nighttime construction of the CN siding and wye is unlikely, but if required will be accomplished using portable diesel powered light plants directed at the specific construction location.

Lighting will be installed for operational use. The main lighting within the site will be 1,000 W HPS luminaires in a ring down-light fixture support system, located in a row along the middle of the Terminal. These HPS lamps are installed on high mast poles to illuminate the Fairview container and inter-modal yards and have a higher lumen/watt (light out to power in) ratio than other light sources and, therefore, a lower operating cost. Metal halide lighting is generally used on container loading equipment at the facility. This type of lighting has a slightly lower lumen/watt ratio than high pressure sodium lamps, but colour recognition is better than HSP lamps. It is used in areas where critical visual tasks are required.

Low cloud cover during operations may cause backlighting that may be observed from some populated areas during some climatic conditions. Lighting during operation will be used along the waterfront on gantry cranes to facilitate the loading and unloading of ships. High mast lights (45 m tall) will also be located on the east side of the Terminal, between the CN mainline track and the switching track, to facilitate railcar loading and unloading. No lights will be necessary along the CN line outside of the Terminal area.

In accordance with recommendations in the Canada Labour Code (Department of Justice Canada 2008), the high mast terminal lighting system will provide average 50-lux, with a 30-lux minimum in all working areas. An exception to this requirement is at the berth face where light levels may be reduced below 30-lux, but in no case will it be reduced below 22-lux.

6.3.4 Mitigation

The Proponents will implement the following mitigation measures to reduce or eliminate potential Project-related Light effects during the construction and operational phases of the Project:

- *Light shielding and cut off racks*: using light shielding and cut off racks to prevent light pollution and trespass
- *Directing light:* ensuring light is efficiently directed to where it is required
- *Controlling light levels:* keeping control over light levels including reducing the use of light where activities are not occurring
- *Centralized light control system:* having a centralized light control system providing the ability to selectively turn off lights where they are not required
- *Approved Lighting:* lighting will be approved terminal lighting (as currently used) or will meet the most recent navigational code lighting requirements, and will be bird-friendly (additional information provided in Section 6.6, Avifauna)

In general, BMPs outlined in the Design Criteria prepared by Westmar (2006, EIS Volume II) and updated by CGR (2011) will guide lighting design for the Project.

Local topographic features and vegetative cover are expected to reduce light spillover to nearby communities. The west side of the proposed Project area, however, is exposed and it can be expected that light could be observed from the east side of Digby Island, directly across from the Terminal location. The mitigation measures proposed will reduce the amount of light observed. HPS luminaires will have sharp cut-off flood light racks on the outer rows to mitigate for light spillover.

Terminal lights will be directed onto the Terminal uplands as much as possible to minimize light trespass to the environment and surrounding communities. Light trespass beyond the wharf surface will also be controlled by lighting shields, as safety and navigation requirements permit.

Light levels will be controlled through an integrated lighting control system from a single location on site. Four levels of lighting will be available: off; 25 percent low-level security; 50 percent mid-level activity; and 100 percent full activity. Lighting can be reduced in selected areas during periods of low activity. For example, security lighting in non-active areas will provide a minimum 15-lux illumination. Project infrastructure (e.g., loading cranes, approximately 80 m high) will be equipped with down-shielded lighting to reduce spillover.

6.3.5 Residual Effects

Residual effects are those that remain after the implementation of mitigation and compensation measures. The definition of significance applied to this VEC and a summary of the anticipated residual effects are provided in the following paragraphs.

6.3.5.1 Residual Effects Rating Criteria

For Light, a significant residual environmental effect is an effect that leads to the permanent loss of an aesthetic environment or habitat within the RSA, which cannot be offset by available mitigation or compensation measures.

6.3.5.2 Effect of Increased Light Trespass and Sky Brightness

Proper lighting during all phases of a project is necessary for a safe and productive terminal. It is expected that there could be some light from the Project observed from the east side of Digby Island.

Although the Project is located 1 km from the populated areas of the City of Prince Rupert, low cloud cover may cause backlighting that may be observed from populated areas during some climatic conditions. Mitigation measures will help to reduce this effect. Taking into consideration the mitigation measures presented, the lack of communities within 1 km of the facility and local topographic features, the magnitude of any effects is predicted to be low and local in geographic extent.

The effects could potentially extend to the RSA because light could be observed in the City during some low cloud situations. However, the geographical extent of any effects would be largely local and in unpopulated areas. Effects are expected to be long term in duration, because they will occur over the life of the Project and their frequency will be sporadic as they are largely affected by climatic conditions (unpredictable). However, lighting will not be required throughout the entire construction phase and light levels will be reduced during the operations phase.

6.3.6 Follow-Up Program and Monitoring

A qualified Environmental Monitor will oversee general construction and any other activities that could be disruptive concerning light. The Environmental Monitor will ensure that mitigative measures outlined in the EMP to minimize such disruptions to local communities are adhered to. Follow-up monitoring during all phases the Project will be on a complaint driven basis so specific light trespass issues can be addressed.

6.3.7 Government, Public and Aboriginal Comments and Proponent's Response

Comments related to lighting are addressed in the Avifauna Section (Section 6.6.7).

6.3.8 Conclusions on Significance of Effects

During this comprehensive study, the RAs have considered those documents outlined at the top of this Section. Assessment and significance conclusions were based on the criteria defined in Table A-2, in Appendix A.

Overall, facility lighting will provide adequate luminance necessary for safe work practices while avoiding nuisance glare beyond the active construction and operational areas. Based on the information summarized in this CSR and provided that the Proponents implement the mitigative actions and best management practices as described, facility lighting is not expected to result in a substantial increase in light trespass to surrounding communities and the RSA and, as such, the potential effects of the Project on Light are predicted to be not significant.

6.4 Vegetation Resources

This section provides an overview of key aspects of Vegetation Resources in the study area as well as a summary of potential Project-related environmental effects, proposed mitigation, monitoring and follow-up measures. Additional detail with respect to Vegetation Resources is provided in the Proponents' EIS and associated TDR (EIS Vol. 1 [Section 9] and Vol. 2 [Vegetation TDR] [PRPA, CN 2009]), and MSR (Section 3.3; PRPA, CN 2011).

The Vegetation Resources VEC includes terrestrial and shoreline Vegetation Resources. Vegetation in riparian ecosystems is considered under the Freshwater Environment VEC, in Section 6.7. Marine plants, including those in the intertidal zone, are considered under the Marine Environment VEC in Section 6.8.

Vegetation Resources was selected as a VEC because of:

- Its contribution to landscape, community and species-level biodiversity
- Its function as an indicator of overall ecosystem health
- The dependence of wildlife, plant communities and hydrological processes on the condition and characteristics of terrestrial vegetation
- Its aesthetic, socio-economic, and cultural values, that may be recognized at a site-specific scale or more broadly across a region
- Direct interaction of the construction and operation of the Project with Vegetation Resources
- Provincial and federal regulations and policies that offer various levels of protection to Vegetation Resources

6.4.1 Study Area

The north section of the LSA is defined by a 200-m buffer on the inland side of the proposed terminal expansion and the shoreline. The south section is defined by a 200 m buffer on the inland side of the rail line and an area to the south of the rail that fully encompasses the proposed wye. The RSA for Vegetation Resources has been defined as including all of Kaien Island.

Information on vegetation resources in the LSA was obtained from a literature review, ecosystem mapping, and field surveys. Project-specific baseline field surveys were conducted in September 2006, and June and September 2007 and focused on ground verification of the ecosystem mapping and surveys for rare plants and invasive plants.

6.4.2 Existing Environment

The RSA is entirely within the Hecate Lowlands Ecosystem and the Very Wet Hypermaritime Central variant of the Coastal Western Hemlock (CWHvh2) biogeoclimatic zone. The CWHvh2 biogeoclimatic zone is a forested low-elevation coastal zone that is typified by high rainfall and moderate temperatures. Eighteen ecosystem units were mapped in the LSA. The most common ecosystem unit in the LSA is Western Redcedar–Western Hemlock–Salal (HS) which covers 83.4 ha (48 percent) of the LSA. The next most common ecosystem units are Western Hemlock/Sitka Spruce–Lanky Moss (HM) and Western Redcedar/Sitka Spruce–Devil's Club (SD), which cover 9.3 ha (6 percent) and 12.1 ha (7 percent) of the LSA, respectively. Previously disturbed areas (i.e., railway, road and urban/industrial development) comprise 32.5 ha (19 percent) of the LSA.

In order to assess the potential Project effects on Vegetation Resources, five KIRs were identified:

- Ecological communities of conservation concern (rare ecosystems)
- Riparian areas
- Rare plants (vascular)
- Wetland ecosystems
- Old forest

Collectively, the condition of these KIRs is representative of overall vegetative ecosystem health and the functional integrity of vegetative ecological systems and biodiversity within the Project area.

In addition to these five KIRs, non-native/invasive plants were documented when encountered in the LSA. Non-native and invasive plants are typically weedy plants which have the potential to spread rapidly and to out-compete native plant species, potentially displacing these species and changing the structure and composition of natural vegetation communities. The most common point of entry to a natural area is from a disturbed site and likewise, new disturbances to the natural ecosystem can result in increased susceptibility to invasive plant incursion. Therefore, invasive plants may be part of an indirect Project effect (i.e., the spread of invasive plants may change the composition of plant communities).

6.4.2.1 Ecological Communities of Conservation Concern

“Ecological communities of conservation concern” are plant communities included on the BCCDC’s Red or Blue lists. They have restricted distribution or require special attention (i.e., management) within British Columbia.

Four ecological communities of conservation concern were identified in the LSA: HM, SD, Western Redcedar–Sitka Spruce–Sword Fern (RF); and Western Redcedar–Sitka Spruce–Skunk Cabbage (RC). All four of these communities are blue-listed, although the SD has been proposed for addition to the Red List (Ronalds and McLennan 2002). Their collective area of coverage in the LSA is 26.2 ha.

Rare Plants

Rare plants were defined as plant species, subspecies or varieties included in under the SARA or the BCCDC’s Red or Blue lists. Rare plants have restricted distributions or few recorded occurrences within British Columbia.

None of the 18 rare vascular plant species that could potentially be found in the Project area were recorded in the LSA. However, it is important to note that rare plant surveys can only confirm the presence of rare species; they cannot confirm their absence (Lancaster 2000).

However, rare bryophytes such as mosses and lichens were not surveyed and therefore their absence of presence cannot be ascertained. Accordingly, the proponent will need to conduct a pre-construction survey for red- and blue-listed bryophytes. Should any be found, the proponent is advised to consult with the Canadian Wildlife Service, including with respect to any additional mitigation measures and/or SARA permit requirements. It should be noted that transplanting bryophytes is not recommended.

Wetland Ecosystems

Wetland ecosystems include forested and non-forested ecosystems that are saturated with water most of the year and that contain an assemblage of hydrophytic plants. Disturbance, alteration or loss of marine beach was assessed as marine habitat, which is discussed in Section 6.8 of this CSR. There is one marine intertidal unit that will be affected by the Project: Lyngby’s Sedge-Seaside Plantain (CP). A second marine intertidal unit (Estuarine Arctic rush Alaska Plantain) is located within the LSA, but will not be affected by Project construction or operation.

The total area of wetland ecosystems in the LSA is 12.8 ha. There are three forested wetland ecosystem units: Western Redcedar–Sitka Spruce–Skunk Cabbage (RC); Western Redcedar-Yellow Cedar-Goldthread (YG); and Shore pine-Yellow Cedar-Sphagnum (LS). RC is also an ecological community of conservation concern. Accordingly, impacts to marine ecological wetland communities and related functions need to be considered through the wetland compensation plan (listed in Table 6-4).

Riparian Areas

Riparian areas are areas adjacent to streams and wetlands that are wet enough or inundated frequently enough to develop and support vegetation cover distinct from that in neighbouring upland sites (Stevens et al. 1995). Riparian areas include: the Terrestrial Ecosystem Mapping (TEM) ecosystem unit that is defined specifically as riparian; the area within 30 m of mapped freshwater and estuarine wetland ecosystem units; and the area within 30 m of all Terrain Resource Inventory Mapping (TRIM) water courses. Riparian ecosystems contribute to biological and structural diversity (e.g., large trees, shrub fringe) on the community and landscape scales, and provide habitat for wildlife and rare plants.

There are 20.1 ha of riparian area in the LSA. The majority of this area is SD, which is also an ecological community of conservation concern, as described above. Further discussions on riparian habitat are provided in Section 6.7 of this CSR.

Old Forest

In the CWH zone, old forest is defined as structurally diverse stands older than 250 years (Luttmerding et al. 1990). These forests are typically comprised of shade-tolerant and regenerating tree species as well as dead or decaying tree snags and coarse woody debris on the forest floor. Old forests often have large openings in the tree canopy with a patchy understory providing opportunities for a diverse array of flora and fauna. Old forest is identified as structural stage 7 in TEM and age class 9 in Vegetation Resource Inventory mapping.

There are 31.0 ha of old forest in the LSA distributed in two patches. One patch is adjacent to a bog in the north section of the LSA, just outside the Project footprint; the second larger patch occupies much of the south section of the LSA. There is old forest representation in six of the ecosystem units in the LSA: HM, SD, RC, YG, HS, and Western Redcedar–Yellow Cedar–Salal (RS). Three of these are also ecological communities of conservation concern (i.e., HM, SD and RC).

Invasive Plants

The results of the invasive plant survey indicate that 15 non-native plant species are established along the existing rail line. Five of these species are listed on the provincial noxious weed list (Canada thistle, butter and eggs, tansy ragwort, common groundsel, and prickly sow thistle) and two are listed provincially as nuisance weeds (oxeye daisy, hedge nettle). The rest are non-native but are not presently recognized as a concern. The species identified along the railway line are all ruderals (plants that grow preferentially in disturbed soils) and are likely to spread into new edge habitats and any disturbed open areas.

6.4.3 Potential Project Effects

During the EA process, the Proponents, the public, WG members, Aboriginal Groups, and federal agencies identified the following potential environmental effects and key issues concerning potential environmental effects of the Project on Vegetation Resources:

- Direct loss
- Changes in abiotic conditions
- Changes in structure or composition

There are no BCCDC rare plant occurrence records for the RSA, and no confirmed rare plant occurrences were documented in or around the LSA during surveys conducted in 2006 and 2007. While these results do not rule out the potential existence of rare plants in the LSA, based on the information available, and assuming implementation of mitigation measures related to Vegetation in general, it is anticipated that rare plants will not be affected on a population level by the Project and this KIR was not considered further in the assessment.

Ecological communities of conservation concern typically occupy narrow ecological niches or require a particular natural disturbance history to facilitate their development. As a result, these ecosystems cannot reliably be expected to recover or be restored once the vegetation and regenerative propagules have been removed or the required abiotic conditions have been altered. It is therefore assumed that Project effects on ecological communities of conservation concern involving total vegetation removal or changes in abiotic conditions (i.e., hydrological conditions) are permanent.

The potential effects to ecological communities of conservation concern, riparian areas, wetland ecosystems and old forest are outlined below.

6.4.3.1 Direct Loss

The Project activities which have the greatest potential to adversely affect ecological communities of conservation concern, wetland ecosystems, riparian areas, and old forest are direct loss of these KIRs during the construction phase. Site clearing and grubbing associated with terminal expansion and construction of the wye are the primary effect mechanisms.

6.4.3.2 Changes in Abiotic Conditions

For ecological communities of conservation concern, wetland ecosystems, riparian areas, and old forest, the maximum potential for changes in abiotic conditions occurs during the construction phase, although effects would be ongoing during the operations phase.

The construction of the proposed Project will create new edges along much of the perimeter of the Project footprint. Thus, there is also potential for changes in abiotic conditions affecting ecological communities of conservation concern and old forest along these edges through exposure to drying elements (i.e., wind, sun).

For changes in abiotic conditions of wetland ecosystems, site preparation activities that interrupt the link between upland and shoreline areas are the primary effect mechanism (e.g., along the southwest edge of the terminal footprint and on the east side of the wye). Wetland ecosystems have very specific ecological requirements in terms of the characteristics of both the soil moisture and nutrient regime required for development, function, persistence and recovery. Therefore, wetlands are not expected to recover or be restored to their original condition if these fundamental abiotic conditions are substantially altered by Project activities.

6.4.3.3 Changes in Structure or Composition

The maximum potential for changes in structure and composition of ecological communities of conservation concern, wetland areas, and riparian areas, occurs during the operations phase. For old forests it occurs following construction of the wye. To varying degrees, the primary effect mechanisms of changes in structure and composition for all of these KIRs are loss of mature trees due to windthrow, root-rot and soil erosion, and incursion of invasive plants along cleared edges.

6.4.3.4 Federal Policy on Wetland Conservation

The primary objective of the Government of Canada's Federal Policy on Wetland Conservation (FPWC) is "*to promote the conservation of Canada's wetlands to sustain their ecological and socio-economic* *functions"* (Government of Canada 1991). The FPWC identifies seven goals that support the above objective and seven strategies that provide practical direction on achieving these goals and the overall objective.

The FPWC reinforces federal responsibilities for wetlands in Canada—including maintaining the quality of the environment, migratory bird populations, inland and ocean fisheries, and international or trans-boundary resources such as water and wildlife.

The FPWC was approved by the federal Cabinet and therefore is a government-wide policy. The commitments of the FPWC apply to agents of the Crown including departments, agencies and corporations, and are referred to as responsible authorities consistent with terminology of CEAA. For these federal entities (i.e., responsible authorities) the FPWC applies to programs, policies, activities and other actions for which the federal government has decision-making authority, and to all lands and waters for which they are responsible. Although all federal departments, agencies and the crown corporations are responsible for implementing the FPWC, the CWS of EC oversees the implementation of the policy.

6.4.4 Mitigation

Table 6-4 is a compilation of the general and KIR-specific mitigation measures that the Proponents will implement to reduce or eliminate Project residual effects to Vegetation Resources. KIRs not listed explicitly in Table 6-4 are considered to be covered by the general mitigation measures presented in the Project EMP. In addition to the localized mitigation measures presented here, the Proponents can assist in minimizing the further loss of ecological communities of conservation concern in the CWHvh1 by sharing the Project Terrestrial Ecosystem Mapping (TEM) with other agencies, such as the BC Ministry of Forests (BCMOF), the BCCDC, and the City of Prince Rupert.

Table 6-4 Summary of Mitigation Measures to Address Potential Project Effects on Vegetation Resources

Potential Project Effect	Mitigation Measure
Loss of vegetation in general	▪ Limit the extent of grubbing, stripping and removal of understory vegetation (e.g., shrubs, grasses and forbs) to the minimum required for terminal construction and operation without compromising safety and security requirements ▪ Avoid additional vegetation clearing and cutting in areas adjacent to the Project footprint during the operations phase where technically feasible and where Project activities, security requirements, and Human Health and Safety will not be compromised. CN has a legislated requirement (Transport Canada) to maintain a clear line of sight and managed right-of-ways to protect Human Health and Safety and track infrastructure ▪ Vegetation in the line of sight or in the right-of-way will be mechanically maintained where necessary ▪ The use of herbicides will be minimized wherever possible ▪ Minimize disturbance of intact Vegetation during the operations phase (e.g., confine storage of materials to the established Project footprint, do not dump rock and other materials on intact vegetated areas) ▪ Conform to restrictions (e.g., maintenance of 30-m riparian buffer) in Stream Riparian Area Development Permit Areas along Casey Creek and near the proposed wye, although noting that rail maintenance regulations as required by the *Railway Safety Act* administered by Transport Canada have primacy over mitigations outlined in this document
Change in abiotic conditions on vegetation in general	▪ Minimize changes to natural drainage patterns: • minimize the linear extent of roads or rail beds crossing or paralleling wetlands or riparian areas • avoid or minimize extent and duration of stream course diversions

Potential Project Effect	Mitigation Measure
	◦ properly culvert all roadways to maintain drainage connectivity ◦ conform to Development Permit Area requirements where the rail maintenance regulations allow for it ◦ minimize changes to soil conditions ◦ re-establish vegetation on disturbed areas as soon as possible (i.e., within two weeks of the disturbance)
Change in structure and composition of plant communities in general	▪ Reduce windthrow risk as per BCMOF guidelines (i.e., Stathers et al. 1994) ▪ Prevent erosion through implementation of specific mitigation measures in the Erosion and Sediment Control Plan ▪ Minimize the further introduction and spread of invasive plant species through best practices that include the following: ◦ minimize area of soil disturbance ◦ re-establish vegetation on disturbed areas as soon as possible (i.e., within two weeks of disturbance). Use fast-growing native plants for this purpose. An alternate method in this situation is the use of sterile or non-aggressive species for initial green-up (e.g., use sterile grasses for first year cover) ◦ during construction, ensure all equipment brought on site is thoroughly cleaned (e.g., remove dirt from other work sites that has accumulated on the tracks, undercarriage, tires) prior to arrival ◦ minimize the risk that gravel or other fill used for road or facility construction contains invasive plant seeds or rhizomatous plant parts. This requires the Proponents to be aware of the origins of any fill materials. Although the Proponents cannot be certain that fill is 100% weed-free, they can avoid using fill from known sites of invasive plant infestation ◦ Monitoring for and control of noxious weeds and invasive plants (as defined within the *Weed Control Act*) will be conducted by a vegetation management professional throughout the operations phase ◦ Management and control of invasive plants conducted in accordance with CN's Integrated Vegetation Management Plan (CN Engineering Services 2006) ◦ investigate partnering with the Northwest Invasive Plant Council in their "Pooled Resources Program"
Loss of ecological communities of conservation concern (HM)	▪ Conduct a pre-disturbance assessment of the old forest Western Hemlock–Sitka Spruce–Lanky Moss ecosystem unit (HM) in the vicinity of the proposed Wye Junction (near the CN Bunkhouse) to: ◦ more accurately locate this small area ◦ identify and evaluate options for avoidance where technically and economically feasible
Loss of wetland ecosystems in general	▪ Buffer wetland areas by 30 m (BCMOF 1995, Internet site), with the exception of the seepage swamp that will be directly affected by construction
Change in abiotic conditions for wetland ecosystems	▪ Construct, install, and maintain berms and culverts in appropriate sites for maintaining drainage to and from wetlands ▪ EC (CWS) to review designs prior to construction ▪ Maintain and protect the integrity of wetland buffers
Loss of old forest	▪ Conduct a pre-development assessment at the location of the wye; focus on minimizing clearing of forest in this area, to reduce the loss of old growth forest and an ecological community of concern. This assessment will include a rare plant survey

Potential Project Effect	Mitigation Measure
Loss or alteration of riparian areas	▪ In addition to those riparian areas identified as a Development Permit Area, buffer all riparian areas by 30 m (BCMOF 1995, Internet site), where rail maintenance regulations allow it ▪ Construct berms and install culverts for maintaining drainage to and from riparian areas ▪ Mitigation and compensation measures for fish habitat (see CHCP, Volume II)
Change in abiotic conditions for riparian areas	▪ Maintain and protect the integrity of riparian area buffers ▪ Maintain berms and culverts in appropriate sites for maintaining drainage to and from riparian areas ▪ Riparian loss to be compensated for in the HCP
Change in structure and composition for riparian areas	▪ Maintain and protect the integrity of riparian area buffers ▪ Maintain berms and culverts in appropriate sites for maintaining drainage to and from riparian areas
Wetland Compensation	▪ The PRPA is actively working with the RAs to establish an acceptable compensation plan for the direct loss of 0.3 ha of peat margin swamp (seepage swamp), as well as up to 0.1 ha of indirect loss of the same seepage swamp. Where required, PRPA commits to compensating for the loss of wetland associated with the Project and will work with the RAs and wetland experts (i.e., Nature Trust, Ducks Unlimited) to identify compensation opportunities that meet the no-net-loss of functions requirement of the FPWC ▪ Compensation is discussed further in Section 6.6.4.1 (as it relates to the seepage swamp), and Sections 6.7.4, and 6.7.6 (as it relates to Pond 4) ▪ Effects to the CP marine intertidal unit (included in marine riparian vegetation losses) are addressed in the Fish Habitat Compensation Plan. Marine riparian losses are being addressed primarily through the creation of eelgrass and kelp beds. Compensation for lost natural marine riparian vegetation will be provided, in part, through the creation of a saltwater wetland riparian area along the east side of the fish nursery habitat. A variety of native salt-tolerant species (CP species) will be planted, including Lyngbye's sedge (Carex lyngbyei), seaside plantain (Plantago maritima), Arctic rush (Juncus arcticus), Alaska alkali grass (Puccinellia nutkaensis), sea arrow-grass (Triglochin maritima) and sea milkwort (Glaux maritima). These wetland plants will contribute organic detritus to the fish nursery habitat, which will promote the growth of transplanted eelgrass ▪ As appropriate, wetland compensation effectiveness monitoring will be undertaken

6.4.5 Residual Effects

Residual effects are those that remain after the implementation of mitigation and compensation measures. The definition of significance applied to this VEC and a summary of the anticipated residual effects are provided in the following paragraphs.

6.4.5.1 Residual Effects Rating Criteria

The significance of an environmental effect was determined by considering the residual environmental effect in the context of the sustainability of the KIR within an appropriate ecological context (e.g., the British Columbia range of a rare plant species). This determination of significance was generally qualitative—considerations include conservation status; range of the species or community; level of existing disturbance; relevant thresholds, if available; and area-specific policies for land use and Vegetation Resources management; in combination with magnitude and duration (i.e., intensity of the effect).

Specifically, with respect to level of existing disturbance and area-specific policies for land use, the following is true for all KIRs: there is already a high level of human disturbance in the LSA, primarily associated with industrial activities; and, the Project footprint falls within areas zoned as 'Business Industrial' or areas identified as the 'Potential SE Kaien Island Industrial Area', according to the City of Prince Rupert's Quality of Life Community Plan.

6.4.5.2 Direct Loss

The Project will result in the permanent residual direct loss of:

- 1.7 ha of ecological communities of conservation concern (6 percent decrease in the total available area of this KIR in the LSA)
- 0.3 ha of wetland ecosystems (2 percent decrease in the total available area of this KIR in the LSA)
- 1.55 ha of riparian area (8 percent decrease in the total available area of this KIR in the LSA)
- 1.3 ha of old forest in the south section of the LSA (4 percent decrease in the total available area of this KIR in the LSA)

Additionally, it is anticipated that there will be up to 0.1 ha of indirect loss or alteration of wetland ecosystem, immediately adjacent to the 0.3 ha described above. The 0.3 ha and 0.1 ha are considered to be conservative estimates, as the PRPA will continue to look at reducing the effects on this wetland through their detailed design process (which will continue over the next several years).

For ecological communities of conservation concern, one ecosystem type (HM) is affected. All of this loss (1.7 ha) is HM in the vicinity of the wye junction. The area of high to very high conservation status lost is less than 1 ha, and the very high conservation status community (HM) is in the vicinity of the wye. As recommended in Section 6.4.4, a pre-disturbance assessment should be conducted at the location of the wye to identify and evaluate options for avoidance of this particular community.

For wetland ecosystems, all of the loss (0.4 ha) is YG, and is associated with the construction of the intermodal yard (upland of the terminal). Given uncertainties associated with the reclamation or recovery of wetland ecosystems following disturbance, this loss is considered permanent.

For riparian areas, the majority of the loss (1.3 ha) is associated with the loss of Watercourse 2 with an additional small area at Watercourse 22 (see Section 6.7 of this CSR). The loss of riparian vegetation along these creeks will be addressed through habitat compensation works which are proposed, and which will include riparian re-vegetation.

For old forest, field surveys confirmed that the majority of the forest in the terminal area of the LSA is mature second growth rather than old forest as had been predicted by Vegetation Resource Inventory mapping. One ecosystem type (HM) is affected. The HM is an ecological community of conservation concern.

As TEM is only available for the LSA, it is not possible to quantitatively evaluate the Project-related loss of KIRs in the context of their availability in the RSA. However, inferences about general context have been made and are presented in detail in Section 9 of Volume 1 of the EIS, and in the Vegetation TDR in Volume 2 of the EIS. Residual environmental effects are anticipated to be low in magnitude, and local to regional in geographic extent.

6.4.5.3 Changes in Abiotic Conditions

The extent of any effect to wetland ecosystems resulting from disruption of drainage and seepage patterns within the LSA is predicted to be relatively small and limited in spatial extent. The ecosystem most likely to be affected is the YG in the centre of the intermodal yard footprint.

An indirect effect on riparian areas is expected as a result of disruption of hydrological conditions. There are two possible effects: excessive drying (due to increased wind and sunlight penetration into the forest and altered drainage away from the area); or increased moisture levels (due to altered drainage preventing water from flowing away from the area).

For ecological communities of conservation concern, old forest, and riparian areas, the extent of any effect from drying conditions along clearing boundaries is predicted to be relatively large with respect to penetration into the standing forest. However, the drying effect is expected to be relatively limited with respect to the amount of new edge actually created in these communities in the LSA. Chen et al. (1995) found that changes in microclimate variables extended from 30 to greater than 240 m into the forest. The edge of the Project footprint does not immediately abut areas of ecological communities of conservation concern in many locations. The only new edge into old forest is created in the south section of the LSA; although the edge is relatively long, the old forest component is only 70 percent of the affected stand. Residual environmental effects are anticipated to be low in magnitude, and local to regional in geographic extent.

6.4.5.4 Changes in Structure or Composition

The extent of any structural or compositional effect on ecological communities of conservation concern and riparian areas resulting from edge effects is predicted to be relatively limited spatially, both with respect to penetration into the standing forest and amount of new edge actually created in these communities in the LSA. The edge of the Project footprint bisects water courses and abuts areas of ecological communities of conservation concern in only a few locations.

There may be some incursion of invasive plants into wetlands where these ecosystems interface with the Project footprint, but this occurs in few locations. In addition, none of the 15 weeds known to be present in and around the LSA are specifically adapted to wetlands or estuarine and marine intertidal habitats.

The extent of any structural or compositional effect on old forest is also predicted to be relatively limited spatially. As discussed above for abiotic conditions, the only new edge created adjacent to old forest (i.e., HM) is along the wye in the south section of the LSA. This edge is south-facing, such that bare soil will revegetate quickly if re-planted soon after disturbance thereby minimizing risk of invasion by unwanted plants. The opportunity of windthrow will be minimal considering the stretch of old forest to be cleared for the wye is small (i.e. the east-facing section of the wye <300m). Residual environmental effects are anticipated to be low in magnitude, and local to regional in geographic extent.

6.4.6 Follow-Up and Monitoring

Follow-up programs are intended to evaluate whether mitigation measures are effective. The Vegetation-specific mitigation measures recommended for this Project are standard and operationally proven. However, some follow-up and monitoring is planned. For example, riparian loss will be monitored through the fish HCP monitoring, as described in Section 6.7 (Freshwater Environment). Furthermore, as appropriate, a wetland compensation plan that meets the requirements of the FPWC will be developed and implemented in consultation with the Canadian Wildlife Service, and its implementation monitored through a formal follow-up program.

An environmental site monitor will ensure that Vegetation-specific mitigation measures are implemented during construction (e.g., minimization of clearing area, no storage or dumping on undeveloped areas, steps to prevent introduction of invasive plants, erosion and sediment control, and maintenance of riparian and wetland buffer zones). Many of these mitigation measures will be ongoing throughout the life of the facility.

The following monitoring program is recommended for Vegetation in general:

- Conduct regular surveys for evidence of the introduction and/or spread of invasive plants, and implement prompt eradication measures if a problem area is identified.

6.4.7 Government, Public and Aboriginal Comments and Proponent's Response

The primary concern raised with respect to vegetation resources was the loss of a tidal marsh lagoon due to construction of the rail wye. In response to the concerns raised with respect to this sensitive habitat, CN identified an alternative site, located at Mile 88.55, near the CN bunkhouse. With the relocation of the wye, the tidal marsh lagoon will no longer be affected by the Project.

The full list of comments, concerns and recommendations from provincial governments, federal authorities and public and Aboriginal consultations is included in the following two IR documents:

- Environmental Impact Statement Information Request Document (PRPA and CN 2011b)
- Mitigation Strategy Report Information Request Document, November 2011 (PRPA and CN 2011c)

These IR documents include the dissenting perspectives, Proponent responses, and commitments. Table 9-1 of this CSR also provides a detailed list of all of the Proponent commitments.

6.4.8 Conclusions on Significance of Effects

During this comprehensive study, the RAs have considered: the EIS, comments from government agencies, WG members, Aboriginal Groups, and the public on the potential effects of the Project; responses by the Proponents to information requests, and the discussions of the WGs. Assessment and significance conclusions were based on the criteria defined in Table A-2, in Appendix A, and according to the information provided in the EIS and associated TDR (EIS Vol. 1 [Section 9] and Vol. 2 [Vegetation TDR] [PRPA, CN 2009]), and MSR (Section 3.3; PRPA, CN 2011).

Based on the information summarized in this CSR and provided that the Proponents implement the mitigative actions as described, the Project will not likely result in significant adverse environmental effects to Vegetation Resources.

6.5 Wildlife and Wildlife Habitat

This section provides an overview of key aspects of Wildlife and Wildlife Habitat in the study areas as well as a summary of potential Project-related environmental effects, proposed mitigation, monitoring and follow-up measures. Additional detail with respect to Wildlife and Wildlife Habitat is provided in the Proponents' EIS and associated TDR (EIS Vol. 1 [Section 10] and Vol. 2 [Wildlife Resources TDR] [PRPA, CN 2009]), and MSR (Section 3.4; PRPA, CN 2011).

The Wildlife and Wildlife Habitat VEC includes terrestrial mammals and herpetiles. Avifauna is addressed as a separate VEC (Section 6.6); marine mammals are addressed in Section 6.8. The terrestrial environment is important to wildlife at all times of the year as habitat requirements change seasonally and across various life history stages (e.g., mating, migration, foraging). Many wildlife populations are declining provincially, nationally and internationally due to changes to habitat, sensory disturbance, and direct mortality related to pressures on wildlife populations from forestry, commercial and recreational fisheries, industrial development, and recreational use. Natural environmental changes, such as climate change, are also affecting wildlife populations through changes to habitats supporting food resources, migrations, breeding cycles and predator/prey interactions.

Wildlife and Wildlife Habitat was selected as a VEC because of:

- Ecological, aesthetic and recreational importance of wildlife resources to the public and Aboriginal Groups
- Direct interaction of the construction, operation, and decommissioning of the Project with Wildlife and Wildlife Habitat
- Provincial (BC *Wildlife Act*) and federal (SARA) regulations that offer various levels of protection to wildlife

Section 6.5.5 (Residual Effects) provides a discussion on the habitat suitability modeling that was completed for the 2009 EIS. The calculations summarized for habitat modelling were prepared based on the 2009 Project design. As detailed in the MSR, the Project footprint, and associated effects on wildlife and wildlife habitat, has changed. The mitigative re-design resulted in a smaller terrestrial footprint and therefore the anticipated effects to wildlife and wildlife habitat are generally less than those quantified in Section 6.5.5, unless otherwise noted. The mitigation and conclusions of the effects assessment and mitigation remain valid.

6.5.1 Study Area

The LSA for Wildlife and Wildlife Habitat is based on the areal extent of the Project activities and their likely environmental effects. The LSA includes a 200-m buffer on the terrestrial side around the Terminal and the wye, and a 100 m buffer around the Kaien sidings. For the purpose of assessing potential increases in moose mortality due to increased rail traffic associated with the Project, the RSA extends from Fairview Terminal to mile 97 of the Bulkley Subdivision, at or near the rail intersection with Lorne Creek (the eastern boundary of the Kitselas Traditional Territory).

In addition to a desktop literature and data review on species and habitat, wildlife habitat assessments were completed in the Wildlife and Wildlife Habitat LSA. These assessments were comprised of modelling habitat suitability and conducting field investigations (June 2007) to confirm the habitat ratings. Incidental observations of wildlife species were also recorded during field investigations for other biophysical components (e.g., avifauna, vegetation, and freshwater resources).

6.5.2 Existing Environment

The Wildlife and Wildlife Habitat LSA is within the Hecate Lowlands Ecosection (Campbell et al. 1990) and is represented by the CWHvh2 biogeoclimatic subzone (Banner et al. 1993). The CWH biogeoclimatic zone provides highly diverse habitat, and therefore has a high diversity of wildlife species. Excluding fish and marine mammals, over 400 vertebrate animal species may occur in the maritime subzones of the CWH biogeoclimatic zone, including six reptiles, 14 amphibians, 310 birds, and 78 terrestrial mammals (Stevens et al. 1995).

In order to assess the potential Project effects on this VEC, three KIRs were identified: black-tailed deer; black bear; and moose. These species were selected as indicators to assess potential Project effects because they use a wide range of habitats within the local ecosystem. Their needs (life requisites) are shared by a broad spectrum of other species including small mammals, small carnivores, and amphibians, which makes them representative of wildlife overall.

6.5.2.1 Black-Tailed Deer

Deer require suitable habitats that meet their thermal and feeding requirements throughout the year. Seasons and life requisites that are most limiting to species' annual survival were selected for the habitat suitability evaluation. In general, the abundance and distribution of deer populations are affected by the availability of good winter habitat and the severity of winter weather. In spring, summer, and fall there are ample food resources available for deer and habitat loss does not severely limit their populations during these periods. Therefore, the habitat suitability evaluation for deer focused on feeding (forage) and thermal habitats during the winter season.

Black-tailed deer (*Odocoileus hemionus*) are common and widespread throughout the region and are known to use habitats found within the LSA. However, under baseline conditions, there is very little suitable winter habitat for black-tailed deer (either for feeding or thermal requirements) within the Wildlife and Wildlife Habitat LSA. Most of the winter habitat is rated as low, very low, or nil suitability for both winter feeding (75 percent of the LSA) and winter thermal habitat (74 percent). Most of the habitat in the LSA is comprised of young forest, with little canopy cover, which does not provide high quality feeding or thermal habitat in winter. No habitat in the LSA is rated as highly suitable, although there is some moderate and moderately high suitability habitat for winter feeding (42.8 ha or 24 percent of the LSA) and winter thermal habitat (44.1 ha or 26 percent). Furthermore, most of the LSA is within 100 m of a currently disturbed area (e.g., access roads, industrial area) further reducing the habitat quality. Most of the moderate or moderately high suitable habitat occurs outside of the Project footprint, with the exception of an area adjacent to the sidings and the wye.

6.5.2.2 Black Bear

The black bear (*Ursus americanus*) is the more common of the two bear species (black bear and grizzly bear) that occur on Kaien Island. Like black-tailed deer, black bears use a range of terrestrial habitats, many of which are shared by many small mammals including small carnivores. Black bear habitat requirements are also very similar to grizzly bear (*Ursus arctos horriblis*) requirements; grizzly bears are a species of Special Concern under Committee on the Status of Endangered Wildlife in Canada (COSEWIC). The abundance and distribution of bears is influenced by seasonally important food items (Rogers 1977). During the spring, coastal bears mainly depend on early-emerging vegetation (e.g., *Carex* spp.) and berries as the season advances (e.g., *Rubus* spp.). During the fall, bears will feed on spawning salmon. The suitability of foraging habitat for black bears for the spring, summer, and fall was evaluated within the LSA.

Black bears are sensitive to land management practices due to: seasonal habitat requirements; slow rate of reproduction; and high potential for conflict with humans. In particular, expanding human settlements, road access, and human activities, have the potential to directly and indirectly increase mortality risk to bears (MELP 2001). The majority of habitat for black bears in the LSA is rated as low to nil suitability for feeding in spring (96 percent of the LSA), summer (94 percent), and fall (96 percent). There is no highly suitable habitat for black bears within the LSA and only a small proportion of the available habitat has been rated as moderate to moderately-high in spring (4 percent), summer (6 percent), and fall (4 percent). While the LSA may contain some preferred forage species, the majority of the habitat consists of young forest of younger structural stages with insufficient forage species or is within 200 m of a currently disturbed area (e.g., access roads, industrial area).

6.5.2.3 Moose

The moose (*Alces alces*) is a common and high profile ungulate species that uses habitats around the LSA. Moose are known to interact with the rail infrastructure in the region and are vulnerable to collisions with trains and vehicles. Moose and moose habitat have been assessed with respect to potential increases in wildlife mortality due to increased rail traffic associated with the Project.

Based on rail-wildlife collision data provided by CN, 86 moose were reported killed between 1995 and 2009 along the CN Bulkley and Skeena Subdivisions (IR 462EIS; Nov 2011). Data provided by the BC Ministry of Environment indicated that 98 moose were killed between 1995 and 2010.This data was pooled and mapped, and several areas with relatively high collision rates were identified (EIS Volume II, Wildlife Resources TDR). These areas correspond to moose winter range, which has been identified along the Skeena River (MSRM 2002; Pollard 2001). Winter range is associated with riparian habitats which provide forage and thermal cover (MSRM 2005) and consists primarily of the spruce - cottonwood riparian habitats along the Skeena River floodplain (MSRM 2002). The younger structure stages within the area provide forage species that are likely to attract moose.

6.5.3 Potential Project Effects

During the EA process, the Proponents, the public, WG members, Aboriginal Groups, and federal agencies identified the following potential environmental effects and key issues concerning potential environmental effects of the Project on Wildlife and Wildlife Habitat:

- Habitat loss or alteration (causing avoidance and/or reduced effectiveness, altering movement or changing forage opportunities)
- Sensory disturbance (causing changes to movement patterns or disruption to behaviour [e.g., disruption of denning and birth/weaning of bear cubs])
- Direct mortality (associated with vehicular and rail collisions (moose in particular), or in the case of black bears, removal of nuisance animals associated with human food and garbage)

These potential effects are outlined below and are summarized across all KIRs (i.e., black-tailed deer, black bear, and moose). As no moose winter range was identified in the Wildlife and Wildlife Habitat LSA, direct mortality along the CN Skeena and Bulkley Subdivisions was the focus of the assessment for moose.

6.5.3.1 Habitat Loss or Alteration

Wildlife habitat will be directly removed during on-shore site preparation when vegetation is cleared from the Project footprint. Vegetation clearing and site preparation activities will also lead to creation of additional edge habitat and associated effects. New foraging habitat may be created along these edge habitats as early successional species (e.g., grasses, fireweed, ornamentals, etc.) naturally revegetate these areas; however, habitat edges also decrease habitat quality by increasing access by humans and predators (Bunnell 1990; Bannerman 1996a).

The expansion of the CN siding, and construction of the wye will likely reduce habitat effectiveness for bears as they are known to decrease their use of habitat or avoid clearings alongside developments such as roads and railways where there are high levels of disturbance (McLellan and Shackleton 1988; Wielgus et al. 2002; Wielgus and Vernier 2003). Other factors that pose risks to bears include a loss of foraging habitat and core security areas. Specific issues of concern include protection of foraging and denning habitat, provision of stable landscape level forage supply, and a requirement for suitable wildlife trees as escape trees in and near forest openings.

The majority of deer winter habitat alteration will occur when existing mature and old-growth forests are removed for the Project Footprint. Mature and old coniferous forests provide critical winter habitat for deer. Mature forest cover provides refuge from the snow, clear sightlines so that deer can easily detect predators, and some winter feeding habitat (Bannerman 1996b). As such, black-tailed deer are vulnerable to losses of winter habitat.

To address the concern about reduced habitat use around developments, habitat suitability modelling incorporated a 200 m buffer either side of the Terminal to calculate potential reductions in habitat suitability for wildlife.

The majority of the habitat loss and alteration will occur during construction. No additional loss of wildlife habitat is anticipated during operations or decommissioning.

6.5.3.2 Sensory Disturbance

Sensory disturbance from noise, artificial light, and other activities during construction and operation may elicit avoidance behaviour from wildlife. This avoidance can cause wildlife to alter their normal movement patterns and expend additional energy avoiding disturbance from project activities. As a result they may spend less time feeding in preferred habitats.

During construction, the installation of the onshore components of the facilities may cause habitat avoidance by wildlife. The increase in human activity, as well as the noise from blasting and other construction activities, may cause wildlife to alter their movement patterns or cause complete avoidance of the area.

Since bears traditionally return to high value feeding areas at certain times of the year, the risk of disturbance and interactions with bears is highest during the spring, summer and fall. Noise and potential sensory disturbances will be highest during the construction phase, when site preparation and construction is ongoing. It is likely that bears will avoid the area during this period and use alternative habitat.

Although there will be some interaction with black-tailed deer during the operation of the facility, based on past experience and professional judgment, habituation would likely occur. It is expected that the noise and disturbances of Project activities during operation would cause bears to avoid the area; however, some individuals may become habituated to the Project over time. This disturbance has the potential to disrupt foraging throughout the warmer months and denning during the winter period. Decommissioning of the facility is expected to have a similar sensory effect on wildlife as construction.

6.5.3.3 Direct Mortality

Construction activities may cause direct mortality of wildlife due to increased vehicular traffic and a correlated increased potential for wildlife collisions (equipment, materials and workers transported to the site). There will also be the potential for wildlife-vehicle collisions during the operations phase due to truck traffic traveling along the Port-dedicated road between the terminal and Ridley Island.

There is no central data-gathering program in British Columbia for collecting wildlife mortality data (Campbell and Preston 2006). However, the Ministry of Transportation's database provides records on the number of wildlife collisions that have been reported over the 225 km stretch of Highway 16 between Prince Rupert and Terrace between 1993 and 2002, and how these compare to other highways in British Columbia (Sielecki 2004). Over this timeframe the database has records of 21 to 50 deer collisions, which is equivalent to 0.01 to 0.03 deer collisions/km/year. Compared to other British Columbia highways, this is within the range of the lowest reported rates of deer accidents (0.001 to 0.1) during that same period. For bears, a total of 6 to 10 bear accidents occurred along Highway 16 between 1993 and 2002. This number is equivalent to 0.004 to 0.007 bear-vehicle collisions/km/year, which is just above the range of the lowest reported rates of bear accidents recorded for highways in British Columbia (0.001 to 0.005; Sielecki 2004). A total of 6 to 20 moose collisions along Highway 16 were recorded in the Ministry of Transportation's database. This number is equivalent to 0.004 to 0.01 moose-vehicle collisions/km/year, which is also within the range of the lowest reported rates of moose-related accidents for highways in British Columbia (0.001 to 0.015; Sielecki 2004). There is no data recording the number of accidents for deer, bear, or moose along other roads in the area (i.e., non-highways).

During operations, vehicle activity will result from workers traveling to and from the Project site as well as from delivery of supplies. Access roads to the Project are within the Prince Rupert municipal boundary and are subject to speed restrictions.

Rail traffic along the CN Skeena/Bulkley subdivision is expected to increase with expansion of the terminal. Higher rail traffic volume has the potential to increase moose collisions. As noted in Section 6.5.2, moose are particularly vulnerable to interactions with trains. Rail traffic along this subdivision is expected to increase from 9.3 (baseline) to 17.3 trains per day. During operations, and based on historical data available, it is expected that moose collisions will increase to 0.056 collisions per km per year, from the current 0.03 collisions per km per year. Moose mortality will increase from 6.75 (existing) moose per year to 12.6 moose per year.

With the addition of the rail sidings, rail traffic along the southern portion of Kaien Island is also expected to increase during operations; however, train movement occurs at a low speed along the siding (compared to the Skeena/Bulkley subdivision) and wildlife mortality is unlikely.

Improper waste management practices during construction and operations could attract bears to the Terminal site, which can cause serious problems if they become habituated to human activities. The fundamental causes of wildlife-human conflict, such as food, garbage, and other attractants, have become an important waste management focus because inadequately stored waste has been associated with property damage, human injury, and bear removal (Herrero et al. 2005; Follmann and Hechtel 1990).

6.5.4 Mitigation

The Proponents will implement the following mitigation measures to reduce or eliminate Project residual effects to Wildlife and Wildlife Habitat:

- *Minimize Project footprint*: limit the extent of grubbing, stripping and removal of understory vegetation (e.g., shrubs, grasses and forbs) to the minimum required for terminal construction and operation without compromising safety and security requirements.
- *Minimize disturbance/disruption*: keep human disturbance to a minimum by restricting and managing access and human activity (e.g., posting signs, security access).
- *Maintain equipment*: maintain construction and operations equipment in good order (e.g., mufflers).
- *Road lighting*: ensure roads in the Terminal area are lit at night to increase roadside visibility.
- *Reduce speed limits*: enforce low vehicle speeds (30 km/h) on roads within the Terminal.
- *Road profiles:* road profiles should be kept as flat and straight as possible to maintain a clear line of vision and well lit at night to increase roadside visibility during periods of high deer activity.
- *Fencing*: maintain fencing around the Terminal that is large enough to exclude large mammals from entry and that provides one-way escape exits to avoid entrapment.
- *Wildlife awareness*: implement a wildlife education program for employees, within the worker health and safety training, which will inform employees of the possible presence and behaviour of wildlife on the Project site, so that they can respond appropriately to wildlife encounters. Ensure staff are trained in bear awareness and the importance of minimizing trash and other bear attractants.
- *Waste management*: implement a secure waste disposal system during construction and operations of the Project to avoid attracting bears onto the site. Remove waste regularly and frequently.
- SARA-*listed species review:* conduct a review of SARA listed species within the Project footprint area prior to Project commencement to assess whether species found in baseline studies have been listed, or re-classified.

Assessment of CN's Telkwa Subdivision sections with high moose-train interactions could potentially aid in developing mitigation measures for moose collision reduction. Potential additional mitigation measures include:

- Sounding the whistle upon sighting of animal on rail right-of-way

CN currently participates in the Telkwa Moose Working Group whose studies investigate the underlying factors causing moose collisions. The results of this work will continue to provide CN with the information required to evaluate and apply effective mitigation measures to high collision areas on the rail line to reduce moose mortality. Additionally, CN proposes to develop a plan to: i) improve mortality counts for all wildlife within the Skeena Subdivision; ii) improve the reliability of CN's reporting to BC MOE; and iii) track the effect of increasing train traffic.

6.5.5 Residual Effects

Residual effects are those that remain after the implementation of mitigation and compensation measures. The definition of significance applied to this VEC and a summary of the anticipated residual effects are provided in the following sections.

6.5.5.1 Residual Effects Rating Criteria

For Wildlife and Wildlife Habitat, a significant residual environmental effect is one that alters terrestrial habitats within the Wildlife and Wildlife Habitat LSA physically, chemically, or biologically, in quality or extent, in such a way as to cause a change or decline in the ecological function of that habitat, or a change or decline in the distribution or abundance of a wildlife population (as represented by the indicator species) that is dependent upon that habitat, such that natural recruitment would not re-establish the population to its original level within two generations.

6.5.5.2 Habitat Loss or Alteration

The Wildlife and Wildlife Habitat LSA provides foraging habitat of moderate to moderately high suitability for black-tailed deer. Based on conservative estimates there are 42.8 ha of suitable (moderate to moderately-high) winter foraging habitat available. Construction activities (as proposed with the original Project design) will alter 6.2 ha of this habitat. Compared to baseline conditions in the LSA and RSA, alteration of 6.2 ha is very small relative to the available habitat in these areas. Similarly, only 6.2 ha of suitable (moderate and moderately high) winter thermal habitat will be altered. Small patches of suitable habitat occur around the buffer of the proposed terminal, and larger tracts exist near the siding. Alteration of 6.2 ha of suitable winter thermal habitat is considered negligible given the availability of habitat in the general area.

The majority of bear habitat in the LSA is mature western hemlock-Sitka spruce ecosystem unit. Although habitats in this ecosystem are usually suitable for black bears, because of the proximity of the site to the existing nearby development features there is very little suitable habitat in the Wildlife and Wildlife Habitat LSA. According to results of the habitat suitability model, the best habitat available for black bear under baseline conditions is of moderate suitability. With the Project's mitigative redesign, all habitat to be cleared for the Project Footprint is of very low to low suitability for bears. Suitable habitat that is not cleared will be reduced in quality due to its proximity to Project activities and associated structures. A greater amount of suitable habitat, just outside of the southeast portion of the LSA, will not be affected.

Residual environmental effects related to habitat loss or alteration are anticipated to be of low magnitude, and site-specific to local in extent.

6.5.5.3 Sensory Disturbance

Given the ability of deer to habituate to human activities, deer are not likely to be adversely affected by sensory disturbance from Project activities, even without mitigation. Considering their use of urban lawns and parks throughout Prince Rupert, deer will likely continue to use forested habitat within the Wildlife and Wildlife Habitat RSA (outside the boundaries of the Project Footprint).

The Wildlife and Wildlife Habitat LSA represents a relatively small area compared to the range of a black bear; therefore, a relatively small number of bears are expected to interact with the Project activities. The black bear habitat that is potentially affected is primarily moderate or low suitable habitat; therefore, avoidance of the area is not expected to have a substantial effect on the life requisites of this species as they typically seek out more highly suitable habitat.

The addition of the road between the terminal and Ridley Island slightly increases the level of sensory disturbance experienced by wildlife in adjacent habitats. It is anticipated that up to 2,500 trucks will use this road per week (15 per hour, on average). Wildlife are known to habituate to sources of sensory disturbance, particularly those that are continuous, predictable, and are not paired with a negative experience (Steidl and Anthony 2000). Wildlife, including birds, currently utilizing the shoreline, upland habitat adjacent to the existing terminal, and/or rail line, are expected to be habituated to the sensory disturbance already caused by existing structures and activities. It is anticipated that an additional 15 trucks per hour would result in a slight increase in the level of disturbance experienced by wildlife. However, this impact is expected to lessen over time as wildlife become accustomed to the noise emissions produced by the additional truck traffic. Residual environmental effects related to sensory disturbance are anticipated to be of low magnitude, and site-specific to local in extent.

6.5.5.4 Direct Mortality

There will be an increase in Project-related traffic along Highway 16 as vehicles travel to the Terminal. In 2008, the BC Ministry of Transportation traffic data program recorded, on average, 213 vehicles per day on Highway 16, east of Prince Rupert (BC MOT 2009, Internet site). During the peak of construction approximately 300 workers will be on site each day. During operations employment is predicted to increase from 310 to 1,030 workers by 2017. It is likely that many of the workers will be living locally and travelling from Prince Rupert, and so only cause a limited increase to the amount of traffic along the highway. As such, the increase in local traffic volume will not substantially increase the reported rate of collisions with wildlife.

If highway traffic (and so wildlife collisions) doubled as a result of the Project, deer collisions could potentially increase to approximately 0.04 collisions/km/year and bear-vehicle collisions could potentially increase to approximately 0.008–0.01 collisions/km/year. These rates are still among the lowest (deer), second to lowest (bear) rates of collisions in British Columbia.

There may be a small increase in vehicle collisions on roads within the RSA. However, even without mitigation, the likelihood of direct mortality to deer and bear within the Wildlife and Wildlife Habitat LSA associated with Project activities is very low. Deer are not likely to enter the area of active operations (i.e., Project footprint) given the level of disturbance occurring, and the lack of forage or cover available within the industrialized site. Deer and bear mortality from rail collisions in the area is currently very low and is not anticipated to increase substantially.

Rail-wildlife collision data provided by CN indicates that 86 moose were reported as killed between 1995 and 2009 along the CN Bulkley and Skeena Subdivisions (IR 462EIS; Nov 2011). Data provided by the BC Ministry of Environment indicates that 98 moose were killed between 1995 and 2010. This is equivalent to 0.03 collisions per km per year. Over the 15 years that the CN data were collected, 33 of the 86 moose collisions (38 percent) occurred in 1999 alone. In February of 1999, 225 cm of snow was recorded at the Terrace airport (Environment Canada 2009, Internet site). This was the most snow recorded within a month over that time period. On average, between December and March, there was only 66 cm of snow. Snow depths of 90 cm are known to restrict moose movements (Coady 1974). As such, the deep snow in the winter of 1999 may have led to increased use of the rail right-of-way as a movement corridor by moose. Heavy snowfall conditions compound moose-train interactions (Andersen *et al*. 1991) and so likely account for the high collision rate during 1999.

In addition to snowfall, collision rates are also influenced by habitat quality along the rail line, line of sight and train speed. Moose mortality is likely to increase given the expected increase in rail traffic along the CN Skeena and Bulkley Subdivisions. Current maximum rail traffic associated with Phase I consists of 2 trains per day (1 inbound and 1 outbound) and is expected to be as high as 10 trains per day (5 inbound and 5 outbound) at maximum terminal capacity. With the Projected increase in rail traffic, the frequency of moose collisions is anticipated to increase to 0.056 collisions per km per year increasing mortality from 6.75 to 12.6 moose per year. Compared to highways, this predicted rail mortality rate, would fall within the mid-range of provincial highway mortalities. The last provincial moose census of the area occurred in the Terrace Area in 1989 which estimated the population size of moose between 500 and 700 individuals in the Skeena Islands Area (BC Ministry of Environment 1989). If the number of moose mortalities from rail collisions increased by 5.5 moose per year as a result of the Project, then an additional 1 percent of the local population may be affected. This is a conservative estimate of effects (i.e., worst case) for a number of reasons: it includes data from 1999, when collision rates were uncharacteristically high due to snow; the increase in rail traffic is based on the assumption that the Port will be operating at full capacity, which is a conservative assumption; and mitigative measures and continued study of moose collisions are expected to reduce train-moose interactions.

Construction activities and presence of crew on the Project site may attract wildlife which can result in potential problems if they become habituated to human activities. Careful waste management will eliminate the risk of habituation and need for removal of nuisance individuals. Based on the assessment of habitat in the LSA, bear interactions, and expected mortality events, with the Project are anticipated to be rare. Current mortality rates from vehicle-bear collisions are relatively low and are not expected to substantially increase. With the implementation of the mitigation measures the Project is not expected to affect bear populations within the region.

As with bear and deer, if highway/road traffic doubles as a result of the Project, moose collisions are expected to increase to 0.02 collisions per km per year. This rate is among the second to lowest rates of moose collisions in British Columbia.

The effects of direct mortality for moose will likely not be measurable at the population level. Because the confidence limits around the population estimate are wide (i.e., 500 to 700) an increase in moose mortality by 1 percent would not be detectable given the uncertainty in the population estimate.

Residual environmental effects related to direct mortality are anticipated to be of low magnitude and site-specific, with the exception of residual effects on moose, which are anticipated to be of low magnitude, and ranging from site-specific to regional (during operation) in geographic extent.

6.5.6 Follow-Up and Monitoring

A qualified Environmental Monitor will oversee general construction and any other activities that could be disruptive to wildlife or wildlife habitat. The Environmental Monitor will ensure that mitigation measures outlined in the EMP to minimize such disruptions are adhered to. Follow-up monitoring after the construction phase will include a moose study program within the Skeena Subdivision to: improve mortality counts for all wildlife within the Skeena Subdivision; improve the reliability of CN's reporting to BC MOE; and track the effect of increasing train traffic.

6.5.7 Government, Public and Aboriginal Comments and Proponent's Response

There were several comments brought forth by provincial government and Aboriginal Groups with respect to wildlife and wildlife habitat, primarily around the potential for effects to moose as a result of increased rail traffic. There has been a substantial amount of discussion and reporting regarding moose, primarily between CN and the BC Ministry of Forests, Lands and Natural Resource Operations. CN was asked to give consideration to further mitigation and monitoring efforts. CN will continue to participate in the Telkwa Moose Working Group whose studies investigate the underlying factors causing moose collisions. The results of this work will continue to provide CN with the information required to evaluate and apply effective mitigation measures to high collision areas on the rail line to reduce moose mortality. Additionally, CN proposes to develop a plan to: i) improve mortality counts for all wildlife within the Skeena Subdivision through improved reliability of reporting; and ii) track the effect of increasing train traffic. CN will track the effect of increasing traffic on the Telkwa, as the pre-increase levels are already known.

The full list of comments, concerns and recommendations from provincial governments, federal authorities and public and Aboriginal consultations is included in the following two IR documents:

- Environmental Impact Statement Information Request Document (PRPA and CN 2011b)
- Mitigation Strategy Report Information Request Document, November 2011 (PRPA and CN 2011c)

These IR documents include the dissenting perspectives, Proponent responses, and commitments. Table 9-1 of this CSR also provides a detailed list of all of the Proponent commitments.

6.5.8 Conclusion on Significance of Effects

During this comprehensive study, the RAs have considered those documents outlined in Section 6.5. Assessment and significance conclusions were based on the criteria defined in Table A-2, in Appendix A. Based on the information summarized in this CSR and provided that the Proponents implement the mitigative actions as described, the Project will not likely result in significant adverse environmental effects to Wildlife and Wildlife Habitat.

6.6 Avifauna

This section provides an overview of key aspects of Avifauna in the study areas as well as a summary of potential Project-related environmental effects, proposed mitigation, monitoring and follow-up measures. Additional detail with respect to Avifauna is provided in the Proponents' EIS and associated TDR (EIS Vol. 1 [Section 11] and Vol. 2 [Wildlife Resources TDR] [PRPA, CN 2009]) and MSR (Section 3.5; PRPA, CN 2011).

British Columbia supports large populations of breeding, migrant, and wintering birds. The various bird guilds (i.e., groups) require different habitats during life history stages (i.e., breeding, staging, and non-breeding periods). Many avian populations are declining provincially, nationally and internationally due to habitat loss, sensory disturbance and direct mortality associated with population pressures from forestry, commercial and recreational fisheries, industrial development and recreational use. Terrestrial and marine settings in British Columbia are important to Avifauna at all times of the year. Marine birds are an integral part of British Columbia's coastal marine ecosystem, and many of these colonial breeding seabirds do not breed anywhere else in Canada (Campbell et al. 1990). The Pacific coast is also an important corridor for millions of migrating birds, especially shorebirds and waterfowl. The north coast of British Columbia is within the Pacific Flyway. Furthermore, the ecosystems in the LSA do not meet the habitat stopover requirements for many of these migratory species. The CWHvh2 biogeoclimatic subzone within the RSA potentially supports 91 marine and water associated birds, plus 106 land birds and raptors (Stevens 1995; Sibley 2000; Campbell et al. 2001; Bird Studies Canada 2009, Internet site). Several monitoring programs and surveys have identified variable species composition in the RSA; these are outlined in Table 11-3 of the EIS. Since submission of the 2009 EIS, additional avifauna surveys have taken place at the request of the Canadian Wildlife Service. These are described in Section 6.1.1.

Avifauna was selected as a VEC because of:

- Social, cultural, and aesthetic value to society
- Contribution to local and global biodiversity
- Direct interaction of the construction, operation, and decommissioning of the Project with Avifauna
- The potential for significant environmental effects on Avifauna as a result of accidents and malfunctions (i.e., spills)
- Provincial (BC *Wildlife Act*) and federal (*Migratory Birds Convention Act*) regulations that offer various levels of protection to migratory and non-migratory birds

Section 6.6.3 (Potential Project Effects) provides information on the habitat suitability modeling that was completed for the 2009 EIS. The calculations summarized for habitat modelling were prepared based on the 2009 Project design. As detailed in the MSR the Project footprint, and associated effects on avifauna, has changed. The mitigative re-design resulted in a smaller terrestrial footprint; therefore the anticipated effects to land birds are generally less than those quantified in Section 1.1.3. Wetland habitat loss has been reduced substantially, while marine habitat loss has increased. Additional loss of marine habitat and the potential effects to marine birds is discussed. The mitigation and conclusions of the effects assessment remain valid.

6.6.1 Study Area

The LSA for Avifauna and its habitat includes a 200 m buffer on the marine side of the Project footprint, the terrestrial side of the Terminal, and a 100 m buffer on the terrestrial side of the CN sidings. Including the Project footprint and a buffer in the LSA allows for the assessment of both direct and indirect Project effects on birds. The terrestrial and marine components of the Avifauna LSA includes approximately 218 ha and 210 ha of habitat, respectively. The RSA for the cumulative effects assessment extends from the Project footprint to the southern entrance to the Prince Rupert Port Authority waters and extends to the northern tip of Kaien Island.

Four field surveys were undertaken between September 2006 and June 2007 to collect biophysical data at or near the proposed Project location, in addition to a desktop literature and data review on species and habitat within the Avifauna survey area. These surveys included data collection for migratory marine birds, breeding birds, and an assessment of suitable nesting habitat. Incidental observations of bird species were also recorded during field investigations for other biophysical components (e.g., vegetation, freshwater resources). Additional surveys that have taken place at the request of the Canadian Wildlife Service, since submission of the 2009 EIS, include:

1. Two spring (June 2010) surveys to determine marsh habitat use by birds in the three marshes at the south end of the CN sidings
2. Two breeding-bird surveys, in early and late June 2010, for land birds along the proposed CN rail line expansion
3. Three raptor surveys (spring 2011)
4. Monthly marine-bird surveys over a 12-month period including: surveys from vessels starting at the Fairview Terminal, and extending around Ridley Island and into Porpoise Harbour near

Zanardi Rapids; and surveys from shore at 500 to 700 m intervals following the rail line between Fairview Terminal and Zanardi Rapids (7 of 12 months are complete)

The impacts to SARA listed species are expected to be limited to Marbled Murrelet (*Brachyramphus marmoratus*), Northern Goshawk (*Accipiter gentilis laingi*), and Peregrine Falcon (*Falco peregrinus*), based on known range and habitat requirements. Impacts to Peregrine Falcon are expected to be negligible as the Project area does not provide suitable breeding habitat.

6.6.2 Existing Environment

Based on the concern of the Project Proponents, regulators, Aboriginal Groups, resource managers, scientists and the general public, two KIRs were chosen to represent important spatial and temporal ecological elements of the Avifauna VEC and to assess potential Project effects on Avifauna. The KIRs selected were Marbled Murrelet and Northern Goshawk. The following provides an overview of each of the KIRs and their presence in the study area.

Marine Birds

Marine birds were defined as birds that frequent coastal waters (e.g., scoter, merganser, loon) and the open ocean (e.g., alcids), and that forage upon small fish, crustaceans and molluscs. For effects assessment purposes, offshore species such as shearwaters, petrels and albatrosses were not investigated because they are generally found great distances from shore. Only marine birds likely to occur within the RSA were included in the assessment of effects.

The Marbled Murrelet was selected as an indicator species for the marine birds KIR because it is federally-listed under SARA as Threatened (Schedule I); and there is potential nesting habitat within the LSA and RSA. Marbled Murrelets require coniferous forests with large, old trees (greater than 140 years old) with numerous moss-covered platforms for breeding. Overhead foliage cover and small gaps in the canopy for nest access are also preferred. Optimal habitat for Marbled Murrelet (e.g., high suitability) does not exist within the LSA and only a small proportion of the available habitat has been rated as moderate (8 percent of the Avifauna LSA), meaning that it may contain some preferred nesting trees. The majority of the habitat in the Avifauna LSA consists of young forest or older forest with inadequate canopy cover (less than 50 percent). Ground-truthing also indicated that most of the terrestrial portion of the Avifauna LSA is close to noise and other disturbance originating from the existing Fairview Terminal (Phase I) or other anthropogenic features (e.g., roads, railway tracks, transmission line, industrial area etc.). Consequently, 171 ha (99 percent) of the terrestrial Avifauna LSA was rated as Low or Nil suitability habitat for Marbled Murrelet nesting. This habitat has been rated as low suitability or not suitable for nesting.

Land Birds

Land birds were defined as perching birds (e.g., vireos, flycatchers), other birds (e.g., ravens), and raptors, including all potentially occurring birds of prey, both nocturnal (i.e., owls) and diurnal (e.g., hawks, eagles), that are considered dependent upon the terrestrial environment.

The Northern Goshawk was selected as an indicator species for the land birds KIR to assist in determining the suitability of nesting habitat for land birds. Most of the forested area east of the transmission line, but outside the Project footprint, provides moderate habitat for the Northern Goshawk, with large trees for nesting and a relatively open understory for flying and pursuit of prey. The total area of the terrestrial portion of the LSA that was modeled for habitat suitability was 173 ha. Of this area, 36 ha (21 percent) was rated as moderate, 80 ha (46 percent) was rated as low, and 57 ha (33 percent) was rated as nil suitability for Northern Goshawk nesting habitat. There was no high suitability breeding habitat found within the LSA.

2010 and 2011 Field Studies

The results of the 2011 field surveys to date are presented in the 2011 Avifauna Data Addendum (Stantec 2011). Key findings from these additional studies include:

- Species detected across all surveys are generally abundant with secure populations that are not listed as species at risk federally or provincially, and have adequate available habitat in the RSA
- Majority of birds using the marine environment are observed travelling through the area, at 300 m+ from the shoreline and will likely experience minimal displacement from construction and operation of the Project
- There is low potential for breeding raptors within the Project area
- Observations of SARA-listed species were limited to Marbled Murrelet but in low occurrence (n = 5)

In general, the knowledge obtained from additional surveys provided greater certainty on species presence, abundance, and usage of the Project area and increases the confidence on the conclusions made in the EIS. These results provided further confirmation that effects of the Project (particularly to species present in the Project area and listed species), are expected to be not significant. The Canadian Wildlife Service recommends that the Proponents consult with the BC Ministry of Environment regarding avifauna survey results and include any further management measures in the environmental management plan.

6.6.3 Potential Project Effects

During the EA process, the Proponents, the public, WG members, Aboriginal Groups, and federal agencies identified the following potential environmental effects and key issues concerning potential environmental effects of the Project on Avifauna:

- Habitat loss or alteration (leading to changes in bird movement patterns and foraging opportunities)
- Sensory disturbance (causing habitat avoidance, changes to movement patterns, or reduced effectiveness (e.g., noise from heavy machinery, lighting)
- Direct mortality (e.g., dredging activities, loss of nestlings, vehicular collisions)

These potential effects are outlined below.

6.6.3.1 Habitat Loss or Alteration

The environmental effect of habitat loss or alteration on marine birds will largely occur during site preparation and construction of the marine berth infrastructure, rail sidings and road. The vessels used for the shipping of equipment and supplies may also temporarily alter the marine habitat.

As defined in Section 6.6.1, the LSA for marine birds includes marine waters 200 m around the Terminal footprint and the Kaien Siding (totaling approximately 210 ha). With the 2011 Project re-design, total direct loss, alteration or disturbance of marine habitat associated with the terminal and all in-water structures (including infill for the CN sidings and the Port-dedicated Road) is estimated to be 32.6 ha. This includes 14.5 ha of intertidal habitat loss, and 7.9 ha of subtidal habitat loss. Potential effects of this habitat loss include a reduction in available food sources for marine birds such as fish, bivalves, crustaceans, and other macroinvertebrates. Subtidal surveys conducted in 2007 and 2011 revealed that the marine area surrounding the Project footprint is comprised of relatively low diversity habitat. The low diversity of invertebrates, fish and macrophytes in this area would limit the effect of reduced foraging for marine birds.

Terminal construction and vessel traffic could potentially cause re-suspension of sediments in the water column. If the sediments were contaminated, this could affect marine birds through habitat alteration or degradation, and a reduction in, or contamination of, available food sources. However, the potential for re-suspension of contaminants in the Avifauna LSA was considered in the Marine Environment VEC and during the EIS review process, and there are no concerns with effects to avifauna from the re-suspension of sediments. Laboratory analysis showed concentrations of contaminants are generally below Interim Sediment Quality Control guideline levels, and are below disposal at sea criteria established under CEPA, and are therefore not expected to have adverse effects on marine birds. Re-suspension of sediments may also increase water turbidity and reduce foraging patterns and the distribution of marine birds. However, it has been demonstrated that some marine birds using nearshore waters for foraging, such as Western Grebe (*Aechmophorus occidentalis*) and Marbled Murrelet, are not influenced by varying turbidity levels (Henkle 2006). Furthermore, the Project site is located within the sediment plume of the Skeena River, and sedimentation patterns within the Avifauna LSA are largely controlled by the natural outflow from this freshwater source. As a result, marine birds are regularly exposed to the natural tidal and current action that create periods of suspended sediments in the water column.

Habitat loss and alteration during construction is the largest Project effect to land birds. With the Project as currently designed (mitigative re-design), approximately 16 ha of potential terrestrial habitat will be removed from the landscape as result of construction of the Terminal yards. Some additional habitat will be lost as a result of clearing for construction of the CN sidings and wye. Based on relative abundance, the land bird species most likely to be (but not exclusively) affected by habitat loss include the Townsend's Warbler (*Dendroica townsendi)*, Swainson's thrush (*Catharus ustulatus)*, Pacific-slope Flycatcher (*Empidonax difficilis*), Winter Wren (*Troglodytes troglodytes*), and Varied Thrush (*Ixoreus naevius).* In addition, the removal of habitat will alter remaining habitat by creating edges along the Project footprint perimeter and linear features (e.g., road, railway lines). The addition of edge habitat will functionally restrict the distribution of land birds due to changes in the vegetation community, predator-prey interactions, nest parasitism and microhabitat change (Burke and Nol 2000; Flaspohler 2001; Manolis 2002). The loss of habitat may permanently displace some land birds, forcing them into lower quality habitat or out of the LSA. Habitat loss and alteration may also result in land bird mortalities due to increased risk of predation, increased energy expenditure due to greater predator vigilance, reduced of energy resources, and lack of suitable cover. Together, these factors may contribute to reduced fecundity.

While habitat will be cleared during the construction phase, the absence of habitat will persist throughout the operation phase. Optimal breeding habitat for Northern Goshawk (e.g., high suitability) does not exist within the Avifauna LSA. The proposed construction activities will result in the loss or alteration of 4.5 ha of moderately suitable Northern Goshawk breeding habitat and 18.6 ha of low suitability habitat, based on the 2009 Project design. As the mitigative re-design (2011) results in substantially less terrestrial loss, effects on breeding habitat for Northern Goshawk will be reduced.

No high suitability habitat for Marbled Murrelet nesting was identified in the LSA. The majority of moderately suitable nesting habitat in the area was located outside of the Avifauna LSA, east of the Terminal yard footprint. The capability of this habitat to support this species (under current conditions) remains the same, as it will not be physically removed; however, a small proportion of this moderate habitat will be altered as a result of the Project, as the suitability of this habitat, comprised of mature, coniferous forest (structural stage 6, age 80–250 years; MELP and MOF 1998), will be reduced given its proximity to the Project footprint.

6.6.3.2 Sensory Disturbance

Construction activities will create noise and human activity that will likely disturb land birds, and has the potential to disturb marine birds, and alter their behaviour. Disturbance of this nature will likely cause temporary displacement of a small number of locally occurring birds to adjacent areas where there are fewer disturbances. Construction and maintenance activities during the nesting season may cause birds nesting near the areas of disturbance to abandon their nests.

Artificial lighting may create sensory disturbance to land birds by influencing bird behaviour. For example, lighting may allow diurnal raptors to forage at night, thus changing predator-prey interactions. There may also be an incremental increase in sensory disturbance to marine birds from land and marine facility construction lights, although this appears unlikely. Scientific literature on marine birds limits its evaluation of artificial lights to pelagic birds (e.g., petrels) (Reed et al. 1985; Wiese et al. 2001), as lights do not appear to affect coastal marine birds.

The effects of noise on marine birds are not well studied, making it difficult to evaluate the potential effects of in-water construction activities, such as vibro-densification, on bird species. Recently, there has been increased attention to the potential for pile driving to adversely affect fish species. Many marine birds dive in pursuit of prey when foraging, and can therefore be exposed to the same elevated sound pressures that negatively affect fish (Teachout 2006). Physical injury, including death, may occur in aquatic organisms at sound pressure levels above 180 dB peak, and levels above 153 dB peak are expected to cause temporary behavioural changes that may negatively affect foraging efficiency (Teachout 2006). Pile installation using a vibratory hammer is also known as vibro-piling. The impact energy of each strike is much less than that of a hydraulic impact hammer and, as such, vibro-piling is the quieter of the two methods. The underwater noise source levels generated by vibro-piling are estimated to be in the range of 150 to 170 dB re 1 μPa at 1 m, and an average of 160 dB re 1 μPa at 1 m has been assumed for subsequent residual impact analysis (EnviroGulf Consulting 2007; Richardson et al. 1995). These sound pressure levels may cause a change in marine bird behaviour, however, it is anticipated that marine birds will temporarily avoid the LSA during periods of high acoustic disturbance.

Noise during terminal operations will likely result in sensory disruption to land birds, although some songbirds and raptors may habituate to human-made noise and human presence associated with predictable or consistent sounds of day-to-day operations (Steidl and Anthony 2000). Noise generators that exceed 85 dB are used to scare off nuisance bird flocks, though birds tend to return once habituation occurs (Dafour 1980; Baxter 2000; Slabbekoorn and Peet 2003). Songbirds may be adversely affected if they are unable to attract mates or defend territories if their songs are drowned out by excessive long term noise, although research suggests that some birds compensate for increases in ambient noise by increasing the pitch and intensity of their songs (Dafour 1980; Baxter 2000; Slabbekoorn and Peet 2003). Raptors are known to tolerate noises of 50–80 dB (White and Thurow 1985, Tempel and Gutierrez 2003). Individuals unable to habituate may be displaced into disturbance-free habitat (Steidl and Anthony 2000). Considering the above, the potential for a substantial effect of operations on land birds appears to be low.

There will be a substantial increase in vessel traffic once the Terminal is operational. The presence of marine birds is negatively correlated with increasing vessel traffic (Kuletz 1996; Hamer and Thompson 1997; Bellefleur et al. 2008). However, most studies focus on recreational boat traffic, which can interfere with birds foraging in shallow waters, and not shipping traffic. Bellefleur et al. (2008) show that marine birds, such as the Marbled Murrelet, do not flush from foraging habitats if boat traffic is greater than 100 m in distance; in general, slower traffic, which is predicted to occur at the Terminal, reduces flushing behaviour. Facility lighting, vessel lights, and navigational lights are not predicted to have a substantial effect on marine bird populations. Scientific literature suggests that artificial lights from structures and vessels tend to disorient pelagic (i.e., open ocean) birds such as petrels, albatrosses, and shearwaters (Reed et al. 1985; Wiese et al. 2001) as well as songbirds (Evans 1996) and collision risk is exacerbated during poor weather conditions (Crawford 1981; Montevecchi et al. 1999) with large groups of birds. However, this disorientation effect has not been recorded for species of marine birds that typically use near-shore habitats.

6.6.3.3 Direct Mortality

The BC *Wildlife Act* (Section 34) and the Migratory Birds Regulations of the *Migratory Birds Convention Act* (Sections 5 and 6[a]); prohibit the destruction of birds, their nests or eggs. There is potential for bird mortality to occur during the construction phase of the Project through activities such as removing vegetation, clearing trees, grubbing, and blasting if there are active nests present. Another potential cause of bird mortality is vehicular collisions due to increased activities in and around the Terminal construction site. Mortality may also result from collision with construction traffic (both on land and on water) and infrastructure. If high intensity construction staging lights are used to extend construction hours after dusk or before dawn, then there is a risk of increasing collisions with equipment as birds may become disorientated by the lights. Furthermore, there is evidence to suggest that some nocturnal predators of birds are more successful when hunting in illuminated areas (Lima and Dill 1990; Mougeot and Bretagnolle 2000; Montevecchi 2006); minimizing light pollution to reduce this possibility would be a prudent measure.

The risk of direct mortality for marine birds during operations will be similar to the risks during the construction phase. The frequency of vessel traffic will be greater and more regular, with a maximum of 14 vessel visits per week at full build out. It is expected that the Project site will be illuminated throughout the night so any marine birds that are active during this time may be attracted to the site. During the operation phase, bird mortality rates could increase as a result of collisions with the facility structures (e.g., cranes) caused by attraction to lighting at the Terminal. Songbirds migrate during the night, and artificial lighting is known to lead to disorientation of migratory birds and increase collision potential (Evans 1996). Under conditions of poor visibility such as low cloud cover or fog, nocturnal migrating birds have difficulty navigating and may be attracted to bright lights. There is also a potential for mortality of marine and land birds from accidental spills. The effects of Accidents and Malfunctions are assessed in Section 6.16.

6.6.4 Mitigation

The Proponents will implement the following mitigation measures to reduce or eliminate Project residual effects to Avifauna:

- *Limit Extent of Dredging:* the dredging footprint will be limited to the greatest extent that is technically feasible to reduce the potential effects associated with re-suspended sediments.
- *Erosion and Sediment Control Plan:* an SCP will be developed to help reduce the dispersion of suspended solids during construction activities. The plan will include appropriate selection of dredge technology, disposal of dredged material in an approved site, and minimization of spillage of materials during dredging. Mitigation to be undertaken during operations will likely require restrictions on operations under certain weather and/or tidal conditions, and monitoring to ensure suspended sediment loads do not exceed specified levels. The SCP will be written in consultation with the DFO.
- *Wildlife awareness:* implement a mandatory wildlife education program within the worker health and safety training that will apprise employees of the possible presence and behaviour of birds on the Project site so that they can respond appropriately to bird encounters.
- *Minimize clearing:* minimize wherever possible the amount of clearing required.
- *Shield outdoor lights:* where permissible under safety and navigation requirements, outdoor lights will be shielded to minimize light spillage beyond the wharf face and other work areas (see also Section 6.3, Light). Lighting will be approved terminal lighting (as currently used) or will meet the most recent navigational code lighting requirements.

- *Acoustic blankets and bubble curtain:* bubble curtains will be deployed to minimize underwater noise for the duration of any impact pile-driving activity where vibratory pile installation is not feasible due to geotechnical conditions.
- *Work scheduling/Minimize disruption:* where practical, construction activities will avoid the time of the year when the North Coast has high marine bird populations, particularly during spring migration (April to May). Schedule activities during daylight hours whenever practical, to minimize the need for staging lights. Avoid disturbance to bird nesting habitat during the nesting season (May 1 to July 31 in the Prince Rupert area) to prevent mortality of birds, nests, or eggs in accordance with Section 34 of the BC *Wildlife Act* and Sections 5 and 6(a) of the Migratory Birds Regulations of the *Migratory Birds Convention Act*. If disturbance is unavoidable during nesting season, the Proponents are referred to advice posted on Environment Canada's website, available through the following link: http://www.ec.gc.ca/paom-itmb/default.asp?lang =En&n=FA4AC736-1.
- *Retain raptor nest trees:* retain raptor nest trees with the appropriate vegetated buffer (i.e., according to MOE 200—Best Management Practices for Raptor Conservation during Urban and Rural Land Development in British Columbia: http://www.env.gov.bc.ca/wld/BMP /bmpintro.html#second_) to reduce the impacts of disturbance, where technically and economically feasible.
- *Retain habitat features:* retain natural habitat features such as wildlife trees; vegetation should be retained wherever possible (e.g., trees which are not deemed to be hazardous provide nesting opportunities for cavity-dependent birds). Conduct a pre-construction survey to identify important wildlife habitat features (e.g., raptor nests). If habitat features are located a mitigation plan will be developed to minimize effects. If removal of significant habitat features is unavoidable, a permit for removal will be sought under the *Wildlife Act*.
- *Retain natural vegetation:* retain natural vegetation along the boundaries of the Project to provide noise buffers and to limit noise associated with clearing.
- *Speed limits:* enforce speed limits for vehicle and vessel traffic.
- *Maintain equipment:* maintain construction and operations equipment in good order (e.g., mufflers).

6.6.4.1 Wetland Compensation:

As described in Table 6-4, PRPA is actively working with Environment Canada to establish an acceptable compensation plan for addressing impacts to wetland functions associated with the direct loss of 0.3 ha and the indirect loss of 0.1 ha of peat margin swamp (seepage swamp). Where required, PRPA commits to compensating for the loss of wetland associated with the Project and will work with EC and other wetland experts (i.e., Nature Trust, Ducks Unlimited) to identify compensation opportunities that will meet the requirements of the FPWC.

Additionally, the freshwater habitat compensation plan being developed for the Project will include compensation for riparian and aquatic losses at Pond 4, which is considered a tidal basin marsh. A total of 0.0254 ha of aquatic habitat at Pond 4 will be affected by construction of the rail sidings. Tidal basin marshes are within the supratidal zone in basins that do not drain during low tide and the water is brackish. Wetland vegetation within these two ponds is limited to upper intertidal areas where fine grained soils are located. The primary ecological function of this wetland is for wildlife habitat. The loss of tidal basin marsh will be compensated through the marine and freshwater fish habitat compensation plan.

The loss of wetland habitat in Pond 4 will be 0.1553 ha of riparian habitat; the area to be affected consists of rip rap armoured fill slope (along the existing rail line), immature alder stands along the rail line (regularly brushcut by CN to maintain safety sightlines), and a small area of natural shoreline sediments. This fill will result in a reduction of surface water (0.1657 ha) within the wetland however that loss will not affect wetland function since the marsh will continue to provide safe resting habitat for the waterfowl that feed on grain spilled at Prince Rupert Grain.

The loss of riparian vegetation is expected to reduce the level of foraging habitat for birds using the pond. To ensure there is no net loss of habitat function due to reduced riparian cover, a 100 m long and 4 m wide bench will be constructed along the fill slope of the new siding, and set back far enough to eliminate the need for brushcutting maintenance. This 400 m^2 bench will be planted with early colonizing trees and shrubs such as alder, thimbleberry, willow and red-osier dogwood further upslope. These plantings will ensure that riparian foraging opportunities for wildlife that use the marsh are not reduced.

In addition to the on-site enhancement in Pond 4, which is proposed as partial compensation for the reduced wildlife habitat function, off-site compensation will also be provided through the creation of intertidal eelgrass habitat (which will provide habitat for waterbirds such as herons and waterfowl), marine shoreline enhancement (which will provide habitat for waterbirds such as herons and shorebirds), freshwater riparian habitat (which will provide habitat for songbirds such as song sparrow and yellow warbler) and freshwater habitat creation and enhancement in the lower Skeena River watershed.

6.6.5 Residual Effects

Residual effects are those that remain after the implementation of mitigation and compensation measures. The definition of significance applied to this VEC and a summary of the anticipated residual effects are provided in the following sections.

6.6.5.1 Residual Effects Rating Criteria

For Avifauna, a significant residual environmental effect occurs when the population of a species is sufficiently affected to cause a decline in the abundance and/or change in distribution beyond which natural recruitment (reproduction and immigration from unaffected areas) would not return the population to its former level within two generations.

6.6.5.2 Habitat Loss or Alteration

The Project-related environmental effects on nesting and foraging habitat of marine birds occur at site specific or local scales. Increased concentrations of suspended sediments from both in-water and onshore construction activities is expected to be isolated to the area immediately surrounding the Project footprint. Naturally turbid conditions currently exist and there is low diversity and abundance of available food sources for marine birds within the LSA. Direct loss of habitat within the Project footprint would persist for the life of the Project; however, habitat altered by construction activities within the Avifauna LSA is expected to recover within one or two breeding seasons after the disturbance. Although 30.05 ha of terrestrial habitat will be permanently removed, the scale of the Project is relatively small compared to the amount of available habitat in the LSA and RSA.

Breeding bird habitat in the area is primarily composed of mature forest habitats dominated by western hemlock, western red cedar, Sitka spruce, and yellow cedar. The ground cover consists of greater than 50 percent salal, sword fern, deer fern, devil's club (*Oplopanax horridus*), and fern-leaved goldthread (*Coptis aspleniifolia*). Birds within the habitat are mostly common species with broad ranges that are not listed as species at risk federally or provincially. Observations of SARA-listed species have been limited to Marbled Murrelet but in low occurrence (n = 5). Breeding birds with high site fidelity will likely be displaced from breeding habitat within the LSA, but this would be limited to a relatively small number of individuals. Residual environmental effects resulting from habitat loss or alteration are anticipated to be of low magnitude and site-specific to local in geographic extent.

6.6.5.3 Sensory Disturbance

The area surrounding the LSA is currently exposed to regular acoustic disturbance from several other industrial facilities and human activity. Underwater noise generated by construction vessels will be similar to that of other ships and boats (e.g., pleasure boats, fishing vessels, tugs, ferries, and container ships) currently operating in the area. Marine birds may temporarily alter foraging and loafing patterns and distribution to avoid certain noise sources; however no measurable behavioural and physiological effects are anticipated in an area that is already highly used.

Although the normal behavioural patterns of marine birds near the LSA may be initially disrupted, birds are expected to become habituated to construction activities provided the disturbances are not associated with other negative experiences (Ward and Stehn 1989; Steidl and Anthony 2000; Goudie and Jones 2004). Birds that do not habituate will exhibit some sort of avoidance behaviour as a result of noise or human disturbance. There is extensive suitable habitat in the region, and birds that are present in the Avifauna LSA during construction will likely move to areas at least 100 m from where the point of disturbance is occurring (Larsen et al. 2004). Coastal marine birds are often recorded at industrialized sites such as ferry terminals and loading docks and are commonly seen around Kaien Island (see the Wildlife Resources TDR). Results of previous field surveys around Ridley Island, showed tolerant birds such as gulls and cormorants having habituated to vessel traffic associated to the grain and coal terminal, while more sensitive marine birds such as the Marbled Murrelet, Ancient Murrelet, and Western Grebe, continued to use the far shore (i.e., greater than 300 m offshore) for foraging and loafing (Wildlife Resources TDR). Sensory disturbance to marine birds during the construction phase is expected to be of minor concern. With the implementation of mitigation measures (i.e., acoustic blankets / bubble curtains, work scheduling) the effects of sensory disturbance on marine birds will be reduced.

Land birds will mostly be affected by sensory disturbances during the construction phase of the Project. In order for birds to tolerate or habituate to light or noise disturbance, the disturbance must be predictable and not paired with a negative experience. Similarly, more predictable sources of disturbance can lead to greater apparent habituation in field situations than less predictable ones (Ward and Stehn 1989; Steidl and Anthony 2000). Project related disturbance would generally not be associated with a direct negative experience (i.e., noise disturbance will be disruptive but entirely passive). In such situations, the effects of sensory disturbance (e.g., changes to movement patterns) are usually temporary.

As is discussed in Section 6.5 (Wildlife and Wildlife Habitat), wildlife, including avifauna are anticipated to habituate to the additional sensory disturbance caused by truck traffic travelling between the terminal and Ridley Island. Residual environmental effects resulting from sensory disturbance are anticipated to be of low magnitude and site-specific to local in geographic extent.

6.6.5.4 Direct Mortality

The risk of direct mortality to marine birds is low because construction activities will likely temporarily deter marine birds from using the Avifauna LSA. Furthermore, construction activities are scheduled during daylight hours where feasible, so bird attraction to vessel lighting will be unlikely. The risk of direct mortality to marine birds during operations is also low. Attraction to lighting has been recorded in pelagic birds such as albatross, petrels, and shearwater but not the type of marine birds that have been documented in the assessment area. Direct mortality to marine birds will be limited, and would only sporadically affect individual birds that come in direct contact with Project activities (e.g., maintenance, collisions).

Mortality to breeding birds, not including raptors and other early nesting species, will be largely, if not completely avoided, if vegetation clearing is completed outside breeding bird periods (May 1 to July 31 in the Prince Rupert area) and the appropriate nest avoidance contingencies employed. Pre-construction surveys will identify and manage site-specific, important habitat elements (such as raptor nests) and help reduce the potential for adverse effects. The Proponents will refer to EC's advice regarding Incidental

Take, posted on EC's national website. Project infrastructure (e.g., loading/unloading cranes) will be approximately 80 m high. Lighting on the infrastructure will be shielded to minimize attraction by birds that fly overhead. Lighting at the berth will be similar to street lighting and will also be shielded as safety and navigation requirements permit. Given the relative position of the Project in regards to the landscape it is not expected that there will be a high collision risk between Avifauna and Project infrastructure. Baseline data indicates that most birds flying through the area remain within the forest cover or are traveling just above the water surface, close to foraging and loafing areas. Furthermore the relative abundance of birds moving through the sheltered waters of the Project area is low compared to bird movements on the outer coast.

Direct mortality effect for land birds, for all phases, is expected to be low in magnitude, with a local spatial scale and sporadic frequency. Population-level effects will likely be low given the nature of predicted project effects and that very few species at risk (five Marbled Murrelets) have been documented in the LSA.

6.6.6 Follow-Up and Monitoring

Monitoring activities will occur throughout the construction phase of the Project, as the majority of Project-related activities that have the potential to interact with birds occur during this phase. A qualified Environmental Monitor will oversee general construction and any other activities for the Terminal, the rail, and the wye that could be disruptive to birds or their habitat. The Environmental Monitor will ensure that mitigative measures to minimize such disruptions are adhered to as per the EMP.

As part of the commitment to the Canadian Wildlife Service, avifauna surveys will be repeated following construction of the terminal to confirm predicted effects and apply further mitigations, if necessary.

6.6.7 Government, Public and Aboriginal Comments and Proponent's Response

The Canadian Wildlife Service provided comments on avifauna data. The Canadian Wildlife Service was concerned with the volume of data on which the assessment was based, and felt that the data used was not sufficient to support the conclusions of the assessment. The Proponents worked with the Canadian Wildlife Service to undertake additional surveys, which included raptor surveys and 12 months of marine bird surveys. The intent of these surveys was to further supplement the historical data and recent field surveys, and to verify that the information presented in the EIS was accurate.

The full list of comments, concerns and recommendations from provincial governments, federal authorities and public and Aboriginal consultations is included in the following two IR documents:

- Environmental Impact Statement Information Request Document (PRPA and CN 2011b)
- Mitigation Strategy Report Information Request Document, November 2011 (PRPA and CN 2011c)

These IR documents include the dissenting perspectives, Proponent responses, and commitments. Table 9-1 of this CSR also provides a detailed list of all of the Proponent commitments.

6.6.8 Conclusions on Significance of Effects

During this comprehensive study, the RAs have considered those documents listed in Section 6.6. Assessment and significance conclusions were based on the criteria defined in Table A-2, in Appendix A. Based on the information summarized in this CSR and provided that the Proponents implement the mitigative actions as described, the Project will not likely result in significant adverse environmental effects to Avifauna.

6.7 Freshwater Environment

This section provides an overview of key aspects of the Freshwater Environment in the study area as well as a summary of potential Project-related environmental effects, proposed mitigation, monitoring and follow-up measures. Additional detail with respect to the freshwater environment is provided in the Proponents' EIS and associated TDR (EIS Vol. 1 [Section 12] and Vol. 2 [Freshwater Environment TDR] [PRPA, CN 2009]) and MSR (Section 3.6; PRPA, CN 2011).

Freshwater Environment was selected as a VEC because of the:

- Ecological, aesthetic, and recreational importance of the freshwater environment to the public and Aboriginal Groups
- Direct interaction of the Project with freshwater streams and ponds, some of which support fish
- Potential for significant environmental effects on the freshwater environment as a result of accidents and malfunctions
- Federal (*Fisheries Act*) regulations and federal and provincial policies that offer various levels of protection to fish and fish habitat

Fish and fish habitat is the focus of the Freshwater Environment VEC given that:

- The Project footprint overlaps with waterbodies that support fish
- Proposed Project activities (e.g., stream diversions, culvert extensions) have the potential to cause adverse effects to fish and fish habitat
- Potential adverse effects on fish and fish habitat are a concern to both the public and regulators

Loss or alteration of fish habitat could reduce the capacity of fish populations to support Aboriginal, recreational, and commercial fisheries. Governance of Canadian fisheries resources, including the protection of fish and fish habitat, are regulated by the *Fisheries Act.*

Marine resources are discussed in Section 6.8. Fisheries resources as they pertain to Current Traditional Use by Aboriginal persons are discussed in Section 6.12. Accidents and malfunctions as they pertain to the freshwater environment are discussed in Section 6.16.

6.7.1 Study Area

For the purposes of the environmental effects assessment, the Freshwater Environment LSA includes the watersheds of the streams, ponds and wetlands within or immediately adjacent to the footprint of the Terminal expansion and CN sidings and wye. The full watersheds of the affected freshwater habitats are included in this LSA (including for the purposes of cumulative effects assessment); a separate RSA is therefore not required.

6.7.2 Existing Environment

The Freshwater Environment VEC focused on fish and fish habitat. The field program was based on the 2009 Project design, and assessed fish habitat (biophysical and chemical characteristics) and existing culvert conditions at watercourses within the LSA.

Field assessments identified 27 watercourses, six ponds and 31 culverts (EIS Vol. II Freshwater TDR, Figure 1) that may be affected by the Project; however, all but eight of the watercourses are small, with observed average channel widths of less than 1.5 m. The largest watercourse is Casey Creek, with an observed mean bankfull width of 5.5 m.

Fish were captured in five of the 27 potentially affected watercourses (Watercourses 2, 4, 5, 22 and 25) and three of the six potentially affected ponds (Ponds 4, 5 and 6). A sixth watercourse (unsampled Watercourse 26) is assumed to be fish bearing based on a literature review. The fish captured were sculpin (general), prickly sculpin (*Cottus asper*), tidepool sculpin (*Oligocottus maculosus*), threespine stickleback (*Gasterosteus aculeatus*), yellow perch (*Perca flavescens*), Dolly Varden (*Salvelinus malma*), coho salmon (*Oncorhynchus kisutch*) and coastal cutthroat trout (*Oncorhynchus clarki clarki*). Further information on methods used to determine fish absence or presence is provided in the EIS (Vol. II Freshwater TDR).

While no fish on Schedules 1 or 2 of the SARA or the BCCDC red list were captured, BCCDC blue-listed (Special Concern) Dolly Varden and coastal cutthroat trout were captured in Watercourses 4 and 25, respectively. The observed range of water temperatures for Watercourses (6.9 to 15.6°C) was largely below the provincially recommended maximum temperature for streams with Dolly Varden (15°C). The majority of watercourses had pH values below the range recommended by provincial and federal guidelines for the protection of aquatic life (pH 6.5 to 9.0 guideline), including all the streams and ponds in which fish were captured.

Casey Creek (Watercourse 5) and Watercourses 4, 18, 22 and 25 were assessed as having good overall habitat quality (spawning, rearing, overwintering, migration and holding), but of those, only Watercourses 4, 5, 22 and 25 support fish . The remaining known fish-bearing watercourses (Watercourses 2 and 26) were rated as having poor to moderate overall habitat quality.

With the exception of four Watercourses (23, 24, 25 and 26), which drain to a brackish wetland near the grain terminal on Ridley Island, all ponds and watercourses discharge to the marine environment through culverts under the CN line (some of the watercourses are drained by more than one culvert). Fifteen of these culverts are perched; however, natural barriers to upstream fish migration (e.g., falls, cascades or subsurface flow) exist on 19 of the 26 surveyed watercourses and on three of the six ponds (as discussed above, one Watercourse, 26, was not sampled).

With the current Project design (MSR) alteration to the Freshwater Environment will be greatly reduced from that estimated in 2009. Currently, one fish-bearing watercourse will be lost due to Terminal construction (Watercourse 2), while one fish-bearing pond (Pond 4) and one watercourse (Watercourse 22) will be marginally impacted by the CN siding and wye construction. Construction of the sidings and road will still result in the extension (shoreward) of many of the existing culverts beneath the CN mainline.

6.7.3 Potential Project Effects

During the EA process, the Proponents, the public, WG members, Aboriginal Groups, and federal agencies identified the following potential environmental effects and key issues concerning potential environmental effects of the Project on the Freshwater Environment:

- The introduction of deleterious substances
- Changes in habitat quantity and quality
- Changes in fish mortality

These potential effects are outlined below.

6.7.3.1 Introduction of Deleterious Substances

The introduction of deleterious substances to fish habitat, which is prohibited under Section 36 of the *Fisheries Act,* has the potential to occur during all phases of the Project. The primary potential source of deleterious substances from the Project is accidental spills of hazardous materials and erosion and suspension of sediment as a result of land clearing and earth works. Wastewaters from onsite concrete production also have potential to harm aquatic life.

Specific Project activities that may result in sedimentation of waterbodies include clearing, grubbing and grading, stream diversions, and culvert extensions. Increased sediment levels in streams can adversely affect fish health by a number of pathways, including:

- Reduction of water clarity which in turn reduces feeding success
- Abrasion of gills by suspended sediments
- Settling of sediments which can smother incubating eggs

Concrete will be used extensively during construction of the Terminal (i.e., caissons, retaining walls, foundations, curbs). Concrete typically cures in 72 hours. Uncured concrete and concrete wastewaters (i.e., washwater from concrete trucks and runoff that has contacted uncured concrete) have a high pH due to the lime content in cement. Elevated pH can adversely affect fish health by damaging gills, eyes and skin, and reducing their ability to metabolize wastes. Untreated concrete wastewater also has the potential to increase turbidity levels in streams due to the fine sand and lime particles that become suspended.

During operations, the potential for introduction of suspended sediments will be limited to relatively small maintenance works (i.e., culvert maintenance).

6.7.3.2 Change in Habitat Quantity and Quality

The harmful alteration, disruption, or destruction (HADD) of fish habitat is prohibited under Section 35(1) of the *Fisheries Act* unless authorized by the Minister. Construction of the terminal and addition of the sidings and wye will affect the quality and availability of freshwater habitats. Effects have been considered for fish-bearing streams, and it is anticipated that any changes to these fish-bearing streams will be considered alteration or destruction of fish habitat.

During the 2007 field assessments, five streams and three ponds within the LSA were found to be fish-bearing. In addition, one unsampled stream was assumed to be fish-bearing. The construction phase poses the greatest opportunity for adverse environmental effects to aquatic and riparian habitat. For the purposes of this CSR, affected riparian habitat is defined as vegetation lost or altered within 30 m of fish-bearing freshwater habitats. The loss or alteration of riparian habitat is important from a fish habitat perspective as fish can be adversely affected by riparian habitat loss due to a reduction in available cover from predators, a reduction in temperature regulating shade, a reduction in nutrient inputs, from insect and litter drop, the destabilization of stream banks, and an increase in erosion and the potential introduction of suspended sediments into aquatic habitat. The introduction of suspended sediments could modify the availability and suitability of habitat by altering watercourse morphology. This in turn may affect the benthic community and developing fish embryos, as well as potentially reducing the amount of available habitat for juvenile and overwintering fish and other organisms.

With the current Project design (2011 mitigative re-design) one fish-bearing watercourse will be lost due to Terminal construction (Watercourse 2), while one fish-bearing pond (Pond 4) and one watercourse (Watercourse 22) will be marginally impacted by the CN siding and wye construction. Construction of these components results in a total loss of fish-bearing freshwater aquatic habitat of 0.23 ha. In addition to these fish-bearing freshwater aquatic habitat losses, 1.55 ha of riparian habitat will be lost due to Project construction.

6.7.3.3 Fish Mortality

Section 32 of the *Fisheries Act* prohibits the destruction of fish by means other than fishing (unless authorized by the Minister). Under the *Fisheries Act* adult and juvenile fish, embryos, and eggs are all protected. Although Section 32 of the *Act* applies to all fish species, the mortality of individuals of a managed stock (i.e., a stock that has a fishery) or species of conservation concern are of primary concern.

There is the opportunity for fish mortalities to occur during each phase of the Project. During aquatic work programs there is the opportunity for a number of events to occur that could cause mortalities including:

- Disturbance or exposure of developing embryos
- Physical trauma caused by equipment working in streams or ponds
- Introduction of deleterious substances to streams
- Exposure to high levels of sediment (due to erosion or suspension of sediments by equipment)
- Stranding of fish during stream diversions and/or during dewatering prior to fish salvage
- Incidental entrainment of fish in pumps or impingement on pump intake screens
- Damage to swim bladders by the use of explosives (blasting) in or near water

The EA for the Project focused on the losses of managed stocks or fish species of special conservation concern where mortalities may have an adverse effect on local population.

6.7.4 Mitigation

The Proponents will implement the following mitigation measures to reduce or eliminate Project residual effects to the Freshwater Environment:

- Implement standard BMPs for sediment and erosion control and concrete management, including those presented in:
    - Land Development Guidelines for the Protection of Aquatic Habitat (Chilibeck et al. 1992)
    - Standards and Best Practices for Instream Works (MWLAP 2004)
    - Fish-stream Crossing Guidebook (MOF 2002)
    - Ready Mix Concrete Industry Environmental Code of Practice (FRAP 1993)
- Limit clearing to areas specified by the engineering designs
- Work that will disturb soils will be stopped during periods of high precipitation if it is likely to lead to sediment deposition into streams
- No temporary work spaces will be located within 30 m of the top-of-bank of streams unless sediment control measures are in place
- Stream diversions and culvert extension/replacement will be conducted in isolation of stream flows, and fish salvages will be completed prior to dewatering
- Where works require isolation of stream flows, measures will be taken to ensure that adequate flow to the downstream is maintained
- Pump intakes in fish-bearing waters will be screened in accordance with DFO’s Intake End-of-Pipe Fish Screen Guidelines to prevent fish impingement and entrainment (DFO 1995)
- Soil stockpiles will be located at a minimum of 15 m from top of stream bank and will be isolated with silt fencing and covered if site topography drains towards a stream
- Erosion and sediment control measures (i.e., silt fencing, temporary diversion berms, check dams, straw bales) will be installed and maintained

- Regular monitoring of aquatic turbidity levels and sediment control measures will take place during construction (particularly following major storm events)
- Concrete pours will be protected from rainfall with an impermeable cover for a minimum 48 hours, if ambient air temperature is above 0°C and for a minimum of 72 hours if ambient air temperature is below 0°C
- Aquatic cast-in-place concrete will be isolated from fish-bearing waters until the concrete has properly cured (minimum 48 hours; 72 hours minimum if ambient air temperature is below 0°C)
- Concrete wastewater and wash waters will be contained and treated to a neutral pH level (between pH 6.5 and 9.0) and appropriate turbidity level (less than 25 NTU above background) before being discharged
- All Project-related works will ensure that water quality meets the Canadian Council of Ministers of the Environment (CCME) Water Quality and Sediment Guidelines for the Protection of Aquatic Life
- Wastewater discharges from the terminal will be subject to compliance with the *Fisheries Act, Environmental Management Act*, Petroleum Storage and Distribution Facilities Stormwater Regulation, and the *Special Waste Regulation*
- Work windows will be established in consultation with DFO to determine the best time of year to conduct activities while minimizing impacts on egg incubation, fry emergence, spawning, or large congregations of fish. If preferred work windows are not feasible, additional mitigative steps will be considered in consultation with DFO
- Follow DFO's Guidelines for use of Explosives in Canadian Fishing Waters during blasting design and blasting activities (Wright and Hopky 1998)
- Have spill kits and spill response training for equipment operators to ensure fuel spills, oil leaks, hydraulic line ruptures and similar accidental spills of hazardous or deleterious materials are identified and cleaned up promptly
- Ensure all industrial equipment is clean, in good mechanical shape, and free of leaks

The above mitigation measures will be provided, along with additional detail, in the Project EMP.

In addition to the mitigation measures described above, the Proponents will provide compensation for the habitat losses. Conceptual level habitat compensation options are currently being developed in consultation with DFO. In brief, the habitat compensation proposal to achieve "no net loss" of the productive capacity of fish habitat includes the following options:

- Construction of a new wall-base groundwater channel approximately 55 km upstream of the Skeena River Estuary near Fairview Crossing, Prince Rupert. The new channel would direct surface flow and groundwater flow through a well-defined channel, connecting to the Khyex River. This channel would provide high quality rearing and overwintering habitat for salmonids.
- Improvements to flow and connectivity in Sacred Tree Creek near the Exchamsiks Backchannel. By removing/replacing/modifying culverts in the area and creating a diversion channel, high quality juvenile rearing and holding/spawning habitat for anadromous salmonids will be created or enhanced.
- Improvement of connectivity in a fish stranding area, referred to as MOT Ditch, located near the Exchamsiks Backchannel, approximately 100 km east of Fairview Crossing, Prince Rupert. These improvements will reduce fish stranding and increase fish habitat utilization by anadromous salmonids, Dolly Varden, rainbow trout, and cutthroat trout.

- The creation and enhancement of access to the Kloiya Dam fishway at the outlet of Taylor Lake, approximately 22 km east of Fairview Crossing, Prince Rupert. The finished channel would provide new spawning/holding/rearing habitat that can be utilized by anadromous salmonids, steelhead, Dolly Varden, rainbow trout, and cutthroat trout.
- The reduction of landfill leachate contamination in Oldfield Creek, approximately 4 km east of Fairview Crossing, Prince Rupert. This option would improve habitat quality for anadromous salmonids, Dolly Varden, rainbow trout, cutthroat trout in Oldfield Creek.
- The restoration of hydraulic action in the Skeena River by placing groynes near the Agate Creek confluence, approximately 56 km upstream of the Skeena River Estuary. Restoration of hydraulic action will create natural instream habitat for anadromous salmonids, eulachon, Dolly Varden, rainbow trout, and cutthroat trout by re-establishing silt deposition and vegetation growth.

CN will commence construction of one siding immediately following completion of the EA and permitting process. CN proposes to construct the second siding and wye when traffic volumes require additional capacity. PRPA and CN will complete the final habitat compensation plan and enter into the authorization process with DFO as soon as there is commercial certainty for the Project. Both PRPA and CN understand that substantial changes in the affected habitats may require additional information or modifications to the HCP. DFO will require assurance of feasibility of the proposed compensation prior to finalizing the HCP.

6.7.5 Residual Effects

Residual effects are those that remain after the implementation of mitigation and compensation measures. The definition of significance applied to this VEC and a summary of the anticipated residual effects are provided in the following sections. The criteria used to predict residual effects and significance are summarized in Table 5-1 and Section 5.6, with additional assessment details provided in the EIS.

6.7.5.1 Residual Effects Rating Criteria

For the Freshwater Environment, a significant residual environmental effect is defined as:

- A change in water quality that would permanently affect the ability of the Freshwater Environment to support fish.
- Mortality of individual fishes of a species at risk (i.e., species listed on SARA or British Columbia's red-list) or mortality of fishes from a secure stock at a level that would influence the BC Ministry of Environment's approach to managing the stock at a regional level.
- A permanent loss or alteration of habitat that is likely to result in a meaningful effect on the productive capacity of the habitat to support fish.

6.7.5.2 Introduction of Deleterious Substances

The implementation of BMPs such as those described above can effectively mitigate the potential adverse environmental effects of sediment and pH. Increases in suspended sediment concentrations are expected to be within the Land Development Guidelines for the Protection of Aquatic Habitat (Chilibeck et al. 1992) recommended concentrations. For concrete wastewater and wash waters, the criteria outlined above (pH 6.5 and 9.0 and turbidity less than 25 NTU above background and/or CCME guidelines) will ensure that concrete leachate does not have negative effects on fish and fish habitat. All Project-related works will ensure that water quality meets the CCME Water Quality and Sediment Guidelines for the Protection of Aquatic Life as mandated by EC. Residual environmental effects resulting from the introduction of deleterious substances are anticipated to be negligible in magnitude and site-specific in geographic extent. The introduction of deleterious substances into the freshwater environment as a result of an accidental spill or malfunction, and management of such an event, is discussed in Section 6.16 of this CSR, Accidents and Malfunctions.

6.7.5.3 Change in Habitat Quantity and Quality

The residual effects of the Project on habitat quality and availability will depend on the compensation option(s) selected, as described above.

Based on the understanding of the habitat effects and the scope of the proposed compensation works, it is anticipated that a HCP can successfully reduce or eliminate adverse effects of the project on freshwater fish and fish habitat. Based on this, residual environmental effects resulting from the introduction of deleterious substances are anticipated to be negligible in magnitude.

6.7.5.4 Fish Mortality

Fish mortalities can be completely eliminated or reduced to very low levels through diligent application of the mitigation measures described above (e.g., fish salvage, sediment and erosion control measures, fish screens, etc.). As a result, the predicted residual effects of all Project activities on fish mortality will be negligible and will not be measurable at a population level or extend to other waterbodies.

6.7.6 Follow-Up and Monitoring

PRPA and CN will provide a qualified environmental professional to monitor and report on Project-related activities during construction, as necessary. The environmental monitor will be familiar with all relevant provincial and federal acts and regulations pertaining to aquatic construction activities and related to fish and fish habitat protection, as well as emergency contact numbers.

Monitoring and reporting activities are required in order to demonstrate construction-related compliance with the Section 35(2) *Fisheries Act* authorization. The environmental monitor's scope of work will involve working with construction crews to ensure that all environmental protection measures are correctly implemented, and recording and reporting on works in and about a stream to ensure that environmental protection measures described in the EMP and this EA are adhered to.

A multi-year monitoring program will also be required to determine the success of the habitat compensation program. The scope and extent of the monitoring program will be described in the Section 35(2) *Fisheries Act* application, and will include methodology, inspection frequency and reporting deliverables.

6.7.7 Government, Public and Aboriginal Comments and Proponent's Response

The primary comment received from all parties with respect to the freshwater environment was regarding the impacts to Casey Creek as described in the 2009 EIS. Given the level of concern, the Proponents re-designed the terminal layout so that the southern extent of the expansion does not extend as far as Casey Creek. It has been recognized that the current culverts beneath the CN mainline do not adequately allow for fish passage. As part of the construction associated with the sidings and Port-dedicated road to Ridley Island, new culverts will be constructed that will allow fish passage between the marine environment and the freshwater environment of Casey Creek.

The full list of comments, concerns and recommendations from provincial governments, federal authorities and public and Aboriginal consultations is included in the following two IR documents:

- Environmental Impact Statement Information Request Document (PRPA and CN 2011b)

- Mitigation Strategy Report Information Request Document, November 2011 (PRPA and CN 2011c)

These IR documents include the dissenting perspectives, Proponent responses, and commitments. Table 9-1 of this CSR also provides a detailed list of all of the Proponent commitments.

6.7.8 Conclusion on Significance of Effects

During this comprehensive study, the RAs have considered those documents listed in Section 6.7. Assessment and significance conclusions were based on the criteria defined in Table A-2, in Appendix A.

Based on the information summarized in this CSR, and with the implementation of proven mitigation and habitat compensation measures, the Project is not likely to result in significant adverse environmental effects on the Freshwater Environment.

6.8 Marine Environment

This section provides an overview of key aspects of the Marine Environment in the study areas as well as a summary of potential Project-related environmental effects, proposed mitigation, monitoring and follow-up measures. Additional detail with respect to the Marine Environment is provided in the Proponents' EIS and associated TDR (EIS Vol. 1 [Section 13]; Vol. 2 [Marine Resources TDR] [PRPA, CN 2009]) and MSR (Section 3.7 and Marine Environment TDR Amendment; PRPA, CN 2011).

Marine Environment is defined as all life stages of fish and the habitat necessary to support marine life at the Project site. As defined under the *Fisheries Act*, fish include all life stages of fish, shellfish, crustaceans and marine mammals. Fish habitat is defined as "spawning grounds and nursery, rearing, food supply and migration areas on which fish depend directly or indirectly in order to carry out their life processes" (Fisheries and Oceans Canada 1986). This includes the physical (e.g., substrate, water temperature and water depth), biological (e.g., fish, benthic invertebrates, marine vegetation), and chemical (e.g., dissolved oxygen, nutrients) attributes of the Marine Environment that are required by these species.

The Marine Environment was selected as a VEC because of:

- Economic, recreation and cultural importance
- Direct interaction of the construction, operation, and decommissioning of the Project with the Marine Environment
- The potential for significant environmental effects on the Marine Environment as a result of accidents and malfunctions
- The specific regulatory requirements of the *Fisheries Act*

An assessment of potential effects associated with disposal of dredged and terrestrial overburden material at Environment Canada's proposed Brown Passage disposal site was prepared based on the 2009 Project design. Components of the assessment report titled "Assessment of Disposal at Sea Activities for the Fairview Terminal Phase II Expansion, Prince Rupert, British Columbia" (Disposal at Sea Assessment Report; PRPA 2010) was updated in 2011 to account for the substantial reduction in the volume and type of material proposed for ocean disposal with the mitigative re-design. Where appropriate, information from these reports has been included in this Marine Environment VEC section.

6.8.1 Study Area

For the purposes of field sampling and assessing potential effects to the Marine Environment, the study area includes three spatial boundaries: the Project footprint; an LSA; and an RSA. The marine LSA includes the Project footprint plus two buffers. The first buffer is comprised of marine habitat within 200 m of the Project footprint around the Terminal expansion. The second buffer is comprised of the marine habitat within 50 m of the Project footprint around the CN expansion. The marine RSA was chosen based on the biological features of selected wider ranging KIRs (e.g., humpback whales) and on the oceanography of the region. Specific features in the RSA include the outflow of the Skeena River and the brackish water of Chatham Sound, the exposed shoreline of Digby Island, and the more protected waters of Tuck Inlet and Porpoise Harbour.

Five field surveys were undertaken between September 2006 and June 2011 to collect biophysical data at or near the proposed Project location, in addition to a desktop literature review on species and habitat within the marine survey area. These surveys included data collection for intertidal species and habitat, intertidal fish, sediment quality, water quality, and subtidal habitat and species distribution.

6.8.2 Existing Environment

In order to assess the potential Project effects on the Marine Environment, eight KIRs were used to represent different groups of species or resources. The following text provides an overview of each of the KIRs and their specific LSA and RSA, if different from the general LSA and RSA described above.

6.8.2.1 Water and Sediment Quality

Water quality is important to all elements of the marine ecosystem, while sediment quality is of particular importance to benthic marine life. Parameters used to assess water quality include turbidity, salinity, temperature, pH, and concentrations of nutrients, metals and hydrocarbons. Parameters used to assess sediment quality include grain size, total organic carbon, and concentrations of hydrocarbons, polychlorinated biphenyls (PCBs), dioxins and furans, and metals.

The water quality at the site indicates typical conditions for nearshore marine habitat at northern latitudes. Levels of turbidity are expected to fluctuate seasonally due to close proximity to the Skeena River outflow. The Project site is partially sheltered from the oceanic influences of Chatham Sound by Digby Island. Grain size analyses and field investigations conducted showed that the beach south of the existing Terminal is composed of rocky outcrops and gravel armoured beaches with interspersed sands and limited sediment sources due to the presence of rocky cliffs adjacent to the site (Westmar Consulting Engineers 2005). Subtidal video survey also showed that the substrate at and around the Project site was composed primarily of cobble with some areas of silt and mud. Oceanographic modeling at the site concluded that the shoreline is fairly stable (Westmar Consulting Engineers 2005; Worley Parsons Westmar 2009).

Over the last 25 years, sediment and water quality in the Prince Rupert area has been affected by the introduction of ballast water from vessels, development and industrial activities such as the Skeena pulp mill on Watson Island, various terminals and port facilities, fish processing facilities, and a log dump. In sediment samples collected between 1988 and 1995 at 20 stations adjacent to the southwest, west and northeast sides of the Fairview Terminal, metal concentrations were compared to sediment quality criteria for typical contaminated sites for marine and estuarine sediments (SedQCTCS; provided under the contaminated sites regulations for British Columbia, schedule 9). These criteria were exceeded for arsenic, copper and zinc, with the highest concentrations being observed in two stations adjacent to the central portion of the Fairview Terminal Phase I (Tera Planning 1991, 1992, 1996). Cadmium levels were high (0.5 to 0.71 mg/kg) at one station and exceeded Environment Canada’s screening limits for disposal at sea (0.6 mg/kg; Tera Planning 1991, 1992, 1996). Metal and polycyclic aromatic hydrocarbon (PAH) concentrations in eight samples collected in 2005 across the Terminal Phase I area had levels of PAH and metals lower than the SedQCTCS criteria in all stations but one, for which the lead concentration (274 mg/kg) was more than twice the criterion (130 mg/kg; Keystone Environmental Ltd. 2005).

Material to be disposed of at sea (2011 mitigative redesign) consists of 180,000 m^3 of subtidal dredged material from the proposed southern expansion area. No terrestrial overburden material will be disposed of at sea. Screening criteria for contaminants, as described within CEPA, must be met in order for a Disposal at Sea permit to be issued. The following sections describe the existing environment as it pertains to disposal at sea.

Marine Dredging Material

Stantec conducted sediment sampling in 2007 (May, June, and October) and 2011 (June) within the LSA, in support of the anticipated Disposal at Sea permit. The samples collected in 2007 are from the area proposed for dredging and disposal at sea and results of the laboratory analyses are summarized in Table 6-5.

Sediment consisted predominantly of sand (range 45 to 95 percent, average 70 percent of sediment samples composition), while silt and clay content varied from 1 to 22 percent and from 4 to 35 percent, respectively. Contaminant levels of cadmium, mercury, PAHs, and PCBs were below disposal at sea regulated levels. Chlorophenol levels were below analytical detection limits and dioxin and furan levels were slightly above the CCME Interim Sediment Quality Guideline (ISQG), but below the probable effects level (PEL).

Table 6-5 Contaminant Levels in Sediment to be Dredged and Disposed of at Sea

Parameter	Disposal at Sea Regulated Levels[3]	Description
Cadmium	0.6 mg/kg	All samples below regulated levels, maximum = 0.2 mg/kg
Mercury	0.75 mg/kg	All samples below regulated levels, maximum = 0.094 mg/kg
PAH	2.5 mg/kg total PAH	All samples below regulated levels, 16 of 23 samples below detection limit (0.2 mg/kg). Maximum = 2.27 mg/kg Sample from Station 17 had total PAH of 3.87 mg/kg in June 2007 and 0.234 mg/kg in October when sampled again
PCB	0.1 mg/kg total PCB	All samples below regulated levels and below detection level of 0.05 mg/kg
Chlorophenol	n/a	All samples below detection level of 0.02 mg/kg
Dioxins and furans	n/a	Two of three samples had levels slightly higher than the CCME ISQG of 0.85 ng TEQ/kg but well below the PEL (21.5 TEQ/kg)

In addition to the disposal at sea screening criteria, comparisons were also made to sediment quality guidelines for Canada (CCME 2007). The ISQG is the level below which adverse effects on marine organisms are not expected. The PEL is the level above which adverse effects are expected to be frequently observed. The following results were found:

- Levels of eight individual PAH compounds were higher than the ISQG in the June 2007 sample collected from Station 17, and were lower in the October 2007 sample.
- Levels of dioxins and furans, measured as Toxic Equivalent (TEQ) for all measured congeners, were 0.285, 1.04 and 1.19 for the three samples analyzed; two of the three samples had levels slightly higher than the CCME ISQG of 0.85 ng TEQ/kg but well below the PEL (21.5 TEQ/kg).
- Concentrations of arsenic exceeded the ISQG of 7.24 mg/kg in 12 samples; however, all concentrations were well below the PEL (41.6 mg/kg).

[3] Contaminant levels from National Action List, in the *Disposal at Sea Regulations*, pursuant to subsection 135(1) of the Canadian *Environmental Protection Act,* 1999

- Copper concentrations exceeded the ISQG (18.7 mg/kg) in 20 samples, but did not exceed the PEL (108 mg/kg).

The full assessment of disposal at sea options is provided in the Disposal At Sea Assessment Report (Stantec 2010). PRPA is committed to undertaking further sampling in support of the application for a Disposal at Sea permit. Requirements for additional sampling of the marine dredging area, in support of the Disposal at Sea permit, will be reviewed with EC. A Disposal at Sea permit is not anticipated to be required prior to 2016, as the southern terminal expansion will be built as part of Stage 2 of the Project development.

6.8.2.2 Marine Riparian Habitat

Marine riparian systems constitute the interface between terrestrial and aquatic ecosystems (Brennan and Culverwell 2004). These systems are areas on land that border tidewater, and may include vegetated or non-vegetated areas shoreward of the higher high water, large tide (annual average of the highest high tides). The marine riparian environment is considered to play an important role in fish health and habitat as a feeding and spawning location. Riparian vegetation provides slope stability; minimizes soil erosion; restricts and filters freshwater runoff into the nearshore marine ecosystem; stabilizes shorelines; provides spawning and incubation habitat; provides shade; and provides a food source for fish (Broadhurst 1998).

The Terminal and the CN sidings and wye will occupy an area that supports approximately 5.96 ha of marine riparian habitat, the majority of which is modified or maintained by CN according to the *Railway Safety Act*, enforced by Transport Canada. This marine riparian habitat will be cleared as a result of the Project.

6.8.2.3 Marine Benthos

The benthic community is composed of animals that live in (infaunal) and on (epibenthic) the ocean floor, such as worms, clams, crabs, and shrimp. The depth and composition of benthic sediments have a strong influence on benthic assemblages. Benthic infauna are indicators of habitat quality as their habitat exposes them to many anthropogenic influences; for example, contaminants that accumulate in the sediment. The benthic community plays an important role in the functioning of nearshore systems. Filter feeders remove sediments and nutrients from the water column and deposit feeders remove organic matter from the sediments on the ocean floor. Both of these functions are critical in nutrient cycling and carbon cycling systems and are vital for sustaining high primary production rates of nearshore environments. Marine benthos considers both intertidal and subtidal habitats.

Subtidal video surveys, intertidal surveys, and benthic sampling surveys were completed in 2007 and 2011 by Stantec to classify the nearshore habitats within the proposed Terminal footprint. The results from these surveys showed that infaunal benthic species richness in the LSA is high, ranging from 97 to 152 species, with a combined diversity of 400 species. The surveys revealed a relatively uniform habitat consisting primarily of sediment substrates with a veneer of cobbles. A small stretch of soft bottom habitat was recorded near the shoreline. A fringe of large kelps (*Nereocystis leutkana*) was recorded along the shoreline of the LSA. Additionally, small patches of eelgrass (*Zostera marina*) where found in the high subtidal and low intertidal areas of the shoreline. These vegetated areas represent areas of higher benthic diversity, relative to the entire site. Subtidal surveys in 2007 using a towed underwater camera did not indicate the presence of unique fish habitat in the LSA. There is a small area of sand habitat (0.41 ha) at the southern end of the LSA that could be considered a higher value marine benthic habitat when compared to the rest of the LSA. These soft bottom areas often provide important habitat for many species such as Dungeness crab (*Cancer magister*), groundfish, clams, shrimp, and numerous other invertebrates that are important ecologically, economically, and culturally in the Prince Rupert area. However, the subtidal survey revealed that this particular sandy area has low diversity of epibenthic species, with a limited number of these being commercially important species.

Important marine benthos in the general area of the proposed Brown Passage disposal site include Dungeness crab, tanner crab, and shrimp; however, important habitat areas identified for these species do not appear to overlap with the proposed Brown Passage disposal site. Although the proposed disposal site is located adjacent to the boundary for important Dungeness crab habitat, the disposal site itself (at 200 m depth) is unlikely to be used extensively by Dungeness crab, as this species ranges to depths of 180 m and is typically found at depths shallower than 50 m (Stantec 2010).

6.8.2.4 Eelgrass

Native eelgrass meadows provide key habitat for numerous ecologically and commercially important species, including outmigrating juvenile salmon (*Oncorhynchus* spp.), Pacific herring (*Clupea harengus*), Dungeness crab (*Cancer magister*), Great Blue Heron (*Ardea herodias*), and Black Brant (*Branta bernicla*) (Phillips 1984; Simenstad 1994; Wilson and Atkinson 1995). Eelgrass meadows form the basis of many food webs and provide an important food source for juvenile and migrating fishes; they are generally described as one of the richest and most productive ecosystems in the world (Phillips 1984). Although eelgrass is common in coastal waters of British Columbia, eelgrass populations worldwide are in decline due to the loss and alteration of estuarine habitats.

The spatial distribution of eelgrass in coastal ecosystems is due to a combination of biotic and abiotic factors, such as desiccation, temperature, salinity and water motion (Phillips 1984). Eelgrass occurs in both intertidal and subtidal areas in British Columbia, typically on both muddy and sandy substrates, in water depths between -2 and -5 m (chart datum). Based on an aerial photograph review and field studies conducted by Stantec, several small intertidal eelgrass beds are present within the LSA. These beds are mostly found within the lower to mid intertidal zone in depths of 0 to +2 m chart datum (up to +4 m) where finer sediments have accumulated among coarser mixed substrate. Ten eelgrass beds were mapped within the LSA. Three of these beds are within the Project footprint. Another large eelgrass area at Barrett Rocks is located adjacent to the southern portion of the CN expansion footprint near the junction of Kaien and Ridley Islands but is not located within the LSA, and will not be affected by construction of the sidings or the Port-dedicated road.

6.8.2.5 Bull Kelp

Kelps are the main primary producers in rocky marine habitats and influence nearshore habitats through: the provision of complex habitat; the modification of hydrodynamic regimes; and the enhancement of secondary productivity. They form important habitat that supports commercial and sport fish such as salmon, rockfish and lingcod, invertebrates, marine mammals and marine birds (Berry et al. 2001). Bull kelp (*Nereocystis luetkeana*) is also harvested for various purposes, including Aboriginal traditional harvest, and commercial harvest to supply the demand for abalone mariculture and human consumption (Springer et al. 2007). In British Columbia, the total standing stock of giant kelp (*Macrocystis spp.*) and bull kelp is estimated to be nearly one million tonnes (Malloch 2000). Bull kelp estimates in the early 1980s were of 500,000 tonnes distributed over 11,600 ha of nearshore habitat along 597 km of coastline (Foreman 1984). The distribution and abundance of kelp species is generally determined by light, temperature, nutrients, substrate type, wave action, inter- and intra-specific competition, and herbivory (Hurd 2000; Springer et al. 2007). Many natural and anthropogenic factors can also influence the extent and composition of kelp beds. Removal of local beds for development may affect the persistence of kelp bed habitat within an area, though local recruitment could be subsidized by input of spores from other populations (Springer et al. 2007).

Based on the Prince Rupert Harbour Foreshore Habitat Classification, kelp and submerged brown vegetation (usually bull kelp) cover an area of approximately 3 ha, representing 0.3 percent of all vegetation cover in areas assessed around Prince Rupert (Archipelago Marine Research Ltd. 1999). Additional mapping of bull kelp distribution within the LSA was done through intertidal and subtidal surveys and indicated two discrete beds in the Project footprint, totaling an area of approximately 0.22 ha.

The presence of kelp is associated with rockier areas along the shoreline with breaks where finer sediments tend to accumulate.

6.8.2.6 Pacific Salmon

Six salmonid species are common in the Prince Rupert area: Sockeye (*Oncorhynchus nerka*), Chum (*O. keta*), Coho (*O. kisutch*), Chinook (*O. tshawytscha*), Pink (*O. gorbuscha*) and Steelhead (*O. mykiss*). Salmon have long played a pivotal role in the fabric of Pacific Coast life, both culturally as a key food source for Aboriginals and economically with a number of commercial, recreational, and indigenous fisheries in the region (DFO 2008). In addition to providing economic and social value to fishers, salmonids act as a keystone food resource for terrestrial vertebrate predators and scavengers, thereby acting as a critical link between terrestrial and aquatic systems (Willson and Halupka 1995).

Adult salmon range throughout offshore marine habitat, returning to their natal freshwater streams to spawn at the age of two to four years. There are no major salmon runs within the LSA. However, the Skeena River and its tributaries to the south of Kaien Island hold the largest number of Chinook stocks on the North Coast (Fisheries and Oceans Canada 2001). According to DFO's 2011–2012 Integrated Fisheries Management Plan (IFMP) for Northern British Columbia salmon (DFO 2011), the Skeena River contains stocks of all anadromous salmonid species found in the area. Measures have been implemented in the Skeena to reduce impacts on these species. According to the IFMP, the Skeena River is the second largest producer of chinook salmon on the British Columbia coast as well as the second largest producer of sockeye salmon in all of British Columbia (DFO 2011). Skeena chinook stocks have been relatively healthy in recent years, and enhanced stocks of sockeye salmon in the Skeena are considered to be very productive; however, other weaker sockeye stocks are also present during certain periods and there are measures in place to protect them (DFO 2011). The International Union for Conservation of Nature (IUCN) recently placed Sockeye salmon on their Red List of Threatened Species, noting the majority of threatened subpopulations are in British Columbia, where dramatic declines have occurred in stretches of the Skeena River (IUCN 2008, Internet site).

Pink salmon stock returns in the Skeena River in 2011 are expected to be above average. Similarly, upper and middle Skeena coho salmon stocks have increased in abundance over the last decade, but the status of the lower Skeena coho stocks are less certain (IFMP 2011–2012). Chum salmon stocks are the least abundant of all of the salmon species in the Skeena system, and are expected to return below desired levels in 2011.

Adult salmon were not a focus of the EIS since adult salmon mainly migrate through areas south of Digby Island and through Chatham Sound on their way up to the Skeena River, and are consequently not exposed to effects from Project construction works. The assessment focused on aspects of the Project that may affect outmigrating juvenile salmon. Each spring, juvenile salmon migrate from the Skeena River and other smaller systems in the area, seeking food, refuge and shelter along coastal shorelines en route to the open ocean; they are thus expected to be the most common life stage present within the RSA. Major studies of outmigrating juvenile salmon from the Skeena River are highlighted in the EIS, Section 13.3.6. Sampling stations located on the western edge of Ridley Island indicated that some salmon traveled through this area, likely towards Prince Rupert. However, these fish were often on their own or in very small groups suggesting they were not part of the major migration.

6.8.2.7 Halibut

Halibut are a benthic flatfish that spend most of their adult lives in deep water (greater than 100 m), soft sediment habitats. Tagging studies have revealed that mature individuals migrate annually from shallower-water (100–200 m) feeding habitats on the continental shelf to deeper-water (200–400 m) spawning habitats on the continental slope (Loher 2011). This offshore migration takes place between late-August and early-December (Loher 2011). The spawning period for halibut occurs from late October to early March, with most fish spawning between December and February (St. Pierre 1989; Loher 2011). Data compiled by Loher (2011) suggests that less than 10 percent of halibut spawn before December 1 and that over 90 percent of halibut have completed spawning by March 1.

Halibut eggs are generally found in deep water (100–200 m) along the outer edge of spawning banks (St. Pierre 1984, 1989). After two to three weeks, the eggs hatch into pelagic larvae that are between 8 and 15 mm in overall length (St. Pierre 1989). As the larvae age they rise into faster-moving surface currents and are carried inshore. By the age of three to five months, all halibut larvae are found at depths of 180 m or less (St. Pierre 1989). After six to seven months (May to June) the larvae have developed into young halibut and take up residence in shallow water benthic habitats (St. Pierre 1989).

Maturity of halibut varies with sex, age and size of the fish. In British Columbia, male halibut begin to reach sexual maturity at age five and females at age seven (St. Pierre 1984). However, the average age at which 50 percent of fish are sexually mature is 12 for both males and females (St. Pierre 1984). Halibut are iteroparous, meaning they are capable of spawning multiple times after reaching maturity. Fecundity ranges from about 100,000 to 4,000,000 eggs and is positively correlated with size (Schmitt and Skud 1978).

6.8.2.8 Humpback Whale (*Mysticetes*)

The North Pacific humpback whale population is listed as threatened under Schedule 1 of SARA. The 2011 COSEWIC status report recommends down-listing to special concern (COSEWIC 2011). It is also listed on the province of British Columbia's Blue List (Environment Canada 2010a). To date, a formal Recovery Strategy under SARA has not been released for North Pacific humpback whales; however, a Draft Recovery Strategy was made available for public comment between April 23 and May 24, 2010 (DFO 2010a, Internet site). This draft version identified four critical habitat areas for humpback whales in British Columbia, but noted that this was only a partial list and that there was insufficient information at present to "delineate other critical habitat features, apart from 'adequate density of important prey species'" (DFO 2010b). None of the four areas identified (i.e., southeast Moresby Island, Langara Island, southwest Vancouver Island, and Gil Island) overlap with the Fairview study area. Areas were identified based on humpback whale information analyzed (Nichol *et al.* 2009), and peer-reviewed science advice (DFO 2009). Activities identified in the Draft Recovery Strategy as likely to destroy critical habitat included fishing, vessel traffic, oil spills, and underwater noise affecting foraging or displacing whales (DFO 2010b).

Humpback whales are a principally migratory species, moving between low-latitude wintering areas (e.g., Hawaii, Mexico, and Asia) and high-latitude summer feeding grounds (e.g., British Columbia Alaska, Russia). They are generally found in coastal habitats, although recent acoustic evidence suggests that they may also travel offshore (Baird 2003a). The geographic distribution and population structure of humpback whales have been derived from historic whaling data, distributions of photo-identified whales, genetic studies, regional song patterns, and fluke coloration patterns (see, for example, Baker et al. 1986; Calambokidis et al. 1997; Gregr et al. 2000; Calambokidis et al. 2001; Calambokidis et al. 2008). Historical whaling records from British Columbia suggest that a sub-population of North Pacific humpback whales occurred year-round on the northern British Columbia coast. This subpopulation was allegedly extirpated in the early years of commercial whaling (Gregr et al. 2000).

Based on the general migration pattern of North Pacific humpback whales, this species is most likely to occur within the RSA during the summer and fall, although individuals may be present year round (Calambokidis et al. 2001; Calambokidis et al. 2008; Baird 2003a; Ford et al. 2009). During summer and fall, the principal activity of humpback whales is feeding. In personal communications with Doug Davis, an owner and operator of a local ecotourism company (Prince Rupert Adventure Tours), Mr. Davis stated that humpback whales are common within Chatham sound year round, where forty or more animals have been observed on a single day (Davis 2006, pers. comm.). Mr. Davis also stated that humpback whales are commonly sighted in the waters between Ridley and Kinahan Islands, possibly due to the presence of large schools of herring in the area. As the proposed Brown Passage disposal site is situated within Chatham Sound, it can be expected that marine mammals would be within the vicinity of the disposal site on occasion.

6.8.2.9 Harbour Porpoise

The harbour porpoise (*Phocoena phocoena*) is a Blue Listed species provincially, and is listed as a species of special concern by COSEWIC and under Schedule 1 of SARA (COSEWIC 2003b; Environment Canada 2010b). Internationally, the harbour porpoise is classified as vulnerable by the IUCN. Harbour porpoises are usually found in small groups of two to five individuals, although lone animals are frequently observed. Some groups have up to 15 members, and good feeding waters can attract anywhere from 50 to several hundred porpoises (Eder 2001). Harbour porpoises typically feed on small schooling fish, such as anchovies, sardines, herring and squid (Eder 2001). Other common prey species include mackerel, pollock, small cod, sole, octopus, and crustaceans.

Harbour porpoises are not known to migrate and can be found year round throughout the coastal shallow waters of harbours, bays, and river mouths in British Columbia (Baird 2003b). In general, they occur in coastal waters no deeper than 200 m, but are thought to prefer shallower waters (Eder 2001). Harbour porpoise densities have been observed to be roughly six times higher in waters less than 100 m than waters between 100 and 200m (Baird 2003b). They are commonly sighted within the RSA, particularly at the southern end of Porpoise Channel (Davis 2006, pers. comm.). Harbour porpoises are also frequently sighted near Kaien Island (Davis 2006, pers. comm.).

6.8.3 Potential Project Effects

During the EA process, the Proponents, the public, WG members, Aboriginal Groups, and federal agencies identified the following potential environmental effects and key issues concerning potential environmental effects of the Project on the Marine Environment:

- Alterations to water and sediment quality;
- Habitat loss or alteration (including loss of 14.5 ha of intertidal habitat and 7.9 ha of subtidal habitat)
- Acoustic disturbance
- Direct mortality or physical injury

These potential effects are outlined below. Potential effects as they pertain to the proposed disposal at sea are also outlined below and discussed in the Disposal at Sea Assessment Report (PRPA 2010).

6.8.3.1 Alterations to Water and Sediment Quality

Terminal construction and operations will involve activities such as dredging, disposal of dredged sediment, infilling, caisson placement, drainage from storm water management on land, and vessel use (barges, tugs). These and other activities during operations and decommissioning may affect physical and chemical parameters of water and sediment quality. Potential alterations may result from increased suspended sediment and the introduction of contaminants. Suspended sediment introduction and resuspension will primarily take place within the Terminal and dredge footprint during site preparation and dredging for the construction phase of the Project. Vessel activity in shallow waters (if required) may also cause some localized sediment resuspension (propeller wash). Resuspension of sediment may increase turbidity in the area and expose marine biota to associated resuspended contaminants and reduced light levels. Some activities during construction and operation of the Terminal (e.g., infilling) may also introduce contaminants such as PAHs (hydrocarbons) and metals into the Marine Environment.

Disposal of material at the proposed Brown Passage site will introduce sediment into the water column, which could reduce the amount of light available for photosynthesis by phytoplankton or introduce irritants to sensitive organisms, potentially leading to a temporary adverse effect on health of aquatic organisms (reducing biological productivity) or human uses (fisheries). Disposal of material at the proposed Brown Passage disposal site has the potential to introduce contaminants to the area.

Accidents and malfunctions also have the potential to affect water and sediment quality, as discussed in Section 6.16.2.

6.8.3.2 Habitat Loss or Alteration

Habitat loss or alteration will result from berth infrastructure construction. Construction activities may result in increased suspended sediment in the water column, resettling of disturbed sediment, and impacts to kelp beds and eelgrass beds. Conceptual modeling indicates that alteration to local hydrodynamics adjacent to the expanded terminal may result in erosion or accretion of the seabed in localized areas around the terminal. Construction and operation vessels have the potential to affect habitat as a result of ballast water introduction at the Terminal. However, current requirements are that vessels entering Prince Rupert Harbour must exchange or treat ballast water at least 200 nautical miles from shore, as per the *Canada Shipping Act, Ballast Water Control and Management Regulations*. The activities described above have the potential to result in the loss or alteration of riparian, intertidal and subtidal habitat. The loss and alteration of habitat may in turn result in the displacement of marine species, localized changes in species composition, a loss of breeding and foraging habitat, and/or a modification of predator-prey interactions. At full Project build-out, marine HADD is estimated to total 353,001 m^2. This includes 169,756 m^2 of HADD resulting from construction of the terminal, and 183,236 m^2 of HADD resulting from construction of the rail sidings and Port-dedicated road. The types and amount of marine HADD have been quantified based on the most recent engineering and design plans, and are considered approximate; additional surveys (e.g., eelgrass, bull kelp) will provide final HADD quantification prior to finalization of the fish HCP.

Disposal of material at the proposed Brown Passage disposal site has the potential to introduce a quantity of sediment that could alter the bathymetry of the site or transport sediment to shallower areas of sensitive habitat. An increase in the thickness of sediment could lead to changes in the bathymetry of the area, transport of sediment outside the disposal area and burial, smothering or crushing of benthic organisms. Such changes could potentially lead to a reduced number of species, density and biomass at the site.

6.8.3.3 Acoustic Disturbance

Acoustic disturbance may result from increased noise levels during construction activities such as dredging, pile construction, vessel activity and the installation of marine and land-based Terminal and rail infrastructure. Potential effects of exposure to elevated sound levels include: permanent threshold shifts; temporary threshold shifts; behavioural avoidance; and auditory masking. Subtidal acoustic disturbance during operations (i.e., from vessels associated with the operation of the Terminal) will be minimal. Effects may result in changes in distribution and behaviour of marine species in the area. Behavioural effects of anthropogenic sounds on cetaceans (e.g., humpback whales, killer whales, and harbour porpoises) are poorly understood; but available literature and threshold values established by the US National Marine Fisheries Service provide some guidance in the assessment and mitigation of effects (Federal Register 2005; Southall et al. 2007.

6.8.3.4 Direct Mortality or Physical Injury

Direct mortality or physical injury may occur during certain construction and operation activities associated with the Project. Direct mortality of marine benthos will occur within the LSA and potentially at the disposal at sea site. As a result of infilling and dredging, there will be a loss of a limited number of benthic species from benthic habitats that are very common in the Port of Prince Rupert. The dredged area is expected to be repopulated by motile invertebrates from adjacent areas immediately after construction is complete, and recruitment of infaunal species into the area will follow shortly thereafter. During the moulting period, crabs are more susceptible to physical damage as they have a soft shell and very limited mobility. Direct mortality of humpback whales may occur as a result of collisions with Project vessels.

6.8.4 Mitigation

The Proponents will implement the following mitigation measures to reduce or eliminate Project residual effects to the Marine Environment:

- *EMP*: this Plan details the protection measures developed by the PRPA for routine activities associated with construction and operations. The EMP lists mitigation and monitoring programs to be implemented in all areas of construction and operations to limit potential impacts. This will include a sediment and erosion control plan, total suspended solids monitoring, the installation of settling ponds, divergent ditches and sediment screens (silt curtains), mitigation techniques to reduce acoustic emissions, sediment chemistry and analysis, and proper maintenance and refuelling methods. All construction activities in water will be conducted using task specific (dredging, densification, pile driving) BMP to reduce sediment disturbances and possible contaminant introduction.
- *Pre-Construction Surveys:* although no suitable Northern abalone (SARA-listed species) habitat is available within the LSA, as a precautionary measure PRPA and CN commit to conducting field surveys for abalone prior to commencement of in-water works associated with terminal construction. The abalone survey will be completed in accordance with the "Impact assessment protocol for works and developments potentially affecting abalone and their habitat". Potential Project-related effects on individuals or aggregations found during the survey will either be mitigated or compensated for.
- The Proponents commit to undertaking pre-construction surveys and mapping of kelp affected or potentially affected by the Project.
- Marine riparian clearing will be kept to the minimum required by rail maintenance regulations.
- All in-water construction activities that have the potential to cause fish mortality will be regulated under Section 32 of the *Fisheries Act*; the proponent will abide by any applicable permit requirements and conditions.
- Marine works will be constructed in the dry, as tides and existing conditions permit (some areas are never dry).
- Conduct a review of SARA-listed species within the Project footprint area prior to Project commencement to assess whether species found in baseline studies have been listed, or re-classified.
- *Compliance with Legislation:* all Project-related works will be conducted in accordance with Section 36(3) of the *Fisheries Act* as well as conditions associated with authorization under Section 35(2).
- *Marine fill:* marine fill material will be free of organics and other deleterious material.
- *Monitoring during Dredging:* monitoring of TSS and turbidity in water will be conducted at and around the dredging location during active dredging. In the event of TSS levels that exceed the allowable maximum, the Environmental Monitor will have the authority to stop work, Work will be

stopped at the dredge location until the problem has been identified and mitigation measures have been adjusted or put in place.

- *Use of proper maintenance and refuelling methods*: maintain construction and operation equipment. Oil and hydraulic fluids will not be changed at the shoreline and absorbent pads will be used to absorb small spills.
- *Proper storage and disposal methods:* storage, handling and use of all hazardous materials will be undertaken in compliance with applicable standards, codes, and regulations. Drainage water will be collected and pass through oil separators.
- *Ballast water management:* container vessels typically do not exchange ballast water; they arrive and depart from Fairview Terminal loaded with cargo, making ballast water exchange unnecessary. Bilge or wastewater discharge facilities are not available in Prince Rupert; therefore there is no disposal of bilge or other wastewaters. PRPA regularly monitors ballast logs of cargo vessels, and randomly inspect seals and/or valves on bilge and grey water holds to ensure that they are in compliance with applicable regulations. Ballast water from incoming ships will be exchanged or treated at sea, at least 200 nautical miles from shore, as per the *Canada Shipping Act, Ballast Water Control and Management Regulations.*
- *Establish work windows to reduce effects on fish, including salmon at all life stages:* work windows will be established in consultation with DFO to determine the best time of year to conduct activities while minimizing impacts on salmon. If preferred work windows are not feasible, additional mitigative steps will be considered in consultation with DFO. Works will be conducted in the dry, as tides permit.
- *Vessel avoidance of shallows:* vessel operators will stay clear of shallow waters where eelgrass and bull kelp is present ("no-go" zones).
- *Bubble curtains:* vibratory pile installation method will be used where technically feasible over impact driving in an effort to reduce marine noise levels. Bubble curtains will be deployed to minimize underwater noise for the duration of any impact pile-driving activity where vibratory pile installation is not feasible.
- *Safety Zone:* the Proponents will ensure that adequate safety radii are established based on the construction activities of the Project. In the event that a marine mammal does come within the safety zone during loud construction activities (primarily impact pile driving), the activity will be halted until the animal moves outside the safety zone.
- *Marine Mammal Observer:* marine mammal observers will be on-site during loud construction activities to monitor the safety zone. The Proponents will ensure that the marine mammal observers' are adequately trained and are committed to their task.
- *Reporting Ship Strikes:* Any vessel strikes that occur, during construction or operation, will be reported to DFO—Pilots will be instructed by PRPA to directly report the ship strike to Marine Communication and Traffic Services in Prince Rupert, on VHF CH 71. Marine Communications and Traffic Services would then fan out the report to agencies, including the PRPA.
- *Reporting Observation*: PRPA will provide to DFO a report of marine mammal species observed during construction monitoring.
- *PRPA Harbour Operations Practices and Procedures*: the existing practices and procedures under which the harbour operates will continue to be implemented:

- “The owner or person in charge of a vessel in the harbour shall ensure that the vessel is not navigated in such a manner or at such a rate of speed so as to endanger or damage…or cause injury or harm to any person or wildlife”.
- “Every vessel shall at all times process at a safe speed so that the vessel can take proper and effective action to avoid collision and be stopped within a distance appropriate to the prevailing circumstances and conditions”.
- Speed limits of 5 knots in place at various locations around the harbour.
- *Mandatory pilotage:* large vessels using the Port are under mandatory pilotage throughout the harbour limits. Fairview-bound container vessels are met by a British Columbia Coast Pilot at the Triple Island Pilot Station, which is located outside of Prince Rupert Port boundaries. Once the pilot is on board, the container vessels travel to south of the Kinahan Islands, at which point they are accompanied by tug to berth at Fairview Terminal, and back.
- *Alerting pilots of whales in the shipping lanes*: pilots are already advised to report whale sightings to Marine Communication and Traffic Services. PRPA will advise Marine Communication and Traffic Services and the British Columbia Coast Pilots of the need for reporting. If a whale or group of whales is known to be present in the shipping lane, Marine Communication and Traffic Services will advise pilots and every precaution will be made to avoid them, assuming this does not put the safety of the vessel at risk. In addition, where practical, PRPA will request float plane operators (via the Harbour Master’s office) to also report whale sightings inside Harbour limits to Marine Communication and Traffic Services. Tug operators will also be looking out for whales, increasing the chance that they may be detected in time to avoid ship strikes.
- *Prince Rupert Port Operations Committee*: this Committee has representation from the following marine operators and stakeholders—Marine Communication and Traffic Services, Coast Guard, Pilots, Pacific Pilotage Authority, Tug operators, ship’s agents, etc.). PRPA will take the opportunity that this Committee brings to advise all parties of the existing reporting procedures that are in place, and the continued need to be vigilant with regard to marine mammal mitigation and reporting.
- *Education Material*: PRPA will develop educational material (i.e., a brochure or poster) that will be distributed to boaters, pilots and tug operators to inform them of the species of whales in the area, their status, the risk of ship strikes and what they can do to help minimize those risks (e.g., reporting the sightings, reducing speeds, and avoiding them where possible).
- *Adaptive Management*: an adaptive management approach will be taken to further reduce risks of ship strikes if a whale is believed to have been struck by a vessel within the Port of Prince Rupert Harbour. PRPA will review the existing information at the time, assess whether further mitigation measures can be implements, and implement them where appropriate.
- *Disposal at Sea Work Window:* disposal at Sea activities will take place between October 1 and November 15, in order to minimize the potential effects to fish and fish habitat, as well as to juvenile and adult salmon, crab molting, and northern resident killer whales. Justification on this window is provided below.

Halibut eggs and larvae are more sensitive than adults to disposal at sea activities. Whereas adult halibut can move away from the disposal area if disturbed, eggs and newly hatched larvae cannot. These life stages are more susceptible to harm from elevated total suspended sediment levels (e.g., larval fish gill damage) and smothering (e.g., egg burial). To minimize potential adverse effects of disposal at sea on halibut eggs and larvae, it is proposed that disposal at Brown Passage take place just prior to halibut spawning. The recommended timing window is October 1 to November 15. This will avoid the peak spawning period that occurs from December to February and the larval development period that may last until June. Disposing of dredgeate during this window has the added benefit of avoiding the period when Chatham Sound is potentially important for northern resident killer whales (May to August when Chinook salmon are present) and the spawning period for eulachon (March to April). By late September, most adult salmon headed for the Skeena and Nass rivers will have completed their migration through Chatham Sound.

Based on the volume of material to be dredged and the distance to Brown Passage, it is estimated that the disposal activity could be completed in as few as 13 days. However, this does not take into account potential delays due to equipment malfunction or inclement weather. If no issues arise, disposal activities will be completed by early October. If delays do occur, the proposed timing window will ensure that disposal activities are still completed in advance of the halibut spawning period.

The Proponents will also provide compensation for the habitat losses. The proposed HCP (Volume 2; PRPA, CN 2009) is intended to ensure that residual effects of the Project on marine fish and fish habitat are reduced or eliminated. Final designs will be developed in consultation with DFO, Aboriginal Groups and experts in marine ecology and habitat design. In brief, the habitat compensation proposal to achieve “no net loss” of the productive capacity of fish habitat includes the following options:

- Eelgrass planting to the south of the terminal site
- Establishment of artificial kelp reefs and kelp transplantation to the south of the terminal site
- Creation of intertidal nursery habitat for juvenile salmon
- Creation of a subtidal rock reef to increase habitat for sessile organisms
- Intertidal shoreline enhancement either by terracing or scalloping to provide increased habitat diversity and complexity, and attachment points for marine macroalgae and invertebrates

Mitigation measures specific to reducing the potential effects of disposal at sea include:

- *Reducing Sediment Volume:* the main mitigation with respect to potential changes to water quality and thickness of sediment accumulation is to reduce the volume of material being disposed. The 2011 mitigative redesign has reduced potential disposal at sea volumes by approximately 87 percent.
- *Dredge Material Disposal Plan:* vessels will adhere to procedures, established shipping routes, proper containment procedures, communications, and schedules as defined in the Disposal Plan. The Dredge Material Disposal Plan will be developed by the PRPA, in consultation with EC (as issuers of the permit under CEPA). The interested Aboriginal Groups will be given the opportunity to provide input to the plan, and will be advised when the PRPA is commencing permitting discussions with EC’s Disposal at Sea group.
- Preliminary surface sediment sampling indicates that material would meet Disposal at Sea criteria, however additional sampling will be completed, in consultation with EC, prior to issuance of a Disposal at Sea permit.

Requirements for additional sampling of the marine dredging area, in support of the Disposal at Sea permit will be reviewed with EC closer to the time at which the permit is required.

All ships must adhere to the rules regarding bilge water as stipulated by the Regulations for the Prevention of Pollution from Ships and for Dangerous Chemicals, made pursuant to *the Canada Shipping Act* (CSA). Sections 28 and 42 of the CSA stipulates that ships wishing to discharge bilge water containing oil or grease must comply with the 5 ppm limit and must have a 5 ppm bilge alarm approved in accordance with Transport Canada standards (TP 12301 E). Transport Canada and PRPA both have a role with respect to enforcement and compliance activities related to the aforementioned regulations.

6.8.5 Residual Effects

6.8.5.1 Residual Effects Rating Criteria

Residual effects are those that remain after the implementation of mitigation and compensation measures. A summary of the anticipated residual effects is provided in the following paragraphs.

For the Marine Environment, a significant residual environmental effect is an effect that leads to the permanent loss of a marine species or habitat within the RSA, which cannot be offset by available mitigation or compensation measures.

6.8.5.2 Alterations to Water and Sediment Quality

Changes in sediment and water quality may occur during construction and occasionally during operations and decommissioning because of sediment being introduced, resuspended or transported within the LSA. However, contaminant levels in the sediment and thus potentially resuspended in water (within the LSA) are all below PEL.

The water quality guidelines (total suspended solids) of an increase of 25 mg/L above background (established by the Ministry of Environment) would not be exceeded at the proposed Brown Passage disposal site, except in deep water (below 140 - 150 m depth), where the activity would be authorized. Levels predicted for surface waters (2 to 3 mg/L above background right after each disposal trip) are not expected to adversely affect primary productivity, reduce the ability of fish to spot prey, or affect commercial fisheries other than for a short period of time if fishing takes place during or shortly after the disposal period. Residual environmental effects resulting from alterations to water and sediment quality are anticipated to be of low magnitude and local in geographic extent.

6.8.5.3 Habitat Loss or Alteration

After mitigation and compensation, the residual effects of Project activities on habitat will be limited to:

- Initial mortality, loss or alteration of habitat for marine riparian, marine benthos, eelgrass and bull kelp due to clearing, dredging, and infilling for the construction of the Terminal
- Minor increases in total suspended solids, and potential alteration of hydrodynamics and sedimentation dispersion

The spatial extent of habitat loss is limited to the LSA and represents a small proportion of similar habitat available in the RSA. The duration of this effect is expected to be short to medium term (less than three years) depending on the habitat compensation options pursued. The effects are mostly offset through habitat compensation. The eelgrass beds that are expected to be lost or altered are small and discontinuous.

Increased sediment thickness at the proposed Brown Passage disposal site would range from 38 to 116 mm. Maximum distance of the bottom deposition (exceeding 1 mm thickness) is about 2.5 km to the southeast. No irreversible or long term effects are predicted for benthic organisms during or following disposal since some invertebrates will be able to migrate up through the sediment as it is deposited and colonization and recovery would occur through vertical and horizontal migration into the area. This recruitment is expected to begin shortly after completion of the dredging and disposal. Effects on benthic organisms outside the disposal area would be negligible.

Based on the understanding of the habitat effects and the scope of the proposed compensation works, it is anticipated that a HCP can successfully reduce or eliminate adverse effects of the project on marine habitat; residual environmental effects resulting from habitat loss or alteration are anticipated to be low to moderate in magnitude, and site-specific to local in geographic extent.

6.8.5.4 Acoustic Disturbance

Acoustic emissions from Project activities are not likely to significantly affect salmon populations within the RSA. Based on the expected source levels of construction, operation, and decommissioning activities, auditory fatigue and physical damage to the auditory system are not likely to occur, nor are changes to regional movement patterns. Salmon will be most sensitive to acoustic disturbance during the construction phase of the Project; however, mitigation measures such as the use of exclusion devices, bubble curtains and appropriate work windows will reduce potential adverse environmental effects. Based on this assessment, potential effects of acoustic emissions on salmon during the construction and decommissioning phases are considered to be low in magnitude and short-term in duration. Potential effects of acoustic emissions on marine fishes during the operation phase are considered to be low in magnitude and long-term.

Sound levels produced by transiting vessels within harbour limits will be within the range currently experienced in the area; however, underwater noise produced by transiting ships will be more frequent. Acoustic emissions from Project activities are not likely to have adverse effects on the health of humpback whales or harbour porpoises, however, it is anticipated that cetaceans could show behavioural disturbance / avoidance up to 4.2 km from a transiting vessel with tug escort. As the zone of behavioural effects is expected to be less than 20 km from the marine Terminal construction site, the area affected is small in comparison to the extent of presumed suitable harbour porpoise and humpback whale habitat in the area. In the event that a humpback whale or harbour porpoise comes within close proximity of a loud construction activity, the proposed mitigation (e.g., safety zones and marine mammal observers) will greatly reduce the likelihood of auditory injury.

While the 2011 Project re-design results in a higher number of vessel calls to the terminal each week, and therefore an increase in the frequency of underwater noise in the RSA, it should not result in changes to the magnitude or geographic extent of potential effects associated with underwater noise. Potential disturbance / avoidance effects are expected to be short in duration and limited to a radius of less than 4.2 km from vessels as they transit through the area. This range is likely very conservative as the models used for this estimate were based on larger vessels escorted by up to three tugs. Potential avoidance of transiting vessels by humpback wales and harbour porpoises would be localized, temporary, and affect only a small proportion of their range and populations, given the small area and duration of ensonification. These conclusions can be extended to killer whales. However, since killer whales are less sensitive to low frequency noise than humpback whales (Southall et al. 2007) possible behavioural avoidance of large vessels is expected to be more limited. Effects of underwater noise on marine mammals in the RSA are expected to be not significant.

6.8.5.5 Direct Mortality or Physical Injury

Direct mortality of marine benthos is confined to the LSA. As a result of infilling and dredging, there will be a loss of a limited number of benthic species from benthic habitats that are very common in the Port of Prince Rupert. The area has no unique or rare species, or any unique features.

The risk of ship strikes is expected to be low given the low abundance of humpback whales within the RSA and the slow speeds at which Project vessels will be operating. A risk assessment for humpback, killer and fin whales suggests that areas at highest risk of ship strikes are found in “bottleneck” areas where both ships and whales are concentrated (e.g., Dixon Entrance, Johnstone Strait; Williams and O’Hara 2010). The Prince Rupert Port area is not currently considered as having high whale-ship interactions for humpback and killer whales relative to other areas in British Columbia.

Recent research shows that vessel speed is positively correlated with the probability of a vessel strike (Kite-Powell et al. 2007; Vanderlaan and Taggart 2007). Mathematical models from current vessel-strike probability research support the reduced probability of a vessel strike with reduced speeds. At a speed of 10 knots, the models predicted a 30 percent chance of vessel strike when the whale is directly in the vessel path (Kite-Powell et al. 2007; Vanderlaan and Taggart 2007). The occurrence and severity of ship strikes has been shown decrease with decreased ship speeds (Laist et al. 2001; Van Waerebeek and Leaper 2008; Vanderlaan and Taggart 2007).Vessels in the RSA that are associated with the Project will be travelling at speeds less than 15 knots and at 5 to 8 knots as they round the Kinahans and line up for the run the channel to Fairview. Average vessel speed during transit within the Port limits is approximately 8 knots. Transit at higher speeds (9 to 15 knots) will be limited in duration to only about 12.5 minutes per transit in open water close to the Harbour limits.

Humpback whales are known to be present within harbour limits and have been reported occasionally feeding south of the Kinahan Islands (e.g., Ford et al. 2009). Therefore, it is possible that avoidance of transiting vessels will occasionally occur when whales are in the area. However, localized displacement of a limited number of humpback whales from the RSA is not likely to compromise the survival or fecundity of affected whales. Harbour porpoises are frequently seen in the area and are known to be sensitive to noise and avoid vessels at distances of up to 800 m (Barlow 1998). However, since local harbour porpoises continue to use the area at current levels of anthropogenic sounds and are often seen in proximity to moving vessels (Stantec pers. obs.) it is likely that they have become habituated to common vessel sounds, thereby limiting avoidance effects. Ships will be transiting at low speeds (~8 knots) and for a relatively small number of hours (~33) each week at full build out.

Residual environmental effects resulting from direct mortality or physical injury are anticipated to be moderate in magnitude, and site-specific in geographic extent. No significant adverse effects are anticipated.

Vessel strikes are also not expected to be an issue for harbour porpoises given the low incidence of vessel strikes with toothed whales and the slow speeds at which Project vessels will be operating.

6.8.6 Follow-Up and Monitoring

Monitoring activities will take place during the construction, operation and decommissioning phases of the Project. Proposed monitoring activities include:

- Marine mammal monitoring by a trained marine mammal observer during loud construction activities (e.g., dredging, piling activities)
- Report any vessel strikes that occur
- Provide a report of marine mammal species observed during construction monitoring
- Water quality monitoring during construction activities for sediment plumes associated with terrestrial run off and dredging
- Survey of adjacent eelgrass beds 1, 2, 3 and 5 years after the commencement of operations
- Habitat compensation effectiveness monitoring

A multi-year monitoring program will also be required to determine the success of the habitat compensation program. The scope and extent of the monitoring program will be described in the Section 35(2) *Fisheries Act* application, and will include methodology, inspection frequency and reporting deliverables.

6.8.7 Government, Public and Aboriginal Comments and Proponent's Response

Some of the key comments received from government, public and aboriginal groups with respect to potential effects on the marine environment included quantification and distribution of eelgrass, disposal at sea of dredged material, the loss and alteration of marine habitat, acoustic disturbance to marine species, and potential effects to the alluvial fan at Casey Creek. Eelgrass distribution will be further quantified in the spring of 2012 as part of the detailed habitat compensation planning process. Disposal at sea volumes have been reduced by 87 percent from what was originally proposed in 2009, resulting in lower levels of sediment deposition, suspended sediment, and the number of vessel trips required to complete the disposal. As described in Section 6.8.4, a work window for disposal at sea activities will be in place in order to minimize disturbance to fish and fish habitat, killer whales, crab, and juvenile and adult salmon. Aboriginal Groups will be given the opportunity to provide input into development of the Dredge Material Disposal Plan, and Environment Canada has committed to considering Brown Passage as a high priority site for follow up monitoring. Habitat loss will be compensated for through the creation of eelgrass beds, kelp reefs, and shallow reefs. The habitat compensation will ensure that there is no net loss of the productive capacity of fish habitat as a result of the Project. Potential effects on marine mammals from acoustic disturbance will be managed through the use of marine mammal observers during phases of construction producing high levels of underwater noise, the establishment of safety zones, and the use of lower-impact construction methods (i.e., vibratory pile driving vs. impact pile driving). The Casey Creek outlet will no longer be diverted as was originally planned in 2009. The existing culvert will be replaced, ensuring improved fish passage. The location of the alluvial fan will not change, but this habitat could be altered by sediment deposition. A monitoring plan for this area will be developed.

The full list of comments, concerns and recommendations from provincial governments, federal authorities and public and Aboriginal consultations is included in the following two IR documents:

- Environmental Impact Statement Information Request Document (PRPA and CN 2011b)
- Mitigation Strategy Report Information Request Document, November 2011 (PRPA and CN 2011c)

These IR documents include the dissenting perspectives, Proponent responses, and commitments. Table 9-1 of this CSR also provides a detailed list of all of the Proponent commitments.

6.8.8 Conclusions on Significance of Effects

During this comprehensive study the RAs have considered those documents listed in Section 6.8, in addition to supporting assessment information requested by DFO (e.g., Supplemental Information on Transiting Vessels within Port of Prince Rupert Harbour Limits, Stantec. April 2012). Assessment and significance conclusions were based on the criteria defined in Table A-2, in Appendix A. Based on the information summarized in this CSR, and provided that the Proponents implement the mitigative actions as described, the Project is not likely to result in significant adverse environmental effects to the Marine Environment. With respect to disposal at sea, Project-related changes would occur primarily in the area designated for disposal at sea, as authorized by EC, and are not predicted to result in increased contaminant levels, interfere with fish habitat (other than short term burial of benthic invertebrates) or fisheries.

6.9 Socio-Economic Conditions

This section provides an overview of key aspects of Socio-Economic Conditions in the study areas as well as a summary of potential Project-related environmental effects, proposed mitigation, monitoring and follow-up measures. Additional detail with respect to Socio-Economic Conditions is provided in the Proponents' EIS and associated TDR (EIS Vol. 1 [Section 14] and Vol. 2 [Socio-Economic Conditions TDR] [PRPA, CN 2009]), and MSR (Section 3.9; PRPA, CN 2011).

The definition of "environmental effect" in CEAA includes any effect of any change that the project may cause in the environment that could result in an effect on health and socio-economic conditions. Socio-economic effects can be demographically-related, economically-related, resource-related, and culturally-related (Canadian Environmental Assessment Research Council 1985). For example, environmental effects can change the quality or quantity of land available for recreational purposes (resource-related) or the economic benefits from the environmental change (e.g., increased staffing requirements) could lead to a change in traditions and values (culturally-related).

Potential Project-related effects that could affect socio-economic conditions are also considered in the following Sections: 6.1 (Air Quality), 6.2 (Noise and Vibration), 6.3 (Light), 6.10 (Human Health and Safety), 6.11 (Archaeology and Heritage Resources), 6.12 (Current Traditional Use by Aboriginal persons), and 6.13 (Country Foods).

6.9.1 Study Area

The spatial boundary considered for the assessment of the Socio-Economic Conditions VEC includes the Project footprint and the LSA. The LSA includes a 200 m buffer around the Terminal area and an approximate 50 m buffer along the length of the CN track. The LSA encompasses forested and shoreline areas. The RSA includes the City of Prince Rupert and the Skeena-Queen Charlotte Regional District.

6.9.2 Existing Environment

The Project site is located over 1 km south of the more populated areas of Prince Rupert, approximately 3 km south of the City centre, and over 4 km south of Cow Bay and the cruise ship district. The proposed Phase II Project site is situated immediately adjacent (north and south) to the existing Fairview Terminal. Other industrial ports are located at Ridley Island and the community of Port Edward, approximately 7 and 8 km, respectively, south of Fairview Terminal. Land within the Project footprint consists of undeveloped crown land, most of which is federal crown land administered by the PRPA. The PRPA, in its Land Use Plan has identified deep-sea terminal and non-deep-sea marine operations as possible future uses of the site. Commercial use, marine industrial use, recreation, and reserve are excluded land uses under the Plan (PRPA 2000).

Based on published reports, Internet sources and field observations, it is apparent that informal recreational land use occurs within the Project footprint (EIS Vol. 2; Socio-economic TDR). It is assumed that individuals using these lands are local residents and primarily youth. Individuals are using the CN right-of-way as a means of walking around the west side of the island and to access the coast and forest. It should be noted, however, that the CN right-of-way is private property, and using the railway as a corridor is highly hazardous and is considered trespassing. Individuals are also gathering at two sites along the CN mainline: the Barrett Point and Fort Casey military structures.

Beyond the Project footprint and within the LSA, informal recreational sites include gathering sites and canoe runs (EIS Vol. 1, Section 14, Figure 14-1). Within the RSA, recreational land use occurs in municipal parks and greenways throughout the City and becomes a blend of some formal recreation and commercial recreation and a large number of opportunities for informal recreation. The closest municipal park/open space is the Thousand Steps Trail, which is situated about 500 m to the east of the existing terminal. The Thousand Steps Trail has been identified as an important green space and the City is encouraging community service group involvement for the restoration of the trail (City of Prince Rupert 2007). The City also intends to create a universally-accessible trail network that would circumnavigate Kaien Island (City of Prince Rupert 2007). The routing of this trail and therefore its spatial relation to Project elements is unknown at this time; however, given terrain and biophysical constraints it is likely the trail and the Project will be relatively close to one another (respecting safety issues), especially along the CN right-of-way.

6.9.3 Potential Project Effects

Several potential socio-economic elements are predicted to experience little to no change beyond normal socio-economic variation (e.g., population changes; community resource infrastructure; political and social resources) or are addressed in other Sections of the EIS (e.g., archaeological/heritage resources; traditional land use; public health and safety). Economic benefits of the Project are discussed in the economic benefit assessment of the Project (Jonathan Seymour & Associates 2008) and the Prince Rupert/Port Edward Container Port Business Opportunities Study (Economic Growth Solutions Inc. 2005). Therefore, the key issue that forms the focus of the Socio-Economic Conditions VEC is the predicted change in land use.

The proposed Project has the potential to affect Socio-Economic Conditions through changes in current land use. There is predicted to be an adverse effect associated with the loss of access to land for informal recreational use, and a positive effect associated with development of the land for its intended purpose to improve current operations at the existing port facilities.

6.9.4 Mitigation

The Proponents will implement the following mitigation measures for the loss of informal recreational lands as a result of the Project:

- *Communication* (e.g., signage, public notice) in advance of Project construction regarding continued restricted access to Project lands
- Defining the goal for and location of informal and formal recreational lands within the reclamation plan upon Project decommissioning
- *Development of lands* to meet expectations of PRPA Land Use Plan and maximize cumulative benefit of regional development

6.9.5 Residual Effects

Residual effects are those that remain after the implementation of mitigation and compensation measures. The definition of significance applied to this VEC and a summary of the anticipated residual effects are provided in the following paragraphs.

6.9.5.1 Residual Effects Rating Criteria

For Socio-Economic Conditions, a significant residual adverse environmental effect is one in which the proposed use of land for the Project and related facilities is not compatible with adjacent land use activities as designated through a regulatory land use process, and/or the proposed use of the land will create a change or disruption that widely restricts or degrades present land uses to a point where the activities cannot continue at current levels and for which the environmental effects are not mitigated or compensated.

6.9.5.2 Loss of Access to Land for Informal Recreational Use

Project development will lead to a loss of lands for informal recreational purposes. In particular, access to the coastline through lands within the Project footprint will be restricted during the entire construction and operation phase of the Project. The CN right-of-way is private property (as is the terminal) and any current use of these lands for informal recreational use is considered trespassing and is illegal. Given that the CN right-of-way is private property, and in consideration of the mitigation as described above (i.e., communication and contribution) the effect of further loss of access to this right-of-way should be considered negligible. Recreational activities outside the Project footprint, but within the LSA are not predicted to be affected. No other land uses outside the Project footprint are predicted to be affected aside from potential noise and light emissions which are addressed in Sections 6.2 and 6.3, respectively. Residual effects as a result of loss of access to land are anticipated to be site-specific and negligible to low in magnitude.

6.9.5.3 Development of Land to Improve Current Operations

Development of the Project footprint will be consistent with land use plans for the Project lands which specify marine terminal use. Construction activities will create changes to make Project lands more consistent with adjacent lands (i.e., Fairview Terminal Phase I) and fulfill land use planning objectives for the PRPA.

During operations, a positive effect will be realized with respect to the improved land use for intended purposes. The purpose of the Project is to expand the existing terminal in order to significantly increase the capacity of the existing Terminal facility. This expansion will significantly alleviate congestion at existing west coast ports and create significant opportunities for Canadian importers and exporters with the development of improved transportation connections to Asia. This positive effect will be extended beyond the RSA and even beyond the provincial level, for the lifetime of the Project. These positive effects are anticipated to be moderate in magnitude, and will occur at a regional level.

Direct and indirect economic benefits associated with these improvements in land use as a result of Project operation are discussed in the Socio-economic TDR (EIS Vol. 2) and economic forecast studies (Jonathan Seymour & Associates Ltd. 2008; Economic Growth Solutions Inc. 2005).

6.9.6 Follow-Up and Monitoring

No follow up or monitoring programs are recommended for Socio Economic Conditions.

6.9.7 Government, Public and Aboriginal Comments and Proponent's Response

There were no issues of concern raised with respect to socio-economic conditions.

6.9.8 Conclusions on Significance of Effects

During this comprehensive study, the RAs have considered those documents listed in Section 6.9. Assessment and significance conclusions were based on the criteria defined in Table A-2, in Appendix A.

Loss of informal recreational lands at the terminal site is predicted to result in negligible, site-specific, residual effects. This effect on Socio-economic Conditions is therefore rated as not significant. The development of lands for intended use is expected to result in important positive socio-economic effects that will be realized beyond the RSA.

6.10 Human Health and Safety

This section provides an overview of key aspects of Human Health and Safety in the study area as well as a summary of potential Project-related environmental effects, proposed mitigation, monitoring and follow-up measures. Additional detail with respect to Human Health and Safety is provided in the Proponents' EIS (EIS Vol. 1 [Section 15] [PRPA, CN 2009]) and MSR (PRPA, CN 2011).

Human Health and Safety is assessed in this Section according to the requirements of the EIS Scoping Document (EIS Vol. 1, Appendix A)**:**

> "The potential for a change in the environment caused by the Project to affect human health will be examined, including the health of members of the public and workers at the Project. For the purposes of the EA, consideration of human health and safety will focus on the potential impacts resulting from changes to air quality and noise. The focus will be on potential health risks to people living in communities in closest proximity to the terminal."

The potential effects of the Project on Air Quality and Noise emissions have been addressed in Sections 6.1 and 6.2 of the CSR. These Sections are summarized briefly and cross referenced below with respect to human health and safety. A detailed assessment of Human Health and Safety has not been conducted for the Project and is not considered necessary at this time. Public access to Fairview Terminal and the CN right-of-way is restricted and, as a result, there will be limited interaction between the Project and the public. This decision is based on professional judgment and experience on projects with similar conditions. Worker health and safety, Air Quality, and Noise all have implications in Human Health and Safety and further rationale for their inclusion is provided below. Potential effects as a result of Project-related accidents and malfunctions are considered in Section 6.16 (Accidents and Malfunctions) and will not be discussed further in this VEC.

Sections 6.10.1.1 and 6.10.1.2 provide discussion on the modelling that was completed for the 2009 EIS. The results summarized for the modelling were prepared based on the 2009 Project design. As detailed in the MSR the numbers of trains, vessels, and trucks has changed. The re-design resulted in a smaller terrestrial footprint, but higher operational efficiencies result in increased vessel, train, and truck movements at full build out. While the Project re-design results in this increase, the mitigation and conclusions of the effects assessment for the Air Quality and Noise and Vibration VECs remain valid.

6.10.1 Summary of Human Health and Safety Assessment

6.10.1.1 Worker Health and Safety

The health and safety of workers involved in all aspects of Project construction, operation and decommissioning is of critical importance to PRPA and CN. Worker health and safety is regulated at the provincial and federal level by the Occupational Health and Safety Regulation (WorkSafeBC 2009, Internet site) and the Canada Labour Code (revised October 15, 2009). The Proponents and contractors will ensure compliance with all relevant aspects of this legislation including use of personal protective equipment. Both the PRPA, the Terminal Operator and CN strive to have no lost time incidents due to industrial accidents and this is reflected in their respective worker safety plans that currently extend to their existing operations in the Port of Prince Rupert. The Terminal Operator and CN worker safety plans will be applicable to the construction and operation of the Project. These existing plans and procedures will be modified and updated, as necessary, to include the Fairview Phase II Project. Worker training, incident reporting and investigation, safety audits and inspections will be undertaken according to the Terminal Operator and CN safety plans for Project construction and operations. The successful development and implementation of Project safety planning will ensure that worker health and safety is equal to or better than industry standards for similar types of industrial activities.

6.10.1.2 Air Quality

Project activities related to Air Quality that have the potential to affect human health have been addressed in detail in Section 6.1. Air quality has the potential to affect the health of human receptors within local and regional airsheds. For the purposes of the Project, Air Quality has included two primary categories that may have direct human health and safety implications: CACs and HAPs. During construction, CAC and HAP emissions may temporarily affect local air quality. When compared to baseline emissions in the RSA and LSA, emissions generated from construction activities are considered to be low. Some construction related air emissions (e.g., dust) are readily managed through routine mitigation and best management practices (e.g., water application). Other routine emissions (e.g., equipment exhaust) are consistent with generally acceptable construction activities and are limited in scale and duration. In general, the short-term nature of the construction phase emissions reduces their potential effects on local and regional human health as well as contribution to any regional cumulative Air Quality issues.

During operation, emissions will result from marine activities, land vehicles and equipment, and rail activities combined. Maximum and annual average emissions of NO_x, CO, and VOCs associated with the re-design increase compared to the original EIS emissions. This will result in an increase to the predicted ground-level concentrations of NO_2, CO, and VOCs associated with dispersion modelling. Due to the increase in annual average emissions, there will be an increase in the predicted annual average ground-level concentrations of NO_2, CO and VOCs; this represents an exceedance of the annual NO_2 objective. There is no annual average AAQO for CO or for total VOCs.

For the short-term averaging periods (i.e., 1-hour, 8-hour, and 24-hour), maximum emissions from the ULCSs were applied in the modelling. The increase in ULCSs, rail and land-based equipment will result in increased emissions of NO_X, CO and VOCs. Overall, the increase in these emissions as a result of the Project is expected to be very small or negligible. No exceedance of the AAQO is expected for NO_X or CO. There are no ambient air quality objectives for 1-hour or 24-hour total VOC. PRPA, in consultation with the Province, will implement monitoring to validate predicted results and prevent potential human health impacts. If there are concerns with respect to Air Quality identified at sensitive receptors (i.e., Port Edward Elementary School), the Proponents will investigate and implement actions as necessary.

In general, these regulatory standards and government guidelines have been developed in consideration of protection of human and ecological health and safety. Overall, the residual project effects on Air Quality that might pertain to human health and safety are expected to be extremely limited.

6.10.1.3 Noise

Project activities related to Noise emissions that have the potential to affect human health have been addressed separately in Section 6.2. The effects of Noise on human health and safety can be divided into three general categories: i) subjective effects of annoyance, nuisance, dissatisfaction; ii) interference with activities such as speech, sleep, learning; and iii) physiological effects such as startling and hearing loss. There are different noise levels associated with the various Project phases. The construction phase will produce noise based on the type of equipment employed. Modeling results, based on the 2009 Project design, indicate that construction equipment will not create noise exceeding the permissible sound level; construction is planned for daytime, with only rare and isolated night time construction activities. If construction activities are carried out 24-hr per day, the night-time permissible sound level may be exceeded at some nearby residences on the Prince Rupert coast and on Digby Island, potentially causing disturbance. The Project's mitigative re-design is not expected to result in additional construction noise.

Operation of the Project will create different noise and has been modeled separately. The operational Noise footprint is smaller than the construction phase footprint. Similar to the construction phase model, some residents may experience noise levels above the night-time permissible sound levels if terminal operations are carried out 24-hr per day. Mitigation measures will be employed to minimize sound disturbance and to address possible night time exceedances of the permissible sound levels. Management practices such as minimizing simultaneous use of noise-producing equipment will be followed where construction scheduling will allow. Public concerns will be addressed on a complaint-driven basis.

Train whistling and shunting noise has been identified by the public as an existing noise that is causing disturbance and annoyance. This relates in particular to Fairview trains that are utilizing the CN downtown yard under current operations. Maher Terminals Inc. (operator of Fairview Terminal) uses the CN downtown yard due to congestion problems in and around the terminal. Construction of the CN siding(s) will reduce the need for Maher Terminals Inc. to use the downtown yard, thus reducing the noise from whistling. It should be noted that whistling occurs in particular at two locations, for safety reasons: Mile 92.96 Ferry Crossing and Mile 92.70 Highway 16 Crossing. Plans are in place to change these crossings to controlled crossings, reducing whistling.

As the Project will result in an increased number of train movements per day, there is potential for residents living adjacent to the CN mainline (e.g., in Kitsumkalum and Kitselas) to experience additional vibration disturbance. While the frequency of vibration will increase, the overall level of vibration will not change.

While the current Project design results in an increase in the number of vessels, trains and trucks, these additional movements, with the mitigation described in Section 6.2, are not anticipated to result in further annoyance, interference, or physiological effects. Overall, Noise effects on Human Health and Safety are expected to be of low magnitude.

6.10.2 Government, Public and Aboriginal Comments and Proponent's Response

There were no issues raised with respect to human health and safety other than those discussed in Section 6.1 and 6.2, as they relate to air quality and noise.

6.10.3 Conclusions on Significance of Effects

Public health and safety is addressed in this CSR with respect to assessment and management of several key Project emissions. These issues are addressed primarily in the Air Quality and Noise VEC Sections. In addition, government legislation and proponent policy and procedures will manage Project worker health and safety. Based on the results of Air Quality and Noise assessments and the expected application of worker health and safety plans and compliance with regulatory requirements, the residual environmental effects from all Project phases on Human Health and Safety are predicted to be not significant.

6.11 Archaeological and Heritage Resources

This section provides an overview of key aspects of Archaeological and Heritage Resources in the study area as well as a summary of potential Project-related adverse effects, proposed mitigation, monitoring and follow-up measures. Additional detail with respect to Archaeological and Heritage Resources is provided in the Proponents' EIS (EIS Vol. 1 [Section 16] [PRPA, CN 2009]) and MSR (Section 3.10; PRPA, CN 2011).

Millennia Research Ltd., on behalf of PRPA and CN, conducted two AOAs and three AIAs. The results of the AOAs and AIAs (Millennia Research Ltd. 2007a, b, c, d, e) have been distributed to the British Columbia Archaeology Branch and Registry Services Branch, and the RAs have received advice from a federal expert on archaeology (Parks Canada). The reports have also been distributed to the Aboriginal communities of Gitxaala, Lax Kw'alaams, Kitselas, Kitsumkalum and Metlakatla. This VEC chapter is based largely on the results of these studies.

All of the Archaeological and Heritage Resources likely to be affected by the Project are on or originating from federal lands or lands used by a federally regulated railway. Responsibility for archaeological resources on or originating from these lands rests with the federal custodian, which is PRPA (acting on behalf of Transport Canada), or with the federally regulated railway, which in this case is CN. Archaeological and Heritage Resources are a VEC because of federal policies (i.e., the Government of Canada Archaeological Heritage Policy Framework, the Treasury Board Policy on Management of Material, the Treasury Board Policy on Management of Real Property). These resources are included as a VEC for this Project given the potential for the Project to disturb known and previously unidentified Archaeological and Heritage Resources (i.e., artefacts and ancient human remains), as well as traditional sites and materials identified during construction activities.

AIAs were conducted for the Project in accordance with British Columbia's Archaeological Impact Assessment Guidelines and with relevant federal policies and procedures applicable to affected federal lands. The assessment reviewed existing research, traditional knowledge studies and documentation of known archaeological resources in the area, and is consistent with federal policies and procedures.

Decisions on the significance or heritage value of Archaeological and Heritage Resources on or originating from these lands will be made by PRPA and CN with input from Parks Canada and the First Nations, where appropriate.

6.11.1 Study Area

For the purposes of the environmental effects assessment, the Archaeological and Heritage Resources LSA consists of the Project footprint and includes all areas of archaeological potential as outlined by Millennia in the Project AOAs and AIAs. The RSA for the purposes of this VEC includes Kaien Island and the Prince Rupert Harbour. This area was defined for the purpose of assessing effects to Archaeological and Heritage Resources relative to a broader cultural and environmental area.

6.11.2 Existing Environment

6.11.2.1 Phase II Fairview Archaeological Impact Assessment (2007)

Archaeological field investigations for the Project were conducted in the summer and fall of 2007. Examination of natural exposures along with nearly 1,000 subsurface test excavations led to the identification of only two new pre-contact sites, both small and disturbed. Six previously recorded archaeological sites were revisited and site boundaries were defined and often expanded. A total of 13 sites were identified during the AIA process for the Terminal portion of the Project (EIS Section 16, Figure 16-1).

Four of the 13 sites were identified as having a high scientific significance (based on the criteria checklist presented in the British Columbia Significance Assessment Guidelines) (Millennia 2007a):

- GbTo-13: located south of the Casey Creek drainage culverts. The inland side has about 60 m^3 of intact midden and the shoreline side has approximately 200 m^3. There is a total of approximately 50 m^3 of disturbed midden at this site. Intertidal lithic canoe runs are considered 100 percent intact. There is the potential for ancient human burials to be found at this site.
- GbTo-37: located south of the existing terminal along the intertidal zone where the current rail system diverges. Intact midden is estimated at 153 m^3 while disturbed midden is estimated at 228 m^3. There is a potential wetsite which could be of archaeological significance. About five artifacts per cubic metre of intact deposit were found in the evaluative units, so roughly 750 artifacts can be expected in the entire intact deposit. There is the potential for ancient human burials to be found at this site.
- GbTo-54: Intact midden is estimated at 165 m^3. Five artifacts per cubic metre of intact deposit were found in the evaluative unit, so roughly 825 artifacts can be expected in the entire intact deposit (Millennia 2007d). Canoe runs and lithics along the intertidal zone are considered 100% intact. There is potential for ancient human burials to be found at this site.
- GbTo-100: this site contains the remains of Fort Casey, which consisted of a battery mounting a number of naval port defence guns, and an observation tower for fire control and operation of a submarine net.

With the mitigative redesign of the Project (MSR), impacts to GbTo-13 will be avoided inland of the existing CN mainline. Impacts to GbTo-100 (Fort Casey) will be avoided entirely.

6.11.2.2 Kaien Siding and Wye Archaeological Impact Assessment (2007)

Archaeological field investigations for the Kaien Siding and Wye Project component were conducted in the fall of 2007. Extensive examination of natural exposures (including the beach surface) and nearly 700 subsurface tests were excavated during the archaeological project, resulting in the identification of four new archaeological sites. The boundaries of previously recorded archaeological sites were expanded and thoroughly defined. In total, 11 archaeological sites were identified during the Kaien siding and wye AIA process (EIS Section 16, Figure 16-1). In addition, one heritage feature was observed (Fort Barrett searchlight station).

One of the sites was identified as having a high scientific significance (based on the criteria checklist presented in the British Columbia Significance Assessment Guidelines) (Millennia 2007a):

- GbTo-55: located 75 m south of GbTo-54, consisting of two canoe runs. A pebble core artifact was found 25 m north of the northernmost canoe run and the site boundaries are extended to include this finding. Shell midden was encountered in several subsurface tests and was visible in some naturally exposed areas. The volume of remaining midden is calculated to be 148 m^3. Proximity to the canoe runs would indicate that both the midden and canoe runs are part of the same site, and may have included GbTo-54 as well. There is the potential for ancient human burials to be found at this site.

6.11.3 Potential Project Effects

During the environmental assessment process, the Proponents, the public, WG members, Aboriginal Groups, and federal departments and agencies identified the following potential environmental effects and key issues concerning potential environmental effects of the Project on Archaeological and Heritage Resources:

- Loss of or disturbance to Archaeological and Heritage Resources during construction
- Loss of or disturbance to Archaeological and Heritage Resources during operation

These potential effects are described below.

6.11.3.1 Loss of or Disturbance to Archaeological and Heritage Resources during Construction

The construction phase of the Project has more opportunity for effects on Archaeological and Heritage resources than does any other phase of the Project. The planned activities that have the greatest potential for interaction with these resources include forest and vegetation clearing, soil removal, marine infilling, and stream crossings, which will result in an alteration or removal of existing archaeological, heritage and potentially paleontological site components and features.

Site investigations indicate that five sites are likely to be removed during Project construction. These include GbTo-105 (re-deposited shell midden), GbTo-37 (shell midden), GbTo-12 (re-deposited shell midden), GbTo-13 (shell midden, lithics, canoe run), and the Fort Barrett Searchlights. An additional four sites will potentially be affected. These include GbTn-65 and GbTn-66 (Culturally Modified Trees (CMT)), GbTo-54 (shell midden, canoe run, lithics), and GbTo-95 (CMT).

6.11.3.2 Loss of or Disturbance to Archaeological and Heritage Resources during Operation

Routine activities during the operational phase of the Project (i.e., ditch maintenance along the sidings and wye) could result in further disturbance of undiscovered Archaeological and Heritage Resources; however, this is considered unlikely, as ditch maintenance is focused on the removal of newly deposited material (e.g., due to slope slumping etc.) and will not likely remove any pre-existing soils.

Other routine maintenance and repairs to dock facilities, the terminal, and rail components (including the sidings and wye) will not result in effects to Archaeological and Heritage Resources.

6.11.4 Mitigation

Mitigation measures are detailed in the Archaeology Mitigation Plan, associated Addendum and Archaeology Implementation Plan, prepared by subject matter experts and the Project Proponents. Canada and all First Nations EA Working Group members have been consulted on the content of these Plans.

Construction of the Project will occur in phases and archaeological mitigation will be conducted in a coordinated manner with each phase. Prior to construction in archaeological sites, the Archaeology Mitigation Plan, associated Addendum and Archaeology Implementation Plan associated with that area will be implemented. This includes 100% recovery of potential artefacts and ancient human remains. During pre-construction and construction, the identification, documentation, and protection of all Archaeological and Heritage Resources (including ancient human remains) will be the responsibility of the Project Archaeologist on behalf of the federal custodians, PRPA and CN. Interim storage of artefacts and ancient human remains will be at the Museum of Northern British Columbia. Once all Archaeological and Heritage Resources have been processed and assessed, the federal custodians, PRPA and CN will arrange to legally transfer the entire collection and associated records to an approved facility in British Columbia.

6.11.5 Residual Effects

Residual effects are those that remain after the implementation of mitigation and compensation measures. The definition of significance applied to this VEC and a summary of the anticipated residual effects are provided in the following paragraphs. The criteria used to predict residual effects and significance are summarized in Table 5-1, Section 5.6, with additional assessment details provided in the EIS, MSR, and supporting studies (AOAs, AIAs).

6.11.5.1 Residual Effects Rating Criteria

For Archaeological and Heritage Resources, a residual effect is significant if Archaeological and/or Heritage Resources are damaged or destroyed during the life of the Project without being first documented, analyzed, curated, and reported on. A residual effect would be adverse and significant if the recovered material and records are not retained in an appropriate repository.

6.11.5.2 Loss of or Disturbance to Archaeological and Heritage Resources during Construction and Operation

As discussed in the AIAs for the Project, portions of the Project area have high to moderate archaeological potential. Disturbance to archaeological and heritage sites will be irreversible. Some of the known archaeological sites within the Project area have been removed by past activities, and cannot be further altered by the Project's construction activities.

Overall, it is expected that the Project will result in the disturbance of all archaeological and heritage sites in the Project area. Implementation of detailed mitigation measures and the commitment by the Proponents for 100% recovery of artefacts and ancient human remains as agreed to in the Archaeology Mitigation Plan, associated Addendum and Archaeology Implementation Plan will reduce the residual effects associated with the disturbance of these resources.

6.11.6 Follow-Up and Monitoring

The post-1846 CMT and shell midden heritage sites could have high cultural value (significance) to the local Aboriginal Groups, (i.e., Lax Kw'alaams, Metlakatla, Gitxaala, Kitselas, and Kitsumkalum). Therefore, a perspective of the significance of the CMTs, shell middens, burial and lithics sites will be informed by local Aboriginal communities and Canada (on the advice of a qualified archaeological / federal subject matter expert).

The local First Nations, (Lax Kw'alaams, Metlakatla, Gitxaala, Kitselas, and Kitsumkalum) have been consulted on the Archaeology Mitigation Plan, associated Addendum and Archaeology Implementation Plan. Technical concerns and comments received were addressed in those plans.

Additional monitoring and/or follow up is defined in the Archaeological Mitigation Plan, associated Addendum and Archaeology Implementation Plan.

6.11.7 Government, Public and Aboriginal Comments and Proponent's Response

The primary concern raised by Aboriginal Groups was with respect to the management of Archaeological and Heritage Resources. The Proponents have been working closely with the First Nations and Canada to develop Archaeology Mitigation and Implementation Plans that outline the mitigation that will be undertaken to address concerns regarding identification, documentation (i.e., excavation, mapping, etc.) and management of these resources.

The full list of comments, concerns and recommendations from federal authorities, public and Aboriginal consultations is included in the following three IR documents:

- Environmental Impact Statement Information Request Document (PRPA and CN 2011b)
- Mitigation Strategy Report Information Request Document, November 2011 (PRPA and CN 2011c)
- Archaeology Information Requests, August 2012 (PRPA and CN 2012).

These IR documents include the dissenting perspectives, Proponent responses, and commitments. Table 9-1 of this CSR also provides a detailed list of all of the Proponent commitments.

6.11.8 Conclusion on Significance of Effects

During this comprehensive study the RAs have considered those documents outlined in Section 6.11. Assessment and significance conclusions were based on the criteria defined in Table 5-1, in Section 5.6.

Based on the information summarized in this CSR, and with the implementation of the Archaeology Mitigation Plan, associated Addendum and Archaeology Implementation Plan, the Project is not likely to result in significant adverse environmental effects on Archaeological and Heritage Resources.

6.12 Current Traditional Use by Aboriginal Persons

This section provides an overview of key aspects of Current Traditional Use by Aboriginal persons within the study areas as well as a summary of potential Project-related environmental issues, proposed mitigation, monitoring and follow-up measures. Additional detail with respect to Current Traditional Use by Aboriginal persons is provided in the Proponents' EIS (EIS Vol. 1 [Section 17] [PRPA, CN 2009]) and MSR (Section 3.11; PRPA, CN 2011).

Other aspects of land and resource use are considered separately in the following CSR chapters: Socio-economic Environment (Section 6.9); Archaeological and Heritage Resources (Section 6.11), and Country Foods (Section 6.13).

Current Traditional Use by Aboriginal persons has been selected as a VEC as the Project footprint is located within the claimed traditional territory of the Tsimshian Nation. Five Aboriginal Group communities assert Aboriginal Rights to lands in the Prince Rupert Harbour area, and have expressed an interest in the Project: Metlakatla Band; Lax Kw'alaams First Nation; Gitxaala Nation; Kitselas Indian Band; and Kitsumkalum Band. There are additional Tsimshian Nation groups; however, they have not expressed interest in the Project. Selection of Current Traditional Use by Aboriginal persons as a VEC addresses the requirements under CEAA to consider community knowledge and aboriginal traditional knowledge in the EA process, and addresses the CEAA definition of "environmental effect", which includes "the current use of lands and resources for traditional purposes by aboriginal persons". Current use for traditional purposes refers to contemporary Aboriginal hunting, fishing and gathering activities for subsistence purposes and use of lands and resources for social and ceremonial activities.

Metlakatla, Kitselas, and Kitsumkalum are part of the treaty group known as the "Tsimshian First Nations". Lax Kw'alaams and Gitxaala were formerly part of the Tsimshian First Nation treaty group; however, they withdrew from that treaty group (BC MARR 2009). Lax Kw'alaams has rejoined the treaty process and is negotiating independently with Canada and British Columbia. For purposes of this CSR, the five Aboriginal groups named above will be referred to as the "Tsimshian Nation" when referred to as a whole. Where appropriate, the Aboriginal Groups will be referred to individually.

6.12.1 Study Area

The assessment area for Traditional Current Use by Aboriginal persons is defined by the approximate boundary of the claimed traditional territory of the Tsimshian Nation, extending south to Kitasoo, north to the mouth of the Nass River, and up the Skeena River just east of Terrace (EIS Section 17, Figure 17-1). This boundary reflects an area of traditional use recognized by the Tsimshian Nation.

The spatial boundary as defined by the Tsimshian Nation claimed traditional territory covers a region much larger than the Project footprint. However, the assessment focuses on those activities that are likely to interact with aspects of the Project, as determined by available literature.

6.12.2 Existing Environment

The following information focuses on land and resource use given the Project location within the traditional territory of the Tsimshian Nation.

6.12.2.1 Aboriginal Territories, Communities and Settlements

The description provided below, from MacDonald 2009, is on behalf of the Coast Tsimshian (including Metlakatla and Lax Kw'alaams) and is not necessarily accepted as accurate by all of the Tsimshian Nations. Additional information on traditional uses of lands in the Project area by Aboriginal Groups is provided in the reports referenced within this section of the CSR, as well as in a report prepared by Charles R. Menzies, Ph.D. (Menzies 2008).

At the time of contact with Europeans, the Tsimshian peoples consisted of 15 independent, self-governing tribes (Ratcliffe & Co. 2004) commonly divided into three regional groups, although these groups are not recognized by all of the Tsimshian Nations and the descriptive nomenclature is not universally recognized:

- Southern Tsimshian (including Gitxaala)
- Canyon Tsimshian (including Kitselas and Kitsumkalum)

- Coast Tsimshian (including Metlakatla and Lax Kw'alaams)

These three groups are geographically and linguistically distinct (MacDonald 2009). The Southern Tsimshian traditionally occupied the mainland and the islands south of the Skeena River, and relied exclusively on the coast for their livelihood. The Canyon Tsimshian traditionally spent their entire year on the banks of the Skeena River and its tributaries, and relied primarily on the river and its tributaries for their livelihood. The Coast Tsimshian exploited both resource areas (coast and river), and controlled the Skeena River and its tributaries below what is now the City of Terrace. The Coast Tsimshian also controlled the mainland coast and offshore islands from the mouth of the Skeena River to the mouth of the Nass River.

The Tsimshian are part of a larger Tsimshian language group that includes the Gitskan and the Nisga'a. Tsimshian people possess distinctive common features that include language, customs, practices, traditions, laws, economics, spiritual beliefs, and culture.

Tsimshian peoples had villages in and around the Prince Rupert Harbour area, including the lower Skeena River. Ownership of these sites by tribes and by House Groups within the tribes was recognized by the laws and customs of and within the tribes of the Tsimshian.

Sites used by the Tsimshian during their annual round included winter villages, eulachon fishing villages, summer villages, stopover sites, seaweed camps, hemlock and cedar gathering sites, hunting and fishing camps, burial sites, and defensive sites.

6.12.2.2 Community, Social and Economic Setting

According to data collected and maintained by Indian and Northern Affairs Canada (now Aboriginal Affairs and Northern Development Canada), the regional Aboriginal Groups have a combined population of 6,981, with an average of 30 percent of the population living on reserve (INAC 2009). Metlakatla has the lowest percentage of the population living on reserve (15 percent), while Kitselas has the highest (52 percent). Lax Kw'alaams is the largest community, with a registered population of 3,233.

These are small communities with limited economic activity; however, the Aboriginal Groups do have forestry agreements with the Province, ranging from a $1.2 million agreement (Kitselas) to a $6.85 million agreement (Lax Kw'alaams). In May 2003, the Tsimshian Nation treaty group, which at the time included Lax Kw'alaams and Gitxaala, received $737,352 from the governments of Canada and British Columbia to support cruise-ship tourism opportunities and the development of a shellfish aquaculture business.

Unemployment rates for Metlakatla and Kitsumkalum were 28.8 and 28 percent, respectively. The provincial average unemployment rate for 2006 was 6 percent. No data was available for the other three Aboriginal communities.

6.12.2.3 Tsimshian Traditional Land and Resource Use Activities

Tsimshian peoples had villages in and around the Prince Rupert Harbour area, including the lower Skeena River. It has been reported that the Coast Tsimshian had summer villages on the lower Skeena River and winter villages around the Prince Rupert Harbour area (MacDonald 2009). Ownership of these sites by tribes and by House Groups within the tribes was recognized by the laws and customs of and within the tribes of the Coast Tsimshian. The ownership and occupation of these sites, and the right to harvest resources from them was of central significance to each of the tribes (MacDonald 2009).

Each House holds exclusive ownership of certain territories. Such territories are owned jointly by all members of the House. The use of the tribal territory is traditionally under the direction of the hereditary chiefs and spokesmen of the tribe. Each tribe generally recognizes the exclusive ownership of certain territories by other tribes. Each tribe holds aboriginal title to the sites that were owned and occupied by the tribe or House groups within that tribe. The Bands, as present-day holders of the collective rights of the tribes, now hold that aboriginal title.

The winter village sites on the west coast of Kaien Island were chosen because of the abundance of resources that could be harvested in the immediate surrounding areas during the winter months. The west coast of Kaien Island has traditionally been used as a resource harvesting area for the harvesting of medicinal plants (including devil's club, hellebore, cedar planks and bark), and berries (salmonberries, blueberries, gooseberries). The area is home to significant shellfish harvesting grounds, and off-shore marine harvesting grounds. For example, cod, salmon, sea mammals and even halibut have traditionally been and continue to be harvested off the shores of the west coast of Kaien Island. The members of the Tsimshian Nation who live in the Prince Rupert area continue to harvest shellfish and other seafood (clams, crabs, cockles, urchin, shrimp, sea cucumbers, and geoduck) from the inter-tidal flats of the sandbar just north of Casey Point.

A total of 7.9 ha of subtidal habitat and 14.5 ha of intertidal habitat will be lost due to Project-related infilling in the marine environment. Rocky habitats comprise the majority of the impacted area and this type of habitat is considered common throughout the claimed traditional territory of the Tsimshian Nation. Sandy habitats are also present within this claimed traditional territory and supports cockles, which are a valuable traditional food resource. An important constraint to shellfish harvesting is the year-round closure on shellfish harvesting within Prince Rupert harbour, due to potential fecal coliform contamination. Marine macrophytes, such as kelp and eelgrass, provide indirect Aboriginal traditional subsistence resources. Both kelp and eelgrass canopies can provide habitat and refuge for outmigrating juvenile salmon and other commercially important species such as herring spawn. It is expected that 0.12 ha of eelgrass will be lost due to Project construction. All losses of the productive capacity of fish habitat (marine and freshwater) will be compensated for through negotiations with DFO.

6.12.2.4 Known Villages and Traditional Use Sites

There are two archaeological sites on the west coast of Kaien Island which are particularly significant to Tsimshian First Nations. These are known as the Yaga Sqala'i Site and, the Casey Point Sandbar. Both sites will be affected by the proposed Project. Mussel, cockle, littleneck clams, horse and butter clams, both whole and fragmented, as well as land mammal bone, and salmon vertebrae have been found at the Yaga Sqala'i site (Ratcliffe & Co. 2004).The Casey Point sandbar continues to be used as a traditional resource harvesting site for clams, crabs, cockles, urchin, shrimp, sea cucumbers, and geoduck (a large, saltwater clam).

Casey Point is claimed by Metlakatla, Lax Kw'alaams and Gitxaala as their ancestral village site.

6.12.3 Potential Project Effects

During the EA process, the Proponents, the public, WG members, Aboriginal Groups, and federal agencies identified the following key issues concerning potential environmental effects of the Project on Traditional Current Use by Aboriginal persons:

- Project is located in areas subject to land claims
- Project may result in changes to the access to and/or quality of traditional land and marine resources
- Project may result in changes to culturally significant areas

As these key issues are all closely related to changes to traditional use patterns, they are discussed below as one potential effect (Changes to Current Traditional Use Patterns).

6.12.3.1 Changes to Current Traditional Use Patterns

Access to Aboriginal resources harvesting areas will be affected, such as at Casey Point (e.g., cockle, clam, and shrimp harvesting). Vegetative resources (e.g., berries, bark) will also be affected and will either be removed or inaccessible in the immediate Project area. It is expected that members of nearby Aboriginal communities will be able to reasonably continue their traditional resource use activities; however, locations of these activities may change to areas which are outside of the Project footprint, at least temporarily. Potential changes to current traditional use patterns are discussed in the following paragraphs.

Construction

Construction activities have the potential to alter or destroy vegetation, wildlife, freshwater and marine Aboriginal traditional resources and/or culturally significant sites. The Project will have an adverse environmental effect on Tsimshian Nation traditional land use in and around the southwest coast of Kaien Island. Construction activities will involve restriction of access to both terrestrial and near shore marine habitat (i.e., cockle and shellfish collection at Casey Point) for Aboriginal resource users. Further disruptions are expected to occur in the location of the proposed rail sidings and access road, and access to these areas will continue to be prohibited.

On-shore site preparation involves the removal of vegetation and creates new forest edges along the outer perimeter of the Project footprint. Vegetation clearing will result in the direct loss of plants, herbs or berries that may have been used traditionally by Aboriginal Groups. Invasive plant incursions often coincide with the creation of forest edge habitat and can threaten local herb and shrub plants, which are valued by subsistence users.

Construction of the Project will result in the loss and alteration of freshwater habitat due to site clearing and grading, and will temporarily reduce available fish habitat, until compensation habitat is constructed. In-water marine dredging activities could lead to direct mortality of inshore fish and benthic invertebrates such as crabs, cockles, prawns and shrimp as a result of increased sedimentation and potential sediment smothering. There will also be the loss of 0.12 ha of eelgrass beds located within and adjacent to the Terminal footprint. Potential adverse Project-related effects on Vegetation, Freshwater Environment and Marine Environment are addressed in Sections 6.4, 6.7, and 6.8, respectively.

Operation

The effects of Project operation will be similar to those for construction with respect to ongoing disruption of access and traditional use of Tsimshian claimed traditional territory. Regular facility operations and maintenance and repairs to dock facilities have the potential to affect Traditional Current Use by Aboriginal persons during the operations phase. This will occur as the Terminal site will be fenced for security and traditional users will not be able to access the land. This will also occur as a result of the Fishing Exclusion Zone currently in effect within 100 m of a jetty or where it may directly interfere with navigation. Access along the CN right-of-way is currently restricted (i.e., CN right-of-way is private property), therefore the changes in access to traditional resources along the right-of-way will not change.

6.12.4 Mitigation

PRPA, CN, and the Government of Canada have worked with the Aboriginal communities to define the effects of the Project on Aboriginal rights. Impact benefit agreements have been formed with five of the Tsimshian Nations regarding use of traditional lands and marine areas adjacent to Fairview Terminal and along the CN right-of-way. The impact benefit agreements with all five Aboriginal communities (Metlakatla Band; Lax Kw'alaams First Nation; Gitxaala Nation; Kitselas Indian Band; and Kitsumkalum Band) have been finalized and signed by all parties, including the Government of Canada.

Further mitigation includes standard BMPs and VEC-specific mitigation. At a minimum, the Proponents will implement the following mitigation measures to reduce or eliminate Project residual effects to Current Traditional Use by Aboriginal persons:

- *Habitat Compensation:* a Habitat Compensation Plan will be (refer to Sections 6.7 and 6.8, Freshwater and Marine Environments) constructed to ensure that there is no net loss of the productive capacity of fish habitat.
- *Awareness Training:* provide environmental awareness training for all personnel to ensure that Project personnel are aware of Project boundaries, potential effects of Project activities on current traditional use by Aboriginal persons, and areas of particular sensitivity.
- *EM / ER Procedures: during construction* implement environmental protection / management plan and emergency response procedures (e.g., spill prevention, spill response procedures) to ensure that in the event of an accident or malfunction, effects to areas of current traditional use by Aboriginal persons are minimized.
- *Public Notification:* ensure Harbour Control informs vessel traffic of construction work in and near navigational channels. Post public notices (i.e., via a passive website or email distribution) as necessary to inform boaters of construction work. Marine traffic control for the harbour will advise boaters checking in about any marine construction work or restricted access areas.
- *Closure Notifications:* provide Aboriginal Groups with regular updates on activities and progress. Ensure Aboriginal Groups are aware of established marine/fishing exclusion zones during construction

Mitigation for the reduction of effects on Aboriginal traditional resources (e.g., berries, shellfish) are presented in Sections 6.4 (Vegetation), 6.7 (Freshwater Environment), 6.8 (Marine Environment), and 6.16.3 (Accidents and Malfunctions).

6.12.5 Residual Effects

Residual effects are those that remain after the implementation of mitigation and compensation measures. The definition of significance applied to this VEC and a summary of the anticipated residual effects are provided in the following sections.

6.12.5.1 Residual Effects Rating Criteria

For Current Traditional Use by Aboriginal persons, a significant residual environmental effects is one affecting an entire definable group of people in such a way as to cause disturbance of established traditional resource use activity patterns for one or two generations.

6.12.5.2 Changes to Current Traditional Use Patterns

During construction, there will be unavoidable direct effects on shellfish areas, benthic invertebrates, and freshwater and marine fish habitat. While juvenile life stages are not harvested, a reduction in rearing habitat may reduce locally available adults. Implementation of the HCP will help establish no net loss of species or habitat, some of which are harvested for traditional use.

Regular facility operations and maintenance or repairs to dock facilities have the potential to affect Traditional Current Use by Aboriginal persons, as access to harvesting areas could be affected. Some harvesting/access restrictions are currently in place in Prince Rupert Harbour (e.g., fishing, shellfish harvesting and access along the rail line); the Project will not substantially increase these current restrictions. Residual environmental effects resulting from changes to current traditional use patterns are anticipated to be of low to moderate magnitude, and will have a site-specific to local extent.

6.12.6 Follow-Up and Monitoring

No specific follow up and monitoring is proposed. Relevant VEC-specific monitoring and follow-up is described in Sections 6.4 (Vegetation), 6.7 (Freshwater), and 6.8 (Marine).

6.12.7 Government, Public and Aboriginal Comments and Proponent's Response

Comments were provided to the Proponents regarding the potential for the Project to affect the claimed traditional territories of the Aboriginal Groups, and regarding the potential loss of access to traditional fishing, hunting and gathering sites. The Proponents have negotiated with the Aboriginal Groups, and with the Government of Canada, and each of the Aboriginal Groups described within this CSR have signed impact benefit agreements, acknowledging that they have been adequately consulted on, and compensated for, any adverse impacts to traditional rights and title.

Comments were also received regarding the accuracy of information presented that was intended to provide background on the use of the area by Aboriginal Peoples historically. The Proponents had limited information available in preparation of the background sections, but were able to add appropriate clarifications regarding the historical descriptions.

The full list of comments, concerns and recommendations from provincial governments, federal authorities and public and Aboriginal consultations is included in the following two IR documents:

- Environmental Impact Statement Information Request Document (PRPA and CN 2011b)
- Mitigation Strategy Report Information Request Document, November 2011 (PRPA and CN 2011c)

These IR documents include the dissenting perspectives, Proponent responses, and commitments. Table 9-1 of this CSR also provides a detailed list of all of the Proponent commitments.

6.12.8 Conclusion on Significance of Effects

The information provided in this section is based on the information available at the time of writing of the EIS (and through the IR process), and is not based on direct data collection with the Aboriginal Groups.

During this comprehensive study, the RAs have considered those documents listed in Section 1.1. Assessment and significance conclusions were based on the criteria defined in Table A-2, in Appendix A). As the Proponents, with the Government of Canada, have signed impact benefit agreements with all five Aboriginal communities, it is understood that Canada's obligations to consult regarding the Project are fulfilled. Further, these impact benefit agreements are indication that the five Aboriginal Groups are confident that the Project will not result in an unreasonable infringement on Aboriginal rights and title. The Project Agreement for the EA fulfills the Proponents' need to address loss or perceived loss to current traditional use by Aboriginal persons. Based on the information summarized in this CSR and Project Agreement, and provided that the Proponents implement the mitigative actions as described, the Project will not likely result in significant adverse environmental effects to Current Traditional Use by Aboriginal persons.

6.13 Country Foods

This section provides an overview of existing uses of Country Foods in the study areas as well as a summary of potential Project-related environmental effects, proposed mitigation, monitoring and follow-up measures. Additional detail with respect to Country Foods is provided in the Proponents' EIS (EIS Vol. 1 [Section 18] [PRPA, CN 2009]) and MSR (Section 3. 12; PRPA, CN 2011).

Country Foods was selected as a VEC because of the potential for Project activities or physical works to affect resources that are used by local harvesters (e.g., hunters, gatherers, trappers or fishers) on Kaien Island and within Prince Rupert Harbour. Local harvesters are people who reside on or near Kaien Island as well as those who travel to the area to use the land and water-based resources for subsistence and recreational purposes. Country Food resources include vegetation, wildlife, freshwater and marine species (e.g., game, fish, shellfish, berries, edible plants).

Project-related effects and their significance on vegetation, wildlife, freshwater and marine species are considered in the following Sections: 6.4 (Vegetation Resources), 6.5 (Wildlife and Wildlife Habitat), 6.7 (Freshwater Environment) and 6.8 (Marine Environment. Current use of local resources by Aboriginal Peoples is addressed in Section 6.12.

6.13.1 Study Area

The spatial boundary considered for the assessment of Country Foods includes the LSAs for the VECs mentioned above. The RSA includes Kaien Island and Prince Rupert Harbour. It is expected that all activities potentially affecting Country Foods will occur within the boundaries of the Project footprint.

As part of the protection of existing shipping lanes within the Harbour, the PRPA established a Fishing Exclusion Zone, which includes the waters bordering the west coast of Kaien and Ridley Islands, and extends to Georgia Rock. Harvesting of Country Foods is restricted within the Fishing Exclusion Zone in the following ways (PRPA 2008):

- There is to be no fishing <u>with nets</u> within the inner Harbour without prior approval by the Authority. Other fishing, without approval is allowed, but must be outside of the exclusion zone (i.e., more than 100m from any berth, jetty, float, etc. and cannot impede shipping channels)
- Crabbing is not permitted anywhere in the Harbour that could constitute a navigational or safety hazard
- Shellfish harvesting is prohibited within 300 m of industrial municipal and sewage treatment plant outfall discharges and within 125 m of marinas, wharves, finfish net pens, float homes or other floating living accommodation facilities, including live aboard boats (DFO 2008)

Project components that fall within this Fishing Exclusion Zone include the terminal (wharf), the CN sidings and inspection road, and the Port-dedicated road between the terminal and Ridley Island.

Prince Rupert lies within an area that is closed to all bivalve shellfish harvesting. This includes a year-round closure due to potential presence of fecal coliforms in water, and occasional closures for paralytic shellfish poisoning (PRPA, CN 2011; DFO http://www.pac.dfo-mpo.gc.ca/fm-gp/contamination/sani/area-secteur-04/4.3-eng.htm).

6.13.2 Existing Environment

Seasonal cycles drive resource availability and consumption, which often begins with spring time oolichan fishing, followed by summer berry picking, plant gathering, and salmon fishing, fall and winter seafood gathering, and winter hunting (Kitsumkalum 2008). Information on the existing environment as it pertains to Country Foods was compiled based on data referenced in the Vegetation, Wildlife, Avifauna, Freshwater, and Marine sections of this CSR.

Recreational and subsistence harvesting activities in the RSA include:

- Collection of cockles, crabs, shrimp and clams
- Fishing for various species, including ground fish and salmon
- Hunting for game (e.g., deer)

- Gathering various herbs, medicinal plants and berries (e.g., salmonberry and bunchberry)

Recreational and subsistence activities are supported by having access to specific fishing and harvesting locations within the Prince Rupert area, including locations found within the LSA. The Prince Rupert Harbour, as well as the waters west of the Harbour, supports recreational tidal-water fisheries (MacConnachie et al. 2007). As discussed above, PRPA established a Fishing Exclusion Zone, which includes the waters bordering the west coast of Kaien Island.

For the purposes of harvesting country foods, the Fishing Exclusion Zone does not preclude recreational or subsistence fishing, particularly with a line and hook. Fishing is allowed to occur under certain conditions, for example where navigation is not compromised.

Old forest, wetland ecosystems, riparian ecosystems, rare plants, and ecological communities of conservation concern can provide important sources of berries and herbs, while forest canopies provide valuable habitat for a range of wildlife species. Black-tailed deer are a common large mammal found within the RSA. Deer, moose and other game species may be hunted recreationally in the RSA.

Six watercourses within the Project footprint are either known or assumed to be fish bearing. Species supported include Dolly Varden, Coho salmon, and cutthroat trout. It is not likely that in these watercourses these species grow large enough within the LSA to be captured in freshwater for human consumption, based on the size and number of fish captured in the Project area. There is no spawning habitat located within the Project footprint. Some adult Coho salmon spawning is likely to occur in the LSA; however, this is expected in very low numbers and is not likely to attract recreational or subsistence fishers.

Prince Rupert Harbour supports a large marine fishery as well as important habitat for many species. Commonly harvested aquatic species include, but are not limited to, Sockeye, Chinook, Coho, Pink, and chum salmon, as well as halibut, yellow-eye rockfish, lingcod, herring, Pacific cod, cockles, crabs, and prawns. Sandy habitats, such as that found at the mouth of Casey Creek support cockles, which are a valuable recreational and subsistence food resource.

Marine macrophytes, such as kelp and eelgrass, provide indirect country foods. Both kelp and eelgrass canopies can provide habitat and refuge for outmigrating juvenile salmon and other commercially important species such as herring spawn.

6.13.3 Potential Project Effects

During the EA process, the Proponents, the public, WG members, Aboriginal Groups, and federal agencies identified the following potential environmental effects and key issues concerning potential environmental effects of the Project on Country Foods:

- Change in availability of and accessibility to Country Foods
- Contamination of Country Foods

6.13.3.1 Contamination of Country Foods

There are no likely Project-related sources of contaminants within the LSA that could potentially enter the food chain and affect country foods in quantities sufficient to adversely affect human health. As discussed in Section 6.8.3, dredging for the Project may result in increased levels of suspended sediments, and may increase the likelihood of marine biota being exposed to contaminants. Typically about 1 percent or less of the total volume of dredged material is released to the water column (Shroeder and Ziegler 2004). Sediment sampling conducted as part of the EA process indicated that all metals concentration levels are well below the CCME PEL. Arsenic and copper levels in sediment are elevated above Canadian Council of Ministers of the Environment ISQG and Disposal at Sea screening criteria; this elevation appears to be of natural origin, given the observed presence in deep as well as shallow sediment.

The potential for shellfish to take up arsenic and copper and pass these metals on to humans has been considered. Shellfish are known to take up and bioaccumulate arsenic and copper from water and sediment sources over four to seven days, depending on the species and metal; however, shellfish also release (depurate) these metals (Campbell and Tessier 1996; Liao et al. 2008; Costa et al. 2009; Perwak 1980; Croteau et al. 2004). Depuration periods range from 7 to 14 days for arsenic and copper (Costa et al. 2009; Liao et al. 2008; Serafim and Bebianno 2009).

6.13.3.2 Change in Availability and Accessibility

Opportunities to harvest marine resources in a few locations, such as directly in front of the proposed terminal expansion, will be affected; however, existing restrictions already limit access to this area. Vegetative and wildlife resources will also be affected and will either be removed or inaccessible in the immediate Project area. However, the general availability/accessibility of country food in the areas adjacent to the existing terminal is not expected to diminish and alternative locations to harvest exist nearby. It is expected that harvesters will be able to reasonably continue their current use of country foods but may need to change the location of their harvesting practices to areas which are outside of the Project footprint.

Construction

Construction activities have the potential to alter or destroy vegetation, wildlife, freshwater and marine country foods. On-shore site preparation involves the removal of vegetation and creates new forest edges. Vegetation clearing will result in the direct loss of plants, herbs or berries that may currently be harvested within the Project footprint. The removal of vegetation can also degrade wildlife habitat and food resources. Forest edge habitats differ from the existing forested habitat and have the potential to attract or deter native wildlife species. Invasive plant incursions often coincide with the creation of forest edge habitat and can threaten local herb and shrub plants, which are valued by recreational and subsistence harvesters.

Construction of the Project will result in an alteration of freshwater habitat due to site clearing and grading, and will temporarily reduce available fish habitat, until compensation habitat is constructed.

In-water marine-dredging activities could lead to direct mortality of inshore fish and benthic invertebrates such as crabs, cockles, prawns and shrimp as a result of increased sedimentation and potential sediment smothering. Dredging will also remove eelgrass beds located within and adjacent to the terminal footprint.

Construction activities will involve restriction of access to both terrestrial and near shore marine habitats for local subsistence and recreational harvesters. It is understood that the proposed Project lands are not heavily used for food gathering activities by recreational and subsistence users (refer to Section 6.12 for current use by Aboriginal Groups).

Operations

Regular railway and facility operations, maintenance, and repairs to dock facilities have the potential to affect country foods during the Operations phase. This will occur as the terminal site will be fenced for security purposes, and harvesters will not be able to access the land. This will also occur as a result of the Fishing Exclusion Zone in effect within 100 m of a jetty or where it may directly interfere with navigation. Potential operational effects are expected to be limited to the marine portion of the LSA. Harvesters will continue to be forbidden to utilize the CN right-of-way for access, for safety reasons.

6.13.4 Mitigation

Mitigation for the changes to the availability of or access to Country Foods are presented in Sections 6.4 (Vegetation Resources), 6.5 (Wildlife and Wildlife Habitat), 6.7 (Freshwater Environment) and 6.8 (Marine

Environment). In general, construction BMPs related to vegetation, wildlife, freshwater, and marine resources can effectively mitigate potential adverse environmental effects on Country Foods. All Project-related effluents, such as batch plant effluents and solid and liquid wastes will be managed according to applicable regulations, industry standards, and best practices. In addition the public will be notified of the construction schedule and access restrictions will be posted on signs.

6.13.5 Residual Effects

Residual effects are those that remain after the implementation of mitigation and compensation measures. A summary of the anticipated residual effects is provided in the following paragraphs.

For Country Foods, a significant residual environmental effect is an effect that permanently alters the availability or quality of these resources within the assessment area, either physically, chemically, or biologically, such that natural recruitment would not re-establish the resource to its original level within several resource (not human) generations. A permanent effect cannot be offset by available mitigation measures.

Uptake and depuration of arsenic and copper is a naturally occurring process for shellfish in the vicinity of the Fairview Terminal, given the naturally elevated levels in sediment, slightly higher than the ISQG but well below the PEL. A small amount of sediment will be released during dredging, and will settle within days of cessation of dredging. Hence, shellfish will have a short term exposure to arsenic and copper, and will depurate these metals to pre-disturbance levels. The risk of human exposure through contamination of country foods (shellfish; fish) is considered to be low and manageable. The existing shellfish harvesting ban, described above, should routinely prevent collection of clams and cockles. While bioaccumulation of metals such as arsenic and copper by shellfish can occur, the depuration rates for these metals for common shellfish species are fairly short. A period of up to one month following dredging should be more than sufficient for shellfish to return to pre-disturbance conditions.

During construction, there will be unavoidable direct effects on crustacean (crab) and salmon rearing habitats and freshwater fish habitat. While juvenile life stages are not harvested, a reduction in rearing habitat may reduce locally available adults and food sources for other recreationally harvested species. However, the implementation of the Habitat Compensation Plan (as discussed in Sections 6.7 and 6.8) will ensure no net loss of these species or their habitat. Residual effects from construction activities are expected to be of moderate magnitude and local in geographic extent.

During operations, potential effects to Country Foods are expected to be low in magnitude and local in geographic extent.

6.13.6 Follow-Up and Monitoring

No follow-up programs are recommended. It is recommended that the public and stakeholder be notified in advance of access restrictions to the Project site (marine or terrestrial). Success of the HCP, which will be monitored, will ensure that country food resources are maintained in the area.

6.13.7 Government, Public and Aboriginal Comments and Proponent's Response

Health Canada provided comments on Country Foods, as they relate to the potential contamination of shellfish during dredging activities. Health Canada asked for additional information to clarify the level of risk related to shellfish contamination. The Proponents were able to provide supporting information that indicates that the risk of shellfish being: a) contaminated as a result of dredging activities, and b) being consumed by humans prior to depuration, is low.

The full list of comments, concerns and recommendations from provincial governments, federal authorities and public and Aboriginal consultations is included in the following two IR documents:

- Environmental Impact Statement Information Request Document (PRPA and CN 2011b)
- Mitigation Strategy Report Information Request Document, November 2011 (PRPA and CN 2011c)

These IR documents include the dissenting perspectives, Proponent responses, and commitments. Table 9-1 of this CSR also provides a detailed list of all of the Proponent commitments.

6.13.8 Conclusion on Significance of Effects

During this comprehensive study the RAs have considered those documents listed in Section 6.13. Assessment and significance conclusions were based on the criteria defined in Table A-2, in Appendix A. Based on the information summarized in this CSR and provided that the Proponents implement the mitigative actions as described, the Project will not likely result in significant adverse environmental effects to the availability of or accessibility to Country Foods.

6.14 Capacity of Renewable Resources

CEAA requires that comprehensive study reports "address the capacity of renewable resources that are likely to be significantly affected by the project to meet the needs of the present and the future" (section 16(2) (d)). Renewable resources on Kaien Island and in Prince Rupert Harbour include, but are not limited to, vegetation (forestry resources), marine, freshwater and wildlife resources. An adverse effect on these resources could result in a reduced capacity to support sustainable forestry, fishing, hunting, and trapping.

The effects of the Project on renewable resources are assessed throughout the CSR based on the details provided in the Proponents' EIS and associated TDRs (PRPA, CN 2009), the MSR (PRPA, CN 2011), and IR documents (PRPA, CN, 2011b). Renewable resources assessed included Vegetation Resources (Section 6.4), Wildlife and Wildlife Habitat (Section 6.5), Avifauna (Section 6.6), Freshwater Environment (Section 6.7), Marine Environment (Section 6.8), and Country Foods (Section 6.13). The effects assessment for each of these renewable resource VECs was conducted in accordance with the approved Scope of Assessment for the Project as well as EA methods that have been developed to satisfy the regulatory requirements of both CEAA and CPAEAR. The Project's potential effects on wildlife, aquatic and vegetation resources that support Aboriginal culture, health and traditional economy has been assessed and discussed in the chapter on Current Traditional Use by Aboriginal persons (Section 6.12).

Measures for significance were determined for each VEC based on the criteria defined in Table 5-1 (Section 5.6). The Scope of Assessment for the Project was reviewed by Aboriginal Groups and the public, as well as by the Responsible Authorities, and the Aboriginal Groups have had ongoing input to the Project through the Working Group established by the CEA Agency for the Project.

After consideration of the Project's design and Project-specific mitigation measures proposed in the CSR, it was concluded that Project activities would not result in significant adverse environmental effects for any of the renewable resource VECs described above.

As there are no predicted significant adverse effects on any renewable resources that may be affected by the Project, the effect of the Project on the capacity of these renewable resources is not significant.

6.15 Effects of the Environment on the Project

CEAA's definition of an environmental effect includes any change to the Project that may be caused by the environment. The Proponents provide background information on environmental factors deemed to have possible consequences on the Project in Section 20.0 of the EIS. Additional details on proposed mitigation measures are provided in the Design Criteria for Phase 2 Terminal Expansion report prepared by Westmar (2006) (EIS, Volume II) and updated by CGR (2011).

6.15.1 Background

The assessment of the Effects of the Environment on the Project included identifying the environmental factors deemed to have possible consequences on the Project, the likelihood and severity of their occurrence, and the mitigation measures planned to minimize their impact. The environment in which the Project is located may have minor effects (e.g., inconveniences) to more profound effects (e.g., causing the operations to cease for some period). Depending on the type and scale of the environmental event, one or more components of the Project could be affected, including the berth and berth approach; intermodal and storage yards; and CN sidings and wye.

6.15.2 Potential Effects on the Project and Mitigation

During the EA process the following four key types of environmental factors that could potentially affect the Project were identified:

- Slope instability
- Extreme weather
- Seismic activity and tsunamis
- Climate change and sea level rise

A summary of the above listed potential Effects of the Environment on the Project are provided in the following paragraphs.

6.15.2.1 Residual Effects Rating Criteria

For the Effects of the Environment on the Project, a significant residual environmental effect would be one that results in a long term interruption in service or major damage to infrastructure. Additionally, a significant effect of the environment on the Project would be one that resulted in a significant adverse residual effect to any of the VECs, based on their individual significance criteria.

6.15.2.2 Slope Instability

The Project will require substantial excavation and blasting of the existing hillside. Large volumes of rock cut and fill are expected. The geotechnical investigations and analyses indicate that the existing hillside is susceptible to landslides. The upper layers of soil typically consist of surface organic materials and/or landslide debris comprised of mixed silts, organics, sands, gravels, and boulders with wood. The lower layers of soil typically consist of glacially deposited sandy soils with varying amounts of silt and gravel. In some cases, these soils cover a layer of dense glacial till and bedrock.

Effects of Slope Instability on the Project

A 1-in-500 year event landslide, referred to as a design landslide, was considered in this analysis. Without mitigation the debris from a design landslide could potentially extend across the intermodal and storage yards and would likely affect Terminal operations. The rail tracks, equipment, and Terminal facilities could be damaged, resulting in a suspension of operations until debris could be removed and facilities and equipment repaired.

Mitigation Measures

Landslide mitigation measures incorporated into the Terminal design include construction of landslide barriers and catch ditches. These barriers and catch ditches are designed to capture and contain debris from a design landslide event before the debris reaches the occupied areas or the area for the proposed Terminal facilities (Westmar 2006; EIS Volume II; CGR 2011). There is approximately a 10% probability of exceeding the design landslide in 50 years (Westmar 2006; EIS Volume II). Landslide containment and diversion channels will be detached from the Terminal facilities. With this arrangement, the Terminal will not be substantially affected during design landslide events or from surface runoff flooding. A continuous catch ditch or barrier wall is proposed to contain open slope debris flow. A lock block barrier wall filled with rock and reinforced geogrid will be located at the north end of the Project site, approximately 20 m from the toe of the existing rock cut slope. Since the barrier will inhibit surface runoff from cascading down the existing rock face to the existing (Phase 1) east drainage ditch at the Terminal level, a catchment ditch to the east of the barrier will be provided and discharge into the proposed Phase 2 catch ditch. Landslide debris flows in K Creek are anticipated and mitigation measures consisting of catch basins have been incorporated into the Project design. Shoring and drainage measures will be implemented to stabilize the overlying overburden materials where necessary.

6.15.2.3 Extreme Weather

For the purposes of this report, extreme weather includes wind, waves and rainfall. Severe weather has the potential to damage the Terminal and berthed vessels and can make working conditions hazardous, resulting in temporary Terminal closures.

Effects of Extreme Weather on the Project

The Fairview Terminal channel is part of a U-shaped fjord that is partially sheltered from the oceanic influence of Chatham Sound by Digby Island, although some wave action can enter from the south. The predominant wind direction in the area is from the southeast, blowing off-shore for 10 months of the year (August to May) (Westmar 2005). However, in June and July westerlies predominate. The average wind speed is approximately 14 km/hr in the winter and 10 km/hr in the summer. The maximum hourly wind speed ever recorded is 93 km/hr, which occurred in October 1964. The Project site is protected from waves from the open ocean to the east, but is exposed to waves generated by winds blowing over fetches in the channel to the south of the site, and within Prince Rupert Harbour to the north (Westmar 2005). In addition, a portion of the waves generated over the eight nautical mile (11 km) fetch to the south of the channel travel to the Project site. Extreme winds can produce high waves, dense blowing sea foam, heavy tumbling of the sea and poor visibility, all which can make on and off shore working conditions hazardous, resulting in temporary Terminal closure. High winds and heavy seas at low temperatures can cause freezing snow and spray conditions which are most likely to occur between November and April. Safe working conditions aboard a vessel or at the Terminal can be impeded by freezing spray.

Extreme rain events can result in stoppages of outdoor work when it creates unsafe working conditions. Unsafe working conditions will be determined by the Project manager or site supervisor. No adverse effects of extreme weather are anticipated on CN operations, unless the extreme weather resulted in a landslide, grade failure or effect to the track or grade structure.

Mitigation Measures

Rain is an expected work condition and the construction schedule will allow for reasonable rain delays. The Project EMP will include provisions for site drainage; sedimentation and erosion control will be designed to ensure that structural loadings in the event of extreme rain do not put facility structures at risk. Vessels will dock and undock only if weather conditions are within the design criteria. The Project EMP will include provisions for site drainage; sedimentation and erosion control will be designed to ensure that structural loadings in the event of extreme rain do not put facility structures at risk. Vessels will dock and undock only if weather conditions are within the design criteria. Wind speeds for various directions and return periods, based on the data from the Prince Rupert Airport, have been used to determine wind forces on container ships and to design the mooring points. Down time (percentage exceedance) due to a 35 knot gust is anticipated to be 2 percent in winter, spring and fall, and 0.1 percent in summer. Terminal design will account for extreme weather conditions (i.e., wind, waves, rain) where possible, through the use of applicable codes and standards that will take into account the region's climate. Additionally, extreme weather events that do occur are expected in frequencies as low as 1-in-30 years or 1-in-50 years (Westmar 2006; EIS Volume II; CGR 2011). Significant wave heights have been set at a maximum of 1.6 m from the south for a 30-year return period, and 1.8 m for a return period of 50 years. Given the anticipated low frequency of such events, it is expected that the Terminal, with the appropriate design standards, will be capable of withstanding these infrequent extreme weather events. The Project will be constructed to meet extreme weather criteria identified in the National Building Code.

6.15.2.4 Seismic Activity and Tsunamis

Western Canada experiences higher than average seismic activity due to its location near some major plate tectonic boundaries. The Juan de Fuca Plate (in the vicinity of Vancouver Island) is currently moving eastward beneath the North American Plate upon which most of Canada rests, while the Pacific Plate is moving north-westward along the edge of the North American Plate in the vicinity of the Queen Charlotte Islands. The Queen Charlotte-Fairweather Fault, which lies west of the Queen Charlotte Islands, takes up most of the movement, which is estimated at 6 to 7 mm/yr (Mazzotti et al. 2003). It is quite possible that some of the movement is also convergent (with the Pacific Plate sliding beneath the North American) (Mazzotti et al. 2003). These movements cause ongoing small earthquakes, and rarely, earthquakes that are of significant enough magnitude to cause damage to buildings and infrastructure in nearby towns. As it is not possible to accurately predict when large earthquakes might occur, it is important that Project proponents along the west coast of Canada be prepared for such events. Between 1965 and 1991 there were approximately five earthquakes in proximity to Prince Rupert (east of Graham Island and west of Terrace). Of these, four were between 3.0 and 4.9 on the Richter scale (Energy, Mines and Resources Canada 1994), with epicentres near Terrace (2), Hecate Straight south of Dixon Entrance (1), and west of Porcher Island (1). One earthquake was greater than 6.5 on the Richter scale, with the epicentre in Hecate Straight, south of Dixon Entrance. In 2001, a magnitude 6.3 earthquake occurred just east of the Queen Charlotte-Fairweather Fault (Rogers et al. 2002), and was felt in the Prince Rupert area.

Effects of Seismic Activity on the Project

All Project components could be affected by a seismic event, although the wharf would likely sustain the greatest impact. Construction of the Project will primarily comprise of general fill contained by a perimeter berm and wharf structure. The seabed deposits underlying the general fill, the general fill below the water level, and the seabed outside of the perimeter berm will not be densified. These areas are susceptible to liquefaction during a seismic event. The perimeter berm and its supporting seabed will be densified to prevent liquefaction. Consequently, a contained field of potentially liquefiable soil exists both within the planned infill region (southern expansion) and just outside of it on the ocean side. An earthquake of significant magnitude could lead to permanent lateral ground movement and the liquefaction of these sediments. Liquefaction itself could lead to settlement and/or damage to the infrastructure. Seismic motion may also cause subsidence or uplift in the area due to the relative movement of the tectonic plates. As most motion is taken up by the Queen Charlotte-Fairweather Fault, it is unlikely that significant subsidence/uplift will affect the Project Site. The potential effects of seismic activity on the CN portion of the Project are slope failure, landslide, grade failure or other track failure affecting the track grade or track structure.

Mitigation Measures

Seismic activity off the west coast of British Columbia is presented by the 2005 National Building Code of Canada (NBCC 2005) seismic hazard model, where seismic hazard is computed for appropriately selected return periods and seismic performance criteria. The NBCC (2005) seismic model is the 4th generation model, which has revised the seismic zones by using a current earthquake database, refined recurrence statistics for the earthquake populations, new ground motion relationships derived from current empirical earthquake data and the introduction of spectral ground motion parameters. The Project's wharf structure, berm and other supported structural works will be designed by taking the following seismic event performance criteria into account:

- A 1-in-100 year seismic event has a 40 percent probability of exceedance in 50 years, which is the Project's lifespan. If this type of event occurred, it is expected there would be minor, easily reparable damage and full operation would be restored almost immediately.
- A 1-in-475 year seismic event has a 10 percent probability of exceedance in 50 years, which is the Project's lifespan. If this type of event occurred, the Terminal and rail line would potentially require rail realignment and repairs to crane beam joints to become fully operational again.
- A 1-in-2,475 year seismic event has a 2 percent probability of exceedance in 50 years, which is the Project's life span. If this type of event occurred, it is expected that there would be no structure collapse; however, damage may not be economically feasible to repair.

Landside and waterside crane rails will be tied together to maintain rail gauge following a seismic event. Peak Horizontal Ground Acceleration values for the 100, 475 and 2,475 year return periods. Seismic design for the Phase 2 development is governed by the 2005 NBCC document; however, for consistency with the Phase 1 design, the higher 100 and 475 year Peak Horizontal Ground Acceleration values from the 1995 NBCC will be adopted.

Should a seismic event occur, liquefaction is anticipated within the confines of the berm, in the undensified seabed overburden below the general fill, within the undensified general fill, and just outside of this fill area. Liquefaction will be mitigated by permitting controlled levels of movement of the densified perimeter berm seaward during an earthquake. This global movement of the site is a substantial design concern and relative movement between key regions is most critical. Allowable permanent seaward displacements of marine structures will be designed to match those expected for the Phase 1 marine structures and will gradually increase to tolerable maximum values at the south end of the site. The Phase 2 wharf structure will have design movements, both during and following a seismic event, similar to the Phase 1 wharf structure. The apron structure attached to the existing caissons in the Phase 1 terminal conversion was designed to move with the caissons during a seismic event. The original caissons have been estimated to move seaward up to 150 mm temporary and up to 100 mm permanent following the 1-in-475 year 1995 NBCC design earthquake event. The Phase 2 berth structure, also comprised of caissons, will be designed to move similar to the Phase 1 structure under the 1 in 475 year seismic event. This will ensure that differential movements will be minimized between the two structural systems. Under the 1-in-2,475 year 2005 NBCC design earthquake event, displacements will be in the range of 1 to 2 m (Westmar 2006; EIS Volume II; CGR 2011).

Beyond the south end of Berth No. 2, the displacement criteria for the containment berm will be relaxed to permanent seaward displacements of up to 500 mm under the 1-in-475 year 1995 NBCC earthquake event and in the order of 1 to 2 m under the 1-in-2,475 year 2005 NBCC earthquake event.

Effects of a Tsunami on the Project

The seismic activity of the region may also result in tsunami risk. Tsunamis can be generated by earthquakes, offshore asteroid impacts, landslides or submarine landslides. The largest tsunamis tend to be caused by earthquakes with offshore epicentres (Bobrowsky 2001). Even distant earthquakes can generate tsunamis that reach the coast of British Columbia (Clague et al. 1994). While Digby Island and other coastal islands provide some protection for the Project site from tsunami waves travelling in a northeastward or southeastward direction, a wraparound effect of waves around the islands (refraction and diffraction) must be considered, as most tsunami waves reach the area from other angles. The wrap around effect may decrease the amplitude of the waves, resulting in lower run-ups at the Project area; however, it could also increase or maintain wave amplitude if the geometry of the basin over which the waves refract is of a particular shape and depth. The 2001 earthquake off the west coast of the Queen Charlotte Islands generated a small tsunami that produced a run-up of 20 cm on Vancouver Island (Rogers et al. 2002). Run-ups of up to 20 m above sea level have been predicted for some parts of coastal British Columbia (Bobrowsky 2001), but run-ups of up to and over 10 m above sea level are considered most common (Dorner and Wong 2003). Thus, a potential tsunami with a run-up of 10 m in height must be considered for mitigation purposes. Tsunamis are also commonly known to flow onto land like rivers, unlike typical ocean waves. The potential effects of run-up caused by a tsunami on the Terminal and CN grade would include erosion and flooding, the resultant effects would be slope failures and landslides.

Mitigation Measures

Design wave heights account for significant waves in 30 and 50 year return periods (as discussed in Section 6.15.2.3). In the event of an earthquake that is expected to generate a tsunami, or where a tsunami warning is issued, it is expected that the Terminal will be secured to the greatest extent possible, and evacuated.

6.15.2.5 Climate Change and Sea Level Rise

Increasing concentrations of greenhouse gases in the atmosphere are believed to be causing global warming (IPCC 1990; IPCC 1995). Increased temperatures may contribute to a sea level rise. Although estimates vary, a global sea level rise is expected to be +0.5 m by 2100 (Wigley and Raper 1992; IPCC 1995; Forbes et al. 1997). Other atmospheric changes relating to climate change may include increased storm intensity and other changes relevant to coastal stability such as surface winds, ocean waves, storm surges, and ice conditions (Forbes et al. 1997).

Effects of Climate Change and Sea Level Rise on the Project

Rising sea levels have prevailed on the British Columbia coast, with the exception of the western coast of Vancouver Island, for the past 95 years (Natural Resources Canada 2004). However, these rising levels have been offset by the effects of tectonic uplifting and the relative mountainous character of the British Columbia coast. The effect of potential climate change on the Project was assessed qualitatively following the guidelines for Incorporating Climate Change Considerations in Environmental Assessments (The Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment 2003). It is based on an analysis of predicted changes to present climate sufficient to conclude whether or not there is a risk to the public or the environment. The sensitivity of various phases of the Project to these predicted climate parameter changes was ranked. These rankings reflect the potential effect of climate change on the Project in terms of operational productivity or whether additional environmental management is required. Project sensitivity during Construction phase is ranked as nil to low because weather conditions are likely to affect transportation of materials and construction activities only over the short period of time between approval and completion of construction. Project sensitivity to changes in weather conditions due to global climate change during operations is low overall. An increase in average air temperature and in the number of high-temperature days has little potential for a negative effect on the Project. An increase in sea level and winds may affect both the jetty and the land-based infrastructure. An increase in storms may introduce weather delays in ship berthing and unloading but is well within the time-frame tolerance. Fairview Terminal has an operating history in the region and is familiar with extreme weather events relative to operation of an industrial facility. The Fairview Terminal Phase II Expansion Project will be constructed to meet extreme weather criteria identified in the National Building Code.

Project sensitivity to direct and indirect climate influence during decommissioning is ranked as low overall based on the assumption of remediating the site to a non-industrial land use following the life of the facility. The nature and the success of re-vegetation activities at the site will depend on climate conditions at that time.

Mitigation Measures

The design of the structures incorporates an adequate factor of safety to address changes in weather severity during the lifetime of the Project (as discussed in Section 6.15.2.3, above), including storms and sea level rise associated with climate change.

6.15.3 Follow-Up and Monitoring

Follow-up and monitoring has not been recommended for the Effects of the Environment on the Project.

6.15.4 Government, Public and Aboriginal Comments and Proponent's Response

No substantial comments were received regarding the effects of the environment on the Project.

The full list of comments, concerns and recommendations from provincial governments, federal authorities and public and Aboriginal consultations is included in the following two IR documents:

- Environmental Impact Statement Information Request Document (PRPA and CN 2011b)
- Mitigation Strategy Report Information Request Document, November 2011 (PRPA and CN 2011c)

These IR documents include the dissenting perspectives, Proponent responses, and commitments. Table 9-1 of this CSR also provides a detailed list of all of the Proponent commitments.

6.15.5 Conclusions on Significance of Effects

During this comprehensive study, the RAs have considered those documents listed in Section 6.15. Based on the information summarized in this CSR, and provided that the Proponents implement the mitigative strategies applied through design criteria and the EMP, the potential Effects of the Environment are not likely to result in significant adverse effects on the Project.

6.16 Accidents and Malfunctions

CEAA and CPAEAR require the assessment of the environmental effects of any potential accidents or malfunctions that may occur in connection with the construction and operation of a project. This section presents the Project components where accidents and malfunctions could occur; assesses the risk to the environment; and identifies the need for environmental management, spill response or emergency response plans. Additional details on accidents and malfunctions as they relate to the Project are provided in the Proponents' EIS (EIS Vol. 1 [Section 21] [PRPA, CN 2009]) and MSR (Section 3.14; PRPA, CN 2011).

6.16.1 Background

Accidents and malfunctions that may occur during construction, operation, and decommissioning of the Project have the capacity to affect the environment. The most common type of accident or malfunction resulting in a potential environmental effect is a small spill during construction or operation. The credible worst-case accident is a fuel or engine oil release into the environment from train derailment or ship accident. The Proponents have committed to addressing the potential for accidental events and malfunctions and resulting environmental effects in the overall Emergency Response Plans for the Project.

6.16.2 Potential Project Effects

In accordance with the Scope of Assessment, this section of the CSR focuses on "…consideration of the effects of chronic oil releases as well as catastrophic fuel and engine oil releases upon fish and wildlife and associated habitats, as well as the effects of an accidental train and cargo derailment resulting in the loss of cargo, diesel fuel and engine oil into the freshwater and/or marine environment." Based on the requirements of the Scoping Document, the risks of several potential accidental scenarios that could affect the environment have been assessed, including:

- Hazardous materials spills (including fuel, oil, hydraulic fluid, concrete) or ignition of spilled fuel
- Spills of containerized material onto land or into water
- Train derailments adjacent to the Skeena River

6.16.2.1 Hazardous Materials Spill

Small Scale Releases of Hazardous Materials

Fuels, lubricants, concrete and general process chemicals, including paints and solvents, will be used, or stored in small quantities, during all Project phases. Additional material substances such as drilling mud, concrete wash water, and de-greasers may also be found on site. Accidental releases of hydrocarbons (i.e., fuel, oil, hydraulic fluid) could occur during all Project phases, including maintenance activities. Other potential scenarios for release of a hazardous material include accidental releases during materials transfer (e.g., fueling a vehicle or jerry can), rupture of a hydraulic line, or a vehicle accident.

Credible Worst-Case Releases of Hazardous Materials

Background

Container vessels bound for Fairview Terminal transit east from Triple Island to Kaien Island. Triple Island is 37 km west of Kaien Island. The shipping route between Triple Island and Fairview Terminal represents the spatial boundary for the assessment of potential accidents and malfunctions involving marine vessel collisions for the Project. Every ship that is over 350 gross tons is subject to compulsory pilotage from Triple Island.

No bulk fuel transport (oil, chemical or liquid natural gas) occurs between Triple Island and Prince Rupert Harbour. The development of oil and liquid natural gas terminals in the Kitimat, British Columbia area will likely increase the number of bulk vessels traveling along the north coast of British Columbia; however, these vessels will pass to the west of Triple Island and will not overlap with Fairview vessels transiting between Triple Island and Prince Rupert Harbour. Marine accidents involving bulk fuel vessels (e.g., oil and liquid natural gas tankers) are not considered a credible risk in the assessment.

Accident Scenario: Vessel Collision

Bulk cargo vessels transporting grain, coal, logs, wood pellets, wax and containers regularly transit between Triple Island and Prince Rupert Harbour. Accidents involving these vessels could result in the release of hazardous materials to the environment (typically a release of fuel oil). Container and bulk container vessels, such as those bound for Fairview Terminal, typically carry only the fuel needed to operate. Table 6-6 provides a summary of the typical bunker capacities of container vessels.

Table 6-6 Typical Bunker Capacities—Container ships

Description	1,500 TEU[1]	Panamax (5,000 TEU)	Post-Panamax (12,000 TEU)
Deadweight Tonnes	20,000	45,000	75,000
Heavy Fuel Oil (m^3)	2,000	5,600	7,600
Diesel Oil (m^3)	200	330	430

NOTES:
[1] TEU = 20 Foot Equivalent Units
Data from: Michel and Winslow (1999)

The credible worst-case scenario developed for the Fairview Project is a bulk freighter (or similar vessel) transiting past Fairview Terminal (not a Fairview-bound vessel), losing steerage and colliding with a container ship berthed at Fairview Terminal, puncturing one of the container ship's fuel tanks.

In order for the worst-case scenario to occur, the multiple steering systems found on container vessels would have to fail. If this occurred, a British Columbia Coast Pilot would embark and all efforts would be made to slow the ship's speed or to bring the ship to a stationary position in the channel. In all likelihood, any impact between the incoming vessel and the berthed container ship would be at a minimal speed; in this case it is reasonable to expect only isolated damage to the fuel tank of the berthed vessel. In the event that the pilot is unable to slow or stop the incoming vessel, then the potential exists for one of the berthed vessel's fuel tanks to be punctured, triggering the responses described in the 2009 EIS.

In a worst-case scenario, a Post-Panamax vessel (75,000 DWT) would be involved in an accident such that all of its 7,600 m^3 heavy fuel oil and 430 m^3 diesel oil would be released into the marine environment. This scenario is considered extremely unlikely because container vessels typically have several segregated, protectively located fuel tanks. For the entire capacity of fuel to be lost, an accident would have to occur in such a manner as to puncture all of the ships fuel tanks.

6.16.2.2 Spill of Containerized Material on Land or in Water

Containers are designed for the direct transfer of a unit and its contents to and from ocean-going vessels. During the life of the Project a container could overturn during transportation to or from the container yard, due to the potential malfunction of ship-to-shore gantry crane, reach stackers, or top pick, and release all or part of its load. Examples of materials shipped in containers include: automobiles, furniture, refrigerated food items, green coffee beans and cocoa beans, and electronics (Maher 2007, internet site). Containers could also contain possible hazardous materials (lighters, seat belt tensors, sodium persulfate, batteries, resin, paint, and aerosols). Components of the environment most likely to be affected by a spill of containerized material on land or in water include avifauna, the marine environment, country food resources, and Aboriginal current traditional use areas.

6.16.2.3 Train Derailment at the Skeena River

There is the potential for hazardous materials to be introduced into the Freshwater Environment (e.g., the Skeena River), as a result of a train derailment. The Fairview Terminal rail service generally transports non-hazardous public consumer goods such as household products, including electronics, foods, and clothing. The proportion of containers anticipated to carry dangerous commodities is 5 percent (Luanne Patterson, pers. comm., 2009). Typical dangerous commodities transported via service include lighters, seat belt tensors, sodium persulfate (bleaching agent), batteries, resin, paint, and aerosols. The locomotive engines themselves typically carry 4,500 gallons (17 m^3) of diesel, 300 gallons (1 m^3) of lube oil, seven gallons of compressor oil, some amounts of various greases, and lead acid batteries. Therefore a credible worst-case scenario, and the one used for the purposes of this assessment, is two engines derailing onto the banks of the Skeena River, resulting in the complete release of all diesel and lube oil directly into the river. The spatial boundary for this assessment extends from the Fairview Terminal to Mile 97 Bulkley Subdivision, at or near the rail intersection with Lorne Creek, east of Kitselas traditional territory.

A spill under the above scenario could cause a temporary degradation of water quality and could have subsequent lethal and/or sub-lethal environmental effects on freshwater fish, aquatic invertebrates and fish habitat capacity in the local area. Sub-lethal environmental effects could include avoidance behaviour and disruption of feeding, spawning and migration patterns. A derailment resulting in an engine or container entering the river or riparian area could cause temporary physical damage to freshwater and fish habitat.

6.16.3 Mitigation

The Proponent has identified a number of general measures, summarized in Table 6-7 and described further in the EIS (Section 21), that are designed to reduce or eliminate the likelihood of an accident or malfunction occurring. The mitigation measures and commitments outlined by the Proponent are expected to reduce the potential environmental effects of accidents and malfunctions. The PRPA, as one of the Project Proponents for the EA, will contractually bind the Terminal Operator to the mitigation proposed.

Table 6-7 General Measures to Address Potential Accidents and Malfunctions

Mechanism	Mitigation and Contingency
Small-scale Spills of Hazardous materials spill (including fuel, oil, hydraulic fluid, concrete etc.) or ignition of spilled fuel	▪ All land-based equipment will be regularly inspected and properly maintained by the Terminal Operator ▪ Spill containment measures will be in place ▪ Construction management plans will include hazardous materials storage and handling procedures ▪ Ensure that individuals who use material substances and/or equipment on the Project site recognize the hazards and environmental consequences associated with their use ▪ Drainage water will pass through oil interceptors or sumps (for the terminal) ▪ Storage of hazardous materials near watercourses will be prohibited, and restricted near sensitive habitats ▪ Designated refuelling areas will be established, and will be a safe distance from fish habitat and ignition sources ▪ Ensure that contingency plans are in place: Hazardous Spill Contingency Plan, Oil Pollution Emergency Plan, PRPA Hazardous Materials Action Plan, Terminal operators' Spill and Emergency Response Plan ▪ All employees will be trained to respond to hazardous materials spills, and to operate basic fire protection equipment
Spill of containerized material on land or in water	▪ All transfer equipment will be regularly maintained ▪ Speed limits will be observed and enforced for all roads ▪ Where appropriate, personnel will complete appropriate emergency response and spill contingency training, and will be trained in the operation of emergency response equipment ▪ Containerized materials will be properly secured, and regularly checked to ensure efficient hold ▪ All marine vessel traffic entering, within, or leaving the Port will be managed by PRPA, CCG Marine Communication and Traffic Services, and the Pacific Pilotage Authority ▪ Any vessels over 350 gross tons will require pilotage ▪ Ensure the PRPA Emergency Plan is in place and implemented ▪ Appropriate operations personnel will be trained to respond to hazardous

Mechanism	Mitigation and Contingency
	materials spills, and to operate basic fire protection equipment
Train Derailment at the Skeena River	▪ Equipment will be inspected and properly maintained to reduce likelihood of potential malfunction ▪ Transported goods will be primarily non-hazardous consumer products ▪ Train speed limits will be observed and enforced ▪ National and international engineering codes and standards will be followed including the Manual for Railway Engineering ▪ Agreements with Western Canada Marine Response Corporation (WCMRC; formerly Burrard Clean) to respond to an incident as necessary. WCMRS is equipped to respond to hydrocarbon spills, however, they have a strategic alliance with Quantum Murphy who can respond to a hazardous material emergency other than hydrocarbon ▪ Ensure that CN's Emergency Response Plan is in place and implemented ▪ Ensure that spills are reported in accordance with the protocols and procedures set out by the Provincial Emergency Program, CN's Emergency Response Plan, and the PRPA's Practices, Procedures and Policy Emergency Plan
Vessel Collision at Fairview Terminal	▪ Vessel traffic within Price Rupert Harbour is coordinated and well managed. This includes designated shipping routes, tug escorts, mandatory pilotage of large vessels, and other Port procedures and navigation aids ▪ Ensure the following plans and procedures are in place: PRPA Harbour Operations Practices and Procedures; Oil Pollution Emergency Plans for container vessels and other shipping vessels; PRPA Emergency Plan; PRPA Hazardous Materials Action Plan ▪ Ensure the PRPA Emergency Plan and Hazardous Materials Action Plan are updated annually ▪ Develop and implement an Emergency Response Management System ▪ Continue mandatory pilotage (British Columbia Coast Pilots) for large vessels ▪ Implement and enforce vessel speed limits ▪ Appropriate operations personnel are trained on spill response and clean up ▪ Proximity of WCMRS (government certified company specializing in fuel containment and clean up) to Fairview Terminal. WCMRS is equipped to respond to hydrocarbon spills, however, they have a strategic alliance with Quantum Murphy who can respond to a hazardous material emergency other than hydrocarbon ▪ Appropriate operations personnel will be trained to respond to hazardous materials spills, and to operate basic fire protection equipment ▪ The PRPA will meet with Coastal Aboriginal Groups to discuss ways of improving communications to keep the Aboriginal Groups appraised of the PRPA's emergency preparedness efforts and associated responses. Discussion could eventually lead to a representative of the Aboriginal Groups attending the established Prince Rupert Port Security and Emergency Preparedness Committee, chaired by the PRPA

Alterations or disturbances to habitat that are the result of an accident or malfunction would be assessed in conjunction with the appropriate government agencies, and habitat compensation would be provided where required.

6.16.4 Residual Effects

Residual effects are those that remain after the implementation of mitigation (including design measures and BMPs), contingency/emergency response, and compensation measures.

6.16.4.1 Residual Effects Rating Criteria

The potential environmental effects of Accidents and Malfunctions on each VEC were assessed based on the significance criteria as defined for each VEC (Table 5-1, Section 5.6).

6.16.4.2 Hazardous Materials Spill or Ignition of Spilled Fuel

Small-scale Releases of Hazardous Materials

Environmental effects resulting from most small hazardous material spills are not expected to result in significant residual effects; that is, they are not likely to alter marine, freshwater or terrestrial habitats within the assessment area in quality or extent, in such a way as to cause a change or decline in the ecological function of that habitat. Nor are any effects expected to result in a change or decline in the distribution or abundance of a population that is dependent upon that habitat, such that natural recruitment would not re-establish the population to its original level within two generations.

Reasonable Worst-Case Release of Hazardous Materials

Between 2006 and 2010, the following vessel call statistics applied for Prince Rupert Harbour (all Ports of Call) (Table 6-8).

Table 6-8 Vessel Call Statistics for Prince Rupert Harbour

Vessel Calls	2006	2007	2008	2009	2010
Prince Rupert Harbour	215	261	281	311	380

NOTES:
Numbers include cruise ships and grain, coal, log, wood pellet, slack wax, and container vessels (container shipments began in 2007).

In addition to the bulk and containerized vessel traffic, there are approximately 50 cruise ships that transit through Prince Rupert Harbour each year (25 northbound, 25 southbound).

For the period of 1998 to 2008, there were six reported incidents involving marine vessels in the Prince Rupert area. Details of these incidents are presented in Table 6-9.

Table 6-9 Marine Vessel Incidents in the Prince Rupert Area

Date	Location	Incident Type	Ship Type	Gross Tonnage	Damage Severity
9-Apr-1999	SE of Kinahan Islands	Grounding, Taking Water	Bulk Carrier	87,803	Extensive
20-Mar-2000	Prince Rupert	Grounding	Bulk Carrier	20,433	Considerable
18-Jun-2001	Duncan Bay	Striking	General Cargo and Container	30,745	Minor
6-Jan-2004	Lucy Island, Chatham Sound	Capsize	Barge	1,617	Extensive
10-Sep-2005	Prince Rupert Harbour	Striking	Passenger	50,764	Minor
11-Mar-2008	Prince Rupert	Taking Water	Barge	4,411	Considerable

SOURCE:
Transportation Safety Board of Canada Marine Statistics (2009): http://www.tsb.gc.ca/eng/stats/marine/index.asp

Of the six reported incidents, one involved a container vessel. In this case, the vessel sustained minor damage as a result of incident, which was a striking (a hard impact with a stationary object or a vessel not under way).

As indicated in Table 6-9, the last recorded incident involving a container vessel in the Prince Rupert area occurred in 2001. Considering the number of vessels that call on the Port of Prince Rupert every year (see Table 6-8), the incidence of vessel collisions is extremely low.

Although the Canpotex Export Potash Terminal and Ridley Terminals Inc. Projects are likely future projects, consideration of the potential interaction between the Fairview Project and those projects is provided here. At the time of the 2009 EIS, details regarding the proposed Ridley Terminals Inc. (RTI) and Canpotex Export Potash Terminal (Canpotex) were unknown. Vessel numbers for these two projects are now anticipated to be:

- RTI: 125 to 240 vessel calls per year to Ridley Island (2011 through 2017), or 2.4 to 4.6 per week
- Canpotex: 130 to 150 vessel calls per year to Ridley Island (though 2017), or 2.5 to 2.8 per week

Because of their coal and potash cargo, vessels calling on RTI and Canpotex terminals (coming in from Triple Island) will either go directly to berth on Ridley Island or will anchor in the outer harbour. Normally, these vessels (RTI, Canpotex) would not enter the channel and access the inner harbour. The inner harbour will be used to inspect grain ships at anchor and to take container ships calling at Fairview. From a marine traffic control perspective, the Fairview, RTI and Canpotex vessels will be passing each other in the outer harbour and to and from the Triple Island Pilot Station, as one proceeds inbound, the other outbound.

Given the above, any vessels bound for RTI or Canpotex terminals will not be transiting past Fairview Terminal. Therefore there is virtually no opportunity for a Canpotex or RTI vessel to collide with a Fairview container vessel at berth at Fairview Terminal.

Canpotex, RTI, and Fairview vessels are all subject to the same rules and regulations regarding pilotage and traffic management. There has been a recent change in Operating Procedures related to the anchoring of coal and potash vessels. Because of the anticipated increase in marine traffic, normally only grain ships that require Canadian Food Inspection Agency or Transport Canada inspection and certification before loading out now enter the inner harbour to anchor for inspection. Under normal operations, PRPA will keep coal and potash vessels in the outer harbour anchorages. However, there may be occasions when either of these classes of vessels may enter the inner harbour for a sheltered anchorage to effect repairs, for example, but normally they will remain in the outer anchorages. This change is instituted by the Port of Prince Rupert Harbour Master. While the Port of Prince Rupert will experience a net increase in vessel traffic with the operation of projects such as Fairview, Canpotex and RTI, the number of vessels transiting past Fairview Terminal is not anticipated to increase, as the potash and coal vessels will not enter the inner harbour.

PRPA is also working with the Canadian Coast Guard to enhance and improve marine traffic control by implementing AIS and radar to the marine approaches. PRPA has commissioned Det Norske Veritas to complete an update of its marine risk assessment. Results of this study to date indicate that the Port of Prince Rupert is one of the lowest risk ports on the west coast (G. Paulson, pers. comm. 2011).

Residual Effects

Although the number of vessels calling on Fairview Terminal is anticipated to be higher than what was presented in the 2009 EIS, up to 14 vessels per week under full build-out rather than 10, the cumulative risk as a result of vessel interactions in the vicinity of Fairview Terminal (i.e., within the inner harbour) remains unchanged from 2009 predictions.

The cumulative risk of incident in the outer harbour (i.e., in the vicinity of Triple Island) is higher with the addition of projects such as Fairview, Canpotex and RTI. However, traffic management systems (e.g., pilotage) will be adapted to ensure an acceptable level of navigation safety, such as adding pilots and pilot boats, and adding additional anchorages as needed. The appropriate authorities (e.g., Prince Rupert Harbour Master, Transport Canada) will need to determine the required level of safety systems to ensure risk is managed to acceptable levels under all conditions.

The potential exists for a significant effect to Avifauna as a result of a worst case release of hydrocarbons into the marine environment. Effects could potentially alter the marine environment within the assessment area in such a way as to cause a change or sudden decline in the ecological function of that habitat. Effects could also result in a change or decline in the distribution or abundance of an Avifauna populations that is dependent upon that habitat, such that natural recruitment would not re-establish the population to its original level within two generations.

However, with the application of the mitigation as outlined, and in consideration of the historical data and operational procedures in place, the likelihood of a significant adverse residual environmental effect is very low.

6.16.4.3 Spill of Containerized Material on Land or in Water

Containerized materials spills in the Marine Environment could be more challenging to contain than those on land and could result in the contamination of shoreline habitat, depending on the material spilled. The extent of such effects would depend on factors such as the nature of the substance, location of the accident, timing of the accident (e.g., during peak migration) and environmental conditions (e.g., offshore winds, tidal conditions, currents, etc.). Experience with similar marine terminal projects in other locations suggests that the probability of containerized material spills is low if the mitigation measures as outlined above are implemented.

6.16.4.4 Train Derailment at the Skeena River

Qualified personnel will follow best management practices and emergency response and contingency plans during all phases of the Project in the unlikely event of an emergency. In particular, personnel will be trained in the application of the CN Emergency Response Plan. With the proposed mitigation and monitoring, effects from an accidental contaminant spill resulting from a train derailment would likely be localized and may result in temporary disturbance to some freshwater species and habitat within the local zone of influence. This disturbance is not expected to be measureable beyond two years and so would be considered short term, and the effects are considered reversible because of the dynamic nature of fluvial systems. If the effects of a spill are measurable and irreversible, habitat restoration and compensation will be conducted and, where possible, spill sites will be restored to pre-spill habitat conditions leaving no significant long-term effect.

6.16.5 Follow-Up Program and Monitoring

Onsite environmental monitoring will occur during and after a spill event. Follow-up programs will monitor the success of any clean-up and restoration work. Monitoring and follow-up programs would be specific to an incident and would be developed in consultation with the appropriate government agencies. As required, monitoring and follow-up plans will be developed and will include roles and responsibilities (i.e., who carries out the monitoring; who ensures monitoring is in place), and site-specific conditions of monitoring (i.e., what will be monitored, for how long).

6.16.6 Government, Public and Aboriginal Comments and Proponent's Response

Comments received regarding accidents and malfunctions were centered primarily on the potential for vessel collision, resulting in a release of engine oil to the marine environment. Similar concerns were raised with respect to train derailments into the Skeena River. The Proponent was able to provide the government reviewers and Aboriginal Groups, who had raised the concern, with additional statistics on frequency of collisions and derailments, the quantities of fuels on board the vessels and trains, and on the likelihood of such events occurring. With respect to vessel collisions, it was reiterated that no bulk fuel transport (oil, chemical or liquid natural gas) occurs between Triple Island and Prince Rupert Harbour. Standard mitigation measures, as described in Table 6-7, will be implemented and will address the concerns raised with respect to spills in general.

The full list of comments, concerns and recommendations from provincial governments, federal authorities and public and Aboriginal consultations is included in the following two IR documents:

- Environmental Impact Statement Information Request Document (PRPA and CN 2011b)
- Mitigation Strategy Report Information Request Document, November 2011 (PRPA and CN 2011c)

These IR documents include the dissenting perspectives, Proponent responses, and commitments. Table 9-1 of this CSR also provides a detailed list of all of the Proponent commitments.

6.16.7 Conclusions on Significance of Effects

During this comprehensive study the RAs have considered those documents listed in Section 6.16. Accidents and malfunctions are unplanned, infrequent, and ordinarily short-term in nature. The environmental effects of any potential Project accidents or malfunctions that may occur in construction and operation of the Project can be addressed with appropriate environmental management and spill response planning.

Provided that the mitigation outlined is implemented, and provided that appropriate response plans are in place and are updated for the Project, as required, no significant adverse environmental effects are likely to occur.

In the case of a credible worst-case scenario resulting in the release of oil or fuel to the marine environment, effects to Avifauna have the potential to be significant; however, an event of this scale is considered to be very unlikely.

6.17 Decommissioning

Fairview Terminal is a permanent structure, therefore decommissioning of the Project is not anticipated. The Terminal has a design life span of 50 years or more with regular maintenance and scheduled equipment upgrades. However, if market or infrastructure requirements change and if decommissioning is required and is considered feasible, a decommissioning plan will be developed. The decommissioning plan will ensure that decommissioning, abandonment, and restoration activities are conducted in accordance with the applicable regulations of the time. The CN railway is not expected to be decommissioned at any point as it provides service for other customers in the Prince Rupert area, including passenger service through VIA Rail.

At a minimum, a decommissioning plan would include:

- Schedule and work plan for equipment decommissioning and disassembly

- Schedule and work plan to remove and dispose of all abandoned installations, structures, and buildings for which on-site reuse is not possible
- Schedule and work plan to reinstate the site to a quality necessary for subsequent industrial land use
- Consideration for areas that can be restored to a natural state through landscaping and revegetation

Disposal of waste from decommissioning will be conducted in accordance with waste management regulations and guidelines at the time. Removal of buildings or structures is expected to have similar effects and considerations as construction and will be conducted in accordance with regulatory requirements applicable at the time of removal.

Abandonment, if undertaken, will include disconnecting and removing utility supply lines where appropriate; dismantling and removing buildings, foundations and other structures; removing and disposing of equipment, pipes, instruments, etc.; collecting and removing any hazardous materials to approved hazardous materials disposal sites; and landscaping and re-vegetating disturbed areas.

The following sections provide a brief overview of potential VEC-specific interactions with presumed decommissioning activities, as outlined in the EIS.

Air Quality

Project-related sources of GHGs and particulate matter emissions are associated primarily with motor vehicle and construction equipment exhaust in the construction and decommissioning phases.

The equipment required to carry out decommissioning activities is similar to that used during the construction phase of the Project. However, because the scope of activity during decommissioning is much smaller than that required for construction, the equipment required to complete this phase and associated emissions is also reduced—approximately 50 percent. Decommissioning of the terminal would presumably also greatly reduce truck, train and vessel traffic servicing the facility which in turn would return air quality to pre-Project levels.

Noise and Vibration

The decommissioning of this Project could be expected to create noise and vibration effects similar to that of the Project construction phase although without some of the noisier activities such as blasting and pile drilling. If train and ship traffic is reduced as a result of decommissioning there will be an equivalent reduction in noise from these operations. The acoustic environment could be expected to return to pre-Project conditions after decommissioning ends.

Light

It is expected that the effects of Light will be similar to those considered for the construction phase. Any reduction in terminal lighting associated with decommissioning would result in lower levels of ambient light relative to the operational phase.

Vegetation

To the extent Project decommissioning involves removal of infrastructure and hard surfaces, there is potential for previously vegetated areas to return to more natural (i.e., pre-Project) conditions. With respect to terrestrial vegetation, the decommissioning plan may include (but is not limited to) seeding of disturbed areas to control erosion and leaving the grade in place to reduce in-water disturbance and protect the mainline against erosive forces.

Wildlife

Project decommissioning is not expected to result in additional loss of wildlife habitat. Instead, decommissioning may result in portions of the site being reclaimed to a more natural condition (i.e., pre-Project). The moderate to moderately-high suitable habitats that are present outside the Project footprint will likely become more attractive for black bears as the Project infrastructure is removed. For black-tailed deer, the effects of activities associated with decommissioning will be similar to that of construction except it is presumed that eventual habitat recovery will lead to an increase in deer habitat. The sensory effect of decommissioning on wildlife is also expected to be comparable to construction.

Vehicular traffic will be similar to during construction and could result in risk of wildlife mortality due to vehicular collisions. Once decommissioning is complete, vehicle traffic (and therefore potential for collisions) would decrease.

Moose mortality from rail collisions would decrease upon decommissioning of the Terminal, assuming that rail traffic was reduced. While the rail line will continue to exist indefinitely to service the Prince Rupert area, there would potentially be fewer trains per day as a result of the Terminal closure.

Avifauna

Potential environmental effects associated with decommissioning (e.g., the removal of infrastructure) are similar to those associated with construction; however, there will be no additional loss of bird habitat during decommissioning. Instead, decommissioning may result in portions of the site being reclaimed to a more natural condition (i.e., pre-Project) with an increase in land bird habitat. Effects of habitat loss and alteration associated with the initial Project development would therefore be reversed over the long-term should the habitat regenerate.

Sensory disturbance from decommissioning is estimated to be similar or of a lesser extent than during the construction phase. Direct mortality due to decommissioning will be similar to the effects from construction, but the magnitude is expected to be substantially lower.

Freshwater

The removal of the Terminal and the reinstatement of drainage patterns during decommissioning, although unlikely, would require significant work in or near streams. The potential effects from these activities would be similar to those described for construction (e.g., potential for erosion and sedimentation) although it is unlikely that additional habitat will be lost.

It is more likely that decommissioning of the Terminal would leave culverts in place to support other uses of the rail right-of-way; therefore, decommissioning in the long term is expected to cause no change on freshwater habitat quality except for a potential improvement in surface runoff quality. Any alteration or destruction of fish habitat during decommissioning would require approval from DFO.

Marine

Removal of marine structures at decommissioning is unlikely and no dredging or disposal at sea is anticipated; therefore interaction of any foreseeable decommissioning scenario with the marine environment is very small. While there is some potential for land based activities to generate some runoff and siltation to the marine environment, no substantial changes in suspended sediment and contaminant levels are anticipated to result from decommissioning for marine receptors such as sediment and water quality, benthic communities and marine fish. Any alteration or destruction of fish habitat during decommissioning would require approval from DFO.

The effects of acoustic disturbance during decommissioning will be less than those experienced during construction due to the lack of high noise producing activities such as pile driving and marine equipment operation. Presumably closing of the Terminal would reduce vessel traffic and associated underwater noise and risk of vessel strikes with respect to marine mammals. Closure of the Terminal could also be expected to reduce the long term risk of spills into the marine environment.

Socio-Economic Conditions

Although details of a decommissioning plan have not yet been developed, at a minimum, it is likely that informal recreational land use will resume following Project decommissioning. Positive effects realized through Project operations (i.e., social and economic benefits associated with industrial development) will be reversed during decommissioning of the Project. It is presumed however, that alternate, high value land uses consistent with land use plans of the day will be pursued by the Prince Rupert Port Authority to offset losses from a decommissioned terminal.

Human Health and Safety

Decommissioning of the site is expected to have very similar effects on human health and safety as those predicted for the construction phase. Public and occupational health and safety could be marginally improved in the long term with a reduction of industrial activity (including air and noise emissions) at the site.

Archaeological and Heritage Resources

No interactions with Archaeological or Heritage Resources are anticipated during decommissioning.

All decommissioning activities associated with the Terminal expansion and CN siding and wye are expected to remain within the boundaries impacted during the construction phase. As a result, no additional loss of Archaeological or Heritage Resources is expected during the decommissioning phase of the Project.

Current Traditional Use by Aboriginal Persons

All decommissioning activities are expected to be contained within the Project footprint and little or no additional disruptions to vegetation, wildlife or marine habitats are anticipated. Terminal decommissioning could potentially lead to an increase in the availability of resources for traditional use purposes through increased site access (land and marine) and restoration of natural habitats.

Country Foods

All decommissioning activities are expected to be contained within the Project footprint and little or no additional disruptions to vegetation, wildlife or marine habitats are anticipated. Terminal decommissioning could potentially lead to an increase in the availability of resources for harvesting of country foods through increased site access (land and marine) and restoration of natural habitats.

Conclusion

The CN railway is not expected to be decommissioned. At some point in the future, should decommissioning of the Fairview Terminal be required and considered feasible, an additional EA may be required. At that time, a decommissioning plan will be developed to ensure that decommissioning, abandonment, and restoration activities are conducted in accordance with all applicable regulations. Mitigation measures will be developed to the satisfaction of regulatory authorities and site planning will be undertaken in consideration of community social and economic objectives, to offset any losses associated with terminal closure. Assuming the decommissioning plan and implementation comply with all applicable regulatory requirements and BMPs, significant adverse environmental effects are unlikely.

7 CUMULATIVE ENVIRONMENTAL EFFECTS

7.1 Background

This section provides an overview of the cumulative effects assessment (CEA) that was conducted as part of the EA process, in accordance with CEAA and the Scope of Assessment for the Project. Additional detail with respect to background information as it pertains to the CEA is provided in the Proponents' EIS and associated TDR (EIS Vol. 1 and Vol. 2 [PRPA, CN 2009]), and elsewhere in this CSR, as indicated. Where relevant, cumulative effects are also discussed in the Proponents' MSR (PRPA, CN 2011a) and Information Request documents (PRPA, CN 2011b, c).

Paragraph 16(1)(a) of CEAA requires that a comprehensive study include consideration of "any cumulative environmental effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out". Cumulative effects are changes to the environment that are caused by an action in combination with other past, present and future human actions and include changes to the biophysical environment or socio-economic environment (indirectly from a biophysical change). Cumulative effects are to be considered for those reasonably foreseeable projects and activities, the effects of which have the potential for overlapping in time and space with the environmental effects of the proposed project.

Cumulative effects assessment is conducted to ensure the incremental effects resulting from the combined influences of various actions are considered. These combined effects may be significant even though the effects of each action, when individually assessed, are considered not significant.

7.2 Cumulative Environmental Effects Assessment Method

For the purposes of the CSR, it is assumed that the existing status or condition of each VEC reflects the influence of other past and current projects and activities occurring within or outside of the Project area. It also assumes (unless there is evidence to the contrary, such as predictable down or upward trend in a population) that these existing activities will continue to be carried out in the future and will have similar effects as currently observed. The assessment will therefore integrate the cumulative effects of these past and ongoing projects and activities within the discussion of existing conditions for each VEC. This cumulative effects assessment section focuses on the effects of other future projects and activities, as assessed for each VEC. The method used in assessing cumulative effects for this Project follows current practice and is consistent with CEAA and informed by the assessment framework presented in the Cumulative Effects Assessment Practitioners Guide (CEA Agency 1999).

Based on clarification provided by the Joint Review Panel for the Express Pipeline Project in Alberta, a series of three questions can be used to screen cumulative environmental effects (NEB and CEA Agency 1996):

- Is there a Project-related environmental effect?
- Does the Project-related environmental effect overlap with those of other past, present and future projects and activities that have been or will be carried out?
- Is the Project contribution to cumulative environmental effects substantive and measurable or discernible such that there is some potential for substantive cumulative environmental effects that are attributable to the Project?

If, based on these three questions, there is potential for cumulative effects, it is assessed to determine if it has the potential to alter a component of the natural or human environment to an unacceptable state.

In summary, the evaluation of potential cumulative effects for the Project considers other past, present or likely (approved or in the approval process) future projects and activities that will overlap temporally and spatially with Project-related residual environmental effects.

In the early stages of the EA, a cumulative effects scoping exercise was conducted to identify projects and activities that might interact cumulatively with the Project. Past and ongoing projects or activities potentially affecting VECs have been considered in the description of the existing conditions as applicable for each VEC. These past and/or ongoing projects include:

- Fairview Terminal Phase I
- Northlands Terminal
- Atlin Terminal
- Ridley Island Coal Terminal (Ridley Terminals Inc.)
- Prince Rupert Grain Ltd.
- Sun Wave Forest Products
- Port shipping activities at Westview and Lightering
- Houston Pellet Inc. Transfer Facility
- Prince Rupert Container Examination Facility

This list of projects and activities was reviewed and agreed upon by the Fairview Phase II Environmental Assessment Technical Working Group.

The planned future projects (approved or in the approval process) to be assessed, including potential cumulative interactions and relevant VECs, are summarized in Table 7-1.

Table 7-1 Likely Future Projects and Activities with Potential Cumulative Interactions with the Proposed Fairview Terminal Phase II Expansion Project

Project / Activity	Status	Potential Key Cumulative Interaction(s)	VECs Potentially Affected by Cumulative Effects
ICEC Terminals Company Ltd. Sulphur Forming, Handling and Storage, Ridley Island	Approved, not under construction	▪ Project emissions may combine with emissions from construction and operation of the proposed sulphur facility ▪ Losses of vegetation resources and wildlife habitat from ICEC may interact with residual effects of the Project ▪ Construction and operation of the ICEC marine facility may result in residual effects to benthic habitat, fish and fish habitat, marine mammals, and may interact cumulatively with the Project ▪ Increase in vessel numbers increases the potential for interaction with marine mammals (direct mortalities and acoustic disturbances) ▪ Potential for cumulative effects on birds due to noise and light from ICEC and the Project ▪ ICEC impacts to archaeological and heritage resources, as well as Current Traditional Use by Aboriginal persons may interact with those of the Project ▪ Accidents and Malfunctions	Air Quality Noise and Vibration Light Vegetation Resources Wildlife and Wildlife Habitat Avifauna Freshwater Resources Marine Environment Socioeconomic Conditions Current Traditional Use by Aboriginal persons Archaeological and Heritage Resources Country Foods
Canpotex Potash Export Terminal	EA in progress	▪ Project emissions may combine with emissions from construction and operation of the proposed Canpotex facility ▪ Potential for cumulative effects on birds due to noise and light ▪ Losses of vegetation resources and alterations to wildlife and freshwater habitats from Canpotex may interact with residual effects of the Project ▪ Construction and operation of the Canpotex marine facility will interact with the marine environment (benthic habitat, fish and fish habitat, marine mammals) and may interact cumulatively with the Project ▪ Potential for cumulative impacts to marine environment at Brown Passage if it is used as the disposal site for Canpotex dredge material	Air Quality Noise and Vibration Light Vegetation Resources Wildlife and Wildlife Habitat Avifauna Freshwater Resources Marine Environment Socioeconomic Conditions Current Traditional Use by Aboriginal persons Archaeological and Heritage Resources Country Foods

Project / Activity	Status	Potential Key Cumulative Interaction(s)	VECs Potentially Affected by Cumulative Effects
		▪ Increase in vessel numbers from both projects increases the potential for interaction with marine mammals (direct mortalities and acoustic disturbances) ▪ Canpotex impacts to archaeological and heritage resources, as well as Current Traditional Use by Aboriginal persons may interact with those of the Project ▪ Accidents and Malfunctions	
Ridley Island Road, Rail and Utility Corridor	EA in progress	▪ Project emissions may combine with emissions from the operation of the expanded road and rail corridors ▪ Losses of vegetation resources and alterations to wildlife and freshwater habitat may interact with the residual effects of the Project ▪ Potential for cumulative effects on birds due to noise ▪ Impacts to archaeological and heritage resources, as well as Current Traditional Use by Aboriginal persons may interact with those of the Project	Vegetation Resources Wildlife and Wildlife Habitat Avifauna Freshwater Environment Archaeological and Heritage Resources Aboriginal Current Traditional Use
Aero Point Ferry Terminal	Project complete and operational (2011)	▪ Construction and operation of the ferry terminal will interact with the marine environment (benthic habitat, fish and fish habitat, marine mammals) and may interact cumulatively with the Project ▪ Increases in vessel numbers increases the potential for interaction with marine mammals (direct mortalities and acoustic disturbances) ▪ There is the potential for cumulative effects on birds due to noise and light ▪ Impacts to Current Traditional Use by Aboriginal persons may interact with those of the Project	Noise and Vibration Light Air Quality Marine Environment Archaeological and Heritage Resources Current Traditional Use by Aboriginal persons
Mount Hays Wind Farm Project	Approved	▪ Losses of vegetation resources and alterations to wildlife and freshwater habitats may interact with the residual effects of the Project ▪ There is the potential for cumulative effects on birds due to wind farm operational aspects ▪ Impacts to archaeological and heritage resources, as well as Current Traditional Use by Aboriginal persons may interact with those of the Project	Vegetation Resources Wildlife and Wildlife Habitat Avifauna Freshwater Environment Socio Economic Conditions Country Foods Current Traditional Use by Aboriginal

Project / Activity	Status	Potential Key Cumulative Interaction(s)	VECs Potentially Affected by Cumulative Effects
			persons
Mount McDonald Wind Power Project	EA in progress	▪ Losses of vegetation resources and alterations to wildlife and freshwater habitats may interact with the residual effects of the Project ▪ Construction of the marine transmission lines may interact with the marine environment (benthic habitat, fish and fish habitat, marine mammals) and may interact cumulatively with the Project ▪ Increases in vessel numbers during construction increases the potential for interaction with marine mammals (direct mortalities and acoustic disturbances) ▪ There is the potential for cumulative effects on birds due to wind farm operational aspects ▪ Impacts to Current Traditional Use by Aboriginal persons and Country Foods may interact with those of the Project	Vegetation Resources Wildlife and Wildlife Habitat Avifauna Freshwater Environment Marine Environment Socio-Economic Conditions Country Foods Current Traditional Use by Aboriginal persons
NaiKun Wind Energy Project	EA complete	▪ Construction of the marine-based wind farm may interact with the marine environment (benthic habitat, fish and fish habitat, marine mammals) and may interact cumulatively with the Project ▪ Increases in vessel numbers during construction increases the potential for interaction with marine mammals (direct mortalities and acoustic disturbances) ▪ Potential for cumulative effects on marine birds due to wind farm operational aspects ▪ Impacts to Current Traditional Use by Aboriginal persons and Country Foods may interact with those of the Project	Avifauna Marine Environment Country Foods Current Traditional Use by Aboriginal persons

This list of projects and activities has been reviewed and approved for consideration in the cumulative effects assessment by the technical WG and included in the Project's Scope of Assessment. Figure 4-1 of the EIS (EIS Vol. I, Section 4) provides the geographic location of the Projects.

The CEA considered all of the Project's anticipated residual effects, and the expected effects of other past, present and likely future projects and activities on the 13 VECs as described in Sections 6.1 to 6.13 of this CSR. No residual effects were identified in the assessment of Human Health and Safety, therefore a cumulative effects assessment has not been carried out for that VEC. The 12 remaining VECs described in this CSR remain relevant with respect to potential cumulative effects, and there is the potential for specific VECs to interact cumulatively. No additional VECs were identified for the purposes of this CEA.

Temporal boundaries include periods of construction, subsequent operation of the terminal and rail line throughout its expected life span (i.e., 50 years), and eventual decommissioning. The spatial boundaries for the CEA are defined on the basis of the characteristics of each VEC, and encompass the area within which a residual environmental effect of the Project is likely to interact cumulatively with the effects of other past, present or future projects and activities that have been or will be carried out; these spatial boundaries generally correspond to the RSA for each VEC as described below. Specific temporal characteristics for each of the VECs (e.g., seasonal sensitivities) are described in the applicable VEC sections.

7.3 Assessment

The following paragraphs discuss, on a VEC basis, the potential cumulative environmental effects resulting from Project-related residual environmental effects overlapping with the residual environmental effects of other projects and activities, as listed above.

7.3.1 Air Quality

Detailed emissions data and modeling results pertaining to the cumulative effects assessment of Air Quality can be found in the Proponents' TDR (EIS Vol. 2 [Air Quality TDR] [PRPA, CN 2009]). Emissions have been updated since the 2009 EIS based on Project design changes and updated emissions regulations. These changes and the updated emissions values are presented and discussed in the MSR (PRPA, CN 2011).

There is potential for Project-related residual effects on Air Quality to overlap with the residual effects of some other projects and activities listed in Table 7-1. Cumulative effects include emissions of CACs, HAPs, and GHGs from these other projects and activities in combination with the Fairview Project. The spatial boundary for the CEA for Air Quality is the LSA: a 30 km by 30 km study area centered on Fairview Terminal. The Air Quality LSA also includes three communities: Burns Lake; Terrace; and Prince George, selected based on community population statistics, detailed baseline emissions data, and similar characteristics to communities potentially exposed in the study area between Prince Rupert and Kitselas boundary at Mile 97 Bulkley Subdivision. Only one likely future project (approved or in approval process) is located within this LSA, and has the potential to overlap with Project residual effects: the ICEC Terminal Company Ltd. Sulphur Forming, Handling and Storage Facility.

Effects on Air Quality can occur during the Construction, Operations, and Decommissioning phases. Based on the dispersion modeling results as shown in the EIS (EIS Vol. 2 [Air Quality TDR] [PRPA, CN 2009]), it is anticipated that cumulative effects to Air Quality are generally low in magnitude and occur within are site-specific geographic location (in accordance with the definitions as provided in Table 5-1, Section 5.6).

Based on the 2009 dispersion modeling results, effects associated with the Project emissions were dominant, as there was little change between the project case and CEA dispersion modeling scenarios.

While some moderate magnitude effects are expected to occur (Project and cumulative), their temporal and geographic extent is extremely limited. Despite the prediction of exceedances of the AAQO in the dispersion modelling exercise, largely as a result of Project marine vessel SO_2 emissions and downwash effects in stable meteorological conditions, it is not expected that these conditions will manifest outside the immediate Project area. These effects will occur on water near the ships, or on land immediately adjacent to the property line on an isolated hillside within a generally industrialized area. There are no human receptors in any of these areas. As such, there are no high residual cumulative effects predicted. Furthermore, the updated SO_2 emissions (reference MSR or Project section of CSR or both) have decreased by approximately 93 percent compared to the 2009 EIS emissions that were included in dispersion modelling. Therefore, the frequency of predicted exceedances of the AAQO for SO_2 would be much less as a result of the lower SO_2 emissions for both the Project Case and CEA dispersion modelling scenarios.

Mitigation techniques will be applied to minimize cumulative residual effects on Air Quality. The most substantial mitigation—that of using low sulphur fuel—will take effect between 2012 and 2020 when required by announced international standards. Other mitigation includes ensuring equipment is properly maintained and suppressing dust and erosion. For a full list of proposed mitigation measures, see Section 6.1. PRPA, in consultation with the Province, will implement monitoring to validate predicted results.

Overall, dispersion modelling indicates that the addition of likely projects in the LSA do not have a substantial effect on maximum predicted ground-level concentrations of CACs or HAPs. Therefore, combined cumulative effects are considered to be not significant. While the Project re-design (2011) increased the number of vessels, trains, and trucks, the conclusions of the CEA remain valid. Residual cumulative environmental effects related to air quality are anticipated to be of low magnitude and site-specific in extent.

7.3.2 Noise and Vibration

The spatial boundary for the CEA for Noise and Vibration includes that area between the northern end of Fairview Terminal and Mile 97 Bulkley Subdivision, east of Kitselas. It is anticipated that effects would generally be limited to 300 to 500 m from the sound and vibration sources.

It is expected that Noise and Vibration from the Project will overlap with noise and vibrations from the existing Fairview Phase I Terminal and rail line, resulting in potential cumulative effects for nearby receptors.

Train whistling and shunting noise has been identified by the public as an existing noise that is causing disturbance and annoyance. This relates in particular to Fairview trains that are utilizing the CN downtown yard under current operations. Maher Terminals Inc. (Terminal Operator) uses the CN downtown yard due to congestion problems in and around the terminal. Concerns have been raised regarding the potential for additional noise (whistling and shunting) with additional trains as part of the Project. Construction of the CN siding(s) will reduce the need for Maher Terminals Inc. to use the downtown yard, thus reducing the noise from whistling.

The effects from Phase I operations have been considered in the baseline and predictive Noise and Vibrations evaluations discussed in Section 6.2, and are not considered to be significant. Cumulative effects between the Project and other large scale noise or vibration generating activities within the assessment area are not expected to occur or would be negligible to low in magnitude due to the separation distances involved between the Project and other local projects. Therefore it is concluded that the additive effect is expected to be minor and not significant. While the Project re-design (2011) increased the number of trains the conclusions of the CEA remain valid.

7.3.3 Light

The spatial boundary for the cumulative effects assessment for Light is the RSA for the VEC, described as Kaien Island and Prince Rupert Harbour. The potential cumulative effect defined for Light is limited to the potential effect of increased light trespass and sky brightness.

There is potential for the Project to contribute to increased spillover light in the RSA; however, the Project is proposed in a relatively developed area and as a result, cumulative effects of additional light from the proposed Terminal expansion are anticipated to be of low magnitude, local in extent, and are not expected to be substantial (i.e., not likely to be significant).

7.3.4 Vegetation Resources

The spatial boundary for the cumulative effects assessment of Vegetation Resources is the RSA for the VEC, defined as Kaien Island in its entirety. Potential cumulative effects that have been defined for Vegetation Resources include the loss or alteration of ecological communities of conservation concern (rare ecosystems), wetland ecosystems, riparian habitat, and old forests. Rare plants are not assessed for cumulative effects as, based on the field surveys completed, it is anticipated that rare plants will not be affected by the Project.

Within the RSA, total historical extent of wetland and riparian areas are unknown; however, wetlands in general are common on the British Columbia coast, and present-day riparian habitat in the RSA is greater than 300 ha. As is true for much of the coast, extensive historical logging has occurred in the RSA and the extent of remnant old forest is limited. Similarly, although the past and present extent of ecological communities of conservation concern is unknown, the rarity of these ecosystems is largely attributable to historical logging on the coast.

There is the potential for several likely future projects and activities to interact cumulatively with Project-related residual environmental effects on Vegetation Resources. These projects and activities include the Mount McDonald Wind Power Project; the ICEC Project; the Canpotex Potash Export Terminal; the Ridley Island Road, Rail and Utility Corridor Project; the Mount Hays Wind Farm Project; and general development within Prince Rupert. It is difficult to quantify the potential loss or alteration of sensitive habitats as a result of these proposed projects; however, it is expected that these projects will result in some low magnitude, regional residual effects to vegetation that will act cumulatively (e.g., cumulative habitat loss) with the residual effects of the Fairview Project.

Project mitigation will be used to reduce the extent of cumulative effects. The mitigation measures proposed are described within Section 6.4 (Vegetation Resources).

While the current cumulative loss (i.e., baseline) of ecological communities of conservation concern and old forest may be substantial along the north coast as a whole, the Project’s incremental contribution to cumulative effects is predicted to be not significant for the following reasons:

- Residual loss or alteration of ecological communities of concern (HM), wetland ecosystems, riparian areas, and old forest, although permanent, is very small with respect to the RSA
- Effect on ecological communities of concern is primarily on stands of lower conservation value (seral stage; based on ratings criteria for ecological communities of conservation concern)
- Effects occur in areas zoned for industrial development
- Creation of new riparian habitat will form a part of the proposed Habitat Compensation Plan (discussed in Section 6.7, Freshwater Environment)
- There is the potential for future recruitment to old forest as the result of the local availability of younger stands, most of which falls within the area zoned as “Open Space and Park”

The Proponent can assist in minimizing further loss of ecological communities of conservation concern in the CWHvh1 by sharing the Project TEM with other agencies, such as the BC Ministry of Forests, the BCCDC, and the City of Prince Rupert.

7.3.5 Wildlife and Wildlife Habitat

Project related effects on black tailed deed, black bear, and moose and their habitats will result in residual effects. These residual effects have the potential to act cumulatively with the effects from other projects and activities in the area, particularly those resulting in increased rail traffic along the CN Bulkley and Skeena Subdivisions, such as Fairview Phase I and the industrial projects on the north end of Ridley Island (i.e., Canpotex, Ridley Island Road, Rail and Utility Corridor).

The spatial boundary considered for this cumulative effects assessment is the RSA defined for Wildlife and Wildlife Habitat, which extends from Fairview Terminal to Mile 97 of Bulkley Subdivision, at or near the rail intersection with Lorne Creek. This RSA includes the industrial projects that are considered as part of this cumulative effects assessment.

Potential cumulative effects that have been defined for Wildlife and Wildlife Habitat include: habitat loss or alteration; sensory disturbance; and direct mortality. Potential cumulative effects are discussed for each of the three KIRs.

7.3.5.1 Black-Tailed Deer

The primary cumulative effects affecting black-tailed deer and their habitat are fragmentation and the loss of mature and old forest habitat. In addition to the effects on habitat, other cumulative effects, particularly where there are temporal overlaps, are sensory disturbance and direct mortality to deer within the RSA.

The majority of the Wildlife and Wildlife Habitat LSA is considered low habitat suitability for black-tailed deer, and the individual Project effects of sensory disturbance and direct mortality on black tailed-deer will be localized and will affect only a small proportion of the population that may use the Wildlife LSA and RSA.

In summary the incremental (i.e., cumulative) loss of habitat, when accounting for its relative value and the other cumulative effects of sensory disturbance and mortality from all sources in the area, is predicted to be low, and the contribution of the Project to cumulative effects is small. Cumulative effects are not expected to adversely affect the viability and sustainability of the black-tailed deer population in the RSA. Project-related contributions to cumulative residual environmental effects are considered to be of low magnitude, site-specific, and not significant.

7.3.5.2 Black Bear

Project-related residual effects to black bears are expected to be minimal; however the residual effects would overlap with effects (habitat loss, sensory disturbance and direct mortality) from other projects and activities in the area. Given the low amount of suitable habitat and the low occurrence of bears in the RSA, this overlap of effects is not expected to adversely affect the viability and sustainability of the bear population in the RSA.

The cumulative effects of habitat loss and alteration, sensory disturbance, and mortality from all sources in the area are predicted to be low. Despite the reduction of Moderate suitability black bear habitat in the LSA, a greater amount of moderately-high and moderate suitability habitat for black bear occurs outside the LSA to the southeast. Residual cumulative environmental effects are anticipated to be of low magnitude and site-specific in extent. As such, the Project-related contributions to cumulative residual environmental effects are considered to be minor and not significant.

7.3.5.3 Moose

The Project-related residual effects on moose, resulting from direct mortality, will act cumulatively with residual effects from other projects and activities in the area, particularly those resulting in increased rail traffic along the CN Bulkley and Skeena Subdivisions, notably Fairview Phase I. Furthermore, if there is an increase in rail traffic as a result of other present and planned projects in the RSA (i.e., Canpotex; Ridley Island Road and Rail) the risk of mortality to moose could likewise increase.

As discussed in Section 6.5 of this CSR, the inclusion of new data provided by the BC MOE did not affect the results of the assessment, as presented in the 2009 EIS. There are approximately 0.03 moose collisions per km per year currently. With the projected increase in rail traffic as a result of the Fairview Project, the frequency of moose collisions is anticipated to increase to 0.056 collisions per km per year increasing mortality from 6.75 to 12.6 moose per year (addition of 5.85 moose per year). An additional 5.85 moose per year translates to approximately 1 percent of the estimated population size. Including Fairview, Canpotex, and RTI rail traffic is expected to increase by up to 20.7 trains per day. Additional rail traffic from Canpotex (4 trains per day; increasing mortality by 2.5 moose per year) and RTI (8.7 trains per day; increasing mortality by 5.5 moose per year) will increase mortality from 6.75 to 20.6 moose per year. This total mortality represents approximately 2.9 to 4.1 percent of the population. Despite the predicted increase in mortality, it is not expected that the Project's contribution to the cumulative effects will affect the sustainability of moose populations in the RSA. While increased mortality from predation, hunting, or rail mortalities may regulate moose populations, they do not necessarily limit them. The predicted increase in rail mortality is within the range of the reported moose harvest in the last several years. Between 2005 and 2008 the moose harvest ranged from zero to 44 individuals in the Skeena 6–10 management unit, and between 22 to 66 individuals in management unit 6–15 (which overlaps the Skeena and Bulkley subdivisions). Harvest rates have increased over that four year period, suggesting that the current level of mortality is not to be a limiting factor for the harvested population.

The level of moose mortality on the rail line is a concern despite the prediction that it will not affect the sustainability of the population. Feasible mitigative solutions however, are not readily apparent and study of this issue is ongoing. The Telkwa Moose Working Group has been studying moose mortality on the Telkwa Subdivision for the past few years. This section of track runs from Smithers to Endako, British Columbia and has been selected as a trial site in British Columbia to study moose mortality and mitigation. The working group members include representatives from CN (and their consultant McElhanney), BC MOE, representatives of the public (i.e., Rod and Gun clubs of BC, BC Wildlife Federation), and an external moose expert. The objectives are to study the behavioural and physical factors related to moose mortality and to test the effectiveness of trial mitigation measures. To meet these objectives the working group is: i) tracking moose mortality using three methods and evaluating their accuracy: ii) assisting in moose population estimates and evaluating the effect of collision mortality on the population; iii) mapping mortality locations to identify key areas of concern; iv) implementing trial mitigation measures; and v) monitoring the behavioural response by moose at trial locations.

Initial results from these studies indicate that a solution to the mortality problem is complex and site specific, and that broad application of mitigation measures (if their effects at a particular location are not well understood) can result in additional effects on the population. For example, though fencing along the rail line may reduce mortality, it may also induce fragmentation or isolation of populations.

CN will continue to participate in the Telkwa Moose Working Group whose studies investigate the underlying factors causing moose collisions. The results of this work will continue to provide CN with the information required to evaluate and apply effective mitigation measures to high collision areas on the rail line to reduce moose mortality. Additionally, CN proposes to develop a plan to: i) improve mortality counts for all wildlife within the Skeena Subdivision by improving CN's reporting to BC MOE; and ii) track the effect of increasing train traffic. As it is not expected that the cumulative effects will affect the viability and sustainability of the moose population in the RSA, cumulative residual environmental effects are considered to be not significant.

7.3.6 Avifauna

The past, present and future projects that may interact in a cumulative manner with Avifauna in the LSA include construction of the Canpotex marine terminal and the Mount Hays Wind Farm Project. These projects will result in the loss of shoreline (marine bird habitat; Canpotex) and forested areas for land bird habitat (Mount Hays).

The cumulative effects assessment for Avifauna included assessment of both land and marine birds. The spatial boundaries considered for this CEA included the RSA for: land birds, which extends from the Project footprint to the southern entrance to the PRPA waters, and to the northern tip of Kaien Island; and for marine birds, an area extending out to 1,000 m offshore of the northern tip of Kaien Island south to the entrance to Porpoise Channel.

Potential cumulative effects that have been defined for Avifauna include: habitat loss or alteration; sensory disturbance; and direct mortality.

Project effects to land birds as a result of habitat loss or alteration are not expected to be substantial. Effects will be localized and will affect a negligible proportion of the land bird population in the region. Displaced birds will still have access to suitable habitat elsewhere within the LSA and RSA. The relative abundance of land birds breeding in proximity to current disturbances (e.g., Fairview Phase I Terminal) is not statistically different from those birds breeding in less disturbed areas (EIS Vol. I [Section 11] and Vol. II Wildlife TDR).

It is expected that the majority of the potential cumulative effects will result from increased sensory disturbance due to an increase in the frequency of large vessel, truck and rail traffic and through incremental lighting at the Terminal. Marine birds in the LSA are currently exposed to elevated levels of underwater noise from existing vessel traffic that includes commercial fishing vessels, pleasure craft vessels, and large cargo ships. The increase from baseline noise levels due to ships associated with the Project are not expected to be substantial, and it is expected that birds will become habituated to the increased frequency of sensory disturbance. Wildlife are known to habituate to sources of sensory disturbance, particularly those that are continuous, predictable, and are not paired with a negative experience. Birds currently utilizing the shoreline, upland habitat adjacent to the existing terminal, and/or rail line, are expected to be habituated to the sensory disturbance already caused by existing structures and activities.

Based on the RSA for marine birds, 2 percent of the habitat available within the RSA will be directly affected by wharf construction, while less than 20 percent of the RSA will be subject to sensory disturbance within the 200 m buffered area. After the implementation of mitigation for habitat alteration or loss in the marine environment, there will be a residual amount of avifauna displacement from habitat loss or alteration that can overlap cumulatively with other projects.

There is unlikely to be any substantial mortality of adults or juveniles due to effects of habitat loss on marine birds. Further, direct mortality events during construction and operation are expected to be rare. Effects will be localized and will affect a negligible portion of the marine bird population in the region. Displaced birds will still have access to suitable habitat elsewhere within the RSA.

While the Project is expected to result in residual effects to Avifauna that will act cumulatively with the effects from other projects and activities in the area, it is not expected that the Project's contribution to these cumulative effects will affect the sustainability of avifauna populations in the RSA for several reasons:

- The total area of suitable habitat directly affected by the Project is very small and is mostly of low suitability for land birds
- The sensory disturbance and avoidance of habitats in the LSA is expected to be minimal, and where it does occur, habituation is anticipated
- Direct mortality events are expected to be rare

Due to the low magnitude, small geographic extent, and applied mitigation, cumulative effects of the Project will not likely affect the stability and long-term survival of Avifauna in the RSA. The Project's contribution to cumulative effects is predicted to be not significant.

7.3.7 Freshwater Environment

The spatial boundary for the CEA of the Freshwater Environment includes the watersheds of the streams, ponds and wetlands within or immediately adjacent to the footprint of the Terminal expansion and CN sidings and wye (i.e., the LSA). The full watersheds of the affected freshwater habitats are included in this LSA (including for the purposes of cumulative effects assessment).

The potential cumulative effect that has been defined for the Freshwater Environment is the loss of habitat.

The past, present and future projects that may interact in a cumulative manner with the Freshwater Environment in the LSA are the construction of the rail line to the Fairview Terminal (Phase I) and the rail line and road to the coal and grain terminals on Ridley Island. These projects have resulted in the installation of culverts on fish-bearing watercourses and ponds, and resulted in the loss of fish habitat. There are no known residual effects on water quality or fish mortality from these projects.

Fish habitat compensation was not required for the loss of freshwater habitat when the CN line was constructed in the 1910s and when the spurs to Ridley Island were constructed in the 1970s. Due to this lack of habitat compensation, effects from the existing rail line may act cumulatively with residual effects from the proposed Project. However, a conceptual HCP is being prepared that describes plans to offset the potential loss of fish habitat productivity associated with the Project. Habitat compensation plans must meet DFO's Policy for the Management of Fish Habitat that requires a net gain of habitat productivity and no net loss of fish habitat. The adverse residual environmental effects to the Freshwater Environment will be offset by the HCP, and there will be no long term cumulative effects between the Project and other past, present, or future projects on the Freshwater Environment. Overall the contribution of the Project to cumulative effects on the Freshwater Environment is predicted to be not significant.

7.3.8 Marine Environment

There is the potential for residual effects of the Project on the Marine Environment to overlap with the residual effects from those projects with marine footprints listed in Table 7-1, particularly the Canpotex Potash Terminal projects. The spatial boundary for the cumulative effects assessment of the Marine Environment is the RSA as described for the VEC: portions of Chatham Sound through Prince Rupert Harbour, up to Tuck Inlet (Figure 13-2, EIS Vol. I Section 13).

Potential cumulative effects that have been defined for the Marine Environment include: alteration in sediment and water quality; habitat loss, alteration or disturbance; direct mortality; and sensory disturbance. Potential cumulative effects are discussed for each of the KIRs and for Disposal at Sea in the following subsections.

7.3.8.1 Water and Sediment Quality

Fairview Terminal Phase I activities and effects on marine water and sediment quality are expected to overlap with the Project-related effects. Changes to water and sediment quality could result from dredging activities (i.e., re-suspension of existing contaminants and/or entrainment of sediment into the water column) and on-land erosion with subsequent transport of entrained sediments into the marine environment. Cumulative effects of increased contamination levels will be of low magnitude, reversible, localized within the LSA and mostly short term in duration. Overlapping effects with other projects and activities is expected to be minimal. Therefore, the residual cumulative effects are rated as not significant.

7.3.8.2 Disposal at Sea

Potential cumulative effects from Project-related disposal at sea of dredged material with other past, present and likely future disposal at sea activities include:

- Increased sediment depth and loss of capacity at the disposal site
- Longer recovery for benthic communities
- Longer duration of increased TSS levels or combined levels over those predicted for the Project (if disposal takes place during the same period)
- Increased vessel traffic

In particular, the proposed Canpotex Potash Export Terminal project is considering the disposal of 840,000 m^3 of material at sea. Brown Passage is being considered as the disposal site for the Canpotex project along with two other sites within Port harbour limits.

A substantial cumulative increase in contaminants is not anticipated, as the material proposed for disposal at sea for all recent and future disposal activities will meet the Disposal at Sea screening criteria. The maximum depth of sediment added to the disposal site from both projects would range from 0.238 m to 5.245 m (0.038 to 0.116 m from the Fairview Project; 0.200 to 5.129 m from Canpotex). If disposal activities from the two projects were to occur concurrently, a greater sediment deposition rate would result in more frequent or greater burying of benthic species, which may not have time to migrate to the sediment surface. It is highly unlikely that the two projects will proceed with disposal at sea at the same time. With respect to the Fairview Project, disposal at sea is not anticipated to proceed until at least 2016. Disposal at sea associated with the Canpotex Project is currently scheduled to proceed in 2012 / 2013. Concurrent disposal could potentially result in increases in TSS beyond the recommended 25 mg/L in productive nearshore areas. It is expected, however, that the increase would likely be 1 to 5 mg/L in surface waters, and is therefore not expected to result in any significant effects.

Barge traffic associated with the Fairview disposal at sea is anticipated to be five barges per day over 25 days. The anticipated increase in barge traffic for the Canpotex project (seven barges a day for approximately 60 days), even if concurrent with the Fairview Project, is not anticipated to significantly affect local traffic or increase the risk of collisions with marine mammals.

Any cumulative residual environmental effects would occur primarily in the area designated for disposal at sea. These effects are not predicted to result in increased contaminant levels, and the impacts to benthic communities will be short term and reversible, and are therefore considered to be not significant.

While other sites have been assessed as part of the Fairview Project, Brown Passage continues to be the preferred site for disposal at sea.

7.3.8.3 Marine Riparian Habitat

The Project could contribute to the cumulative loss of marine riparian habitat in the RSA through interaction with the other large industrial facilities in the vicinity of Fairview Terminal, such as the Canpotex Potash Terminal, the ICEC project, and the Aero Point Ferry Terminal project.

Pink salmon have been known to use the RSA to some extent, and the modification or removal of riparian habitat could affect juvenile salmon by altering migration habitat. The Project-related environmental effects to marine riparian habitat are anticipated to be moderate in magnitude and regional in geographical extent. The implementation of a HCP (including the development of underwater reefs) will ensure that no net loss of fish habitat is achieved; therefore, cumulative effects on riparian habitat in the RSA are expected to be not significant.

7.3.8.4 Marine Benthos

The Project will contribute to the cumulative loss of marine benthic habitat in the RSA through interaction with the other large industrial facilities with marine footprints (dredging, disposal at sea and infilling) in the vicinity of Fairview Terminal, such as the Canpotex Potash Terminal, the ICEC project, and the Aero Point Ferry Terminal project. These effects may be temporary (e.g., associated with dredging and disposal at sea) or more permanent (infilling). The Project's effects on marine benthos are expected to be of small extent within the RSA. Furthermore, the HCP will encompass benthic marine habitat and adequately compensate for any loss resulting from Project activities. It is expected that all other planned and future projects would be required to compensate for lost benthic habitat. Due to the moderate magnitude, regional geographical extent, and applied mitigation, cumulative effects on marine benthos are expected to be not significant.

7.3.8.5 Eelgrass

Eelgrass beds expected to be lost or altered within the Project footprint are small and discontinuous. The nearshore marine components of projects and activities listed in Table 7-1 have the potential to contribute to declines in eelgrass habitat. Construction for the Fairview Terminal Southern Expansion Project completed in 1989 (initial part of Phase I) resulted in the direct loss of approximately 0.276 ha of eelgrass area directly adjacent to the Project footprint (less than 2 percent of the estimated Prince Rupert Harbour eelgrass population) (R.U. Kistritz Consultants Ltd. 1992). Other projects have likely also contributed to the loss of eelgrass in the area and future developments will continue to contribute to this decline although the total loss of eelgrass habitat in this area due to all projects is unknown.

The cumulative loss of eelgrass habitat in the LSA due to the Project as well as past and future shoreline developments is of moderate magnitude and medium term duration (less than three years). With proper mitigation strategies such as the proposed habitat compensation for losses of eelgrass as a component of the marine HCP (i.e., creation of an intertidal fish nursery with transplanted eelgrass), the cumulative effects of such projects can be minimized and are expected to be not significant. It is expected that other planned and future projects and activities affecting eelgrass populations will similarly be required to provide compensatory habitat restoration thereby reducing cumulative effects.

7.3.8.6 Bull Kelp

Development has and will likely continue to result in declines in bull kelp habitat within the RSA if habitat compensation plans and restoration are not implemented or successful where kelp beds occur. While past loss of bull kelp in the region is unknown, the Fairview Terminal Southern Expansion resulted in the loss of a bull kelp band of approximately 80 m along the shoreline (R.U. Kistritz Consultants Ltd. 1992). This area is adjacent to the Fairview Phase II expansion and will combine for a cumulative loss. The combined bull kelp habitat loss in the area is limited to the area close to the LSA, of moderate combined magnitude, and of medium term duration (less than two years). Habitat compensation for bull kelp or other high value habitats in the region is proposed in the conceptual HCP (i.e., construction of an artificial reef with transplantation of kelp); therefore, cumulative effects are anticipated to be not significant. It is expected that other planned and future projects and activities affecting kelp populations will similarly be required to provide compensatory habitat restoration thereby reducing cumulative effects.

7.3.8.7 Pacific Salmon

The proposed Canpotex Potash Terminal and the ICEC project may overlap temporally with the Fairview Project. Consequently, there is potential for elevated TSS levels and increased underwater acoustic emissions, which may represent continuous sources of disturbance to salmon populations in the area. This, coupled with the loss of some shoreline vegetation (marine riparian, eelgrass and bull kelp) critical to the survival of juvenile salmon during their migration through the RSA, may compromise the value of the habitat for salmon to some degree, particularly threatened Sockeye subpopulations. Under more extreme circumstances, loss of habitat affecting juvenile individuals may have subsequent adverse effects on adult returns, with potential implications for salmon dependent economies and ecosystems.

With the proposed mitigation, including the marine HCP, the cumulative environmental effects will not affect the viability or sustainability of salmon populations and can therefore be characterized as not significant. It is expected that other planned and future projects and activities within the RSA potentially affecting migrating salmon will similarly be required to provide mitigation and compensatory habitat restoration thereby further reducing cumulative effects on salmon.

7.3.8.8 Marine Mammals (Humpback Whales and Harbour Porpoise)

The most likely potential effect of the Project on humpback whales and harbor porpoises is behavioural disturbance as a result of exposure to underwater sounds (sensory disturbance). Underwater sounds produced by Project activities may act cumulatively with sounds originating from other industrial activities in the Prince Rupert area. These include sounds produced during the construction of other marine infrastructure projects and sounds produced by existing and future vessel traffic. The combined input of acoustic emissions from various sources within the RSA may cause marine mammals to behaviorally avoid a larger area than they would as a result of sounds from Project activities alone.

Two large development projects on Ridley Island may overlap temporally with the Fairview Project: ICEC Terminals project and the Canpotex potash facility project. Both projects will involve the construction of marine terminals that will require loud construction activities such as pile driving and dredging. During construction, these projects could act cumulatively with the Fairview Project to increase underwater sound levels within the RSA. The zone of influence of the combined construction sounds from these projects will be greater than that of the Fairview Project alone. This may lead to the displacement of a greater number of marine mammals from a larger area within the RSA.

In addition to the proposed development projects, existing vessel traffic in the Prince Rupert area also contributes to underwater sound levels. A large number of cruise ships, cargo vessels, fishing vessels and recreational vessels call on the Port of Prince Rupert each year. Sounds from these vessels will act cumulatively with sounds associated with the construction and operation of the Fairview Project. Future increases in vessel traffic in the Prince Rupert area, associated with projects such as the Canpotex and ICEC projects, will also contribute to this effect. A total of 10 to 14 vessels per week at the Fairview Terminal and 5 to 7 vessels to Canpotex and ICEC (combined) during operations will increase the frequency of underwater noise in the RSA. An increase in the frequency with which marine mammals are exposed to underwater sound in the RSA may affect habitat usage or potentially displace humpback whales and harbour porpoises.

Based on ambient noise levels recorded at other locations on the British Columbia North Coast (Austin et al. 2010), current ambient noise levels in the Prince Rupert Harbour are likely equivalent to or greater than 82 to 84 dB re 1µPa. The radius of displacement due to sensory disturbance around moving vessels will likely be limited to less than 4.2 km, for up to four large vessels combined for the Port per day at full build out[4], for a total of approximately 9.5 hours per day along the shipping route in the RSA. The potential effects occurs in a relatively small proportion of the available habitat within the range of the populations and of the time when some individuals are present in the RSA, especially considering the transient nature of the sound (moving vessel, short duration in any one location). This area represents only a small portion of the RSA and of the available habitat within the range of the populations.

An assessment of the risk of vessel collisions with humpback whales is presented in Section 13.11.3 of the EIS. Recent research shows that vessel speed is positively correlated with the probability of a vessel strike (Kite-Powell et al. 2007; Vanderlaan and Taggart 2007). Mathematical models from current vessel-strike probability research support the reduced probability of a vessel strike with reduced speeds. At a speed of 10 knots, the models predicted a 30 percent chance of vessel strike when the whale is directly in the vessel path (Kite-Powell et al. 2007; Vanderlaan and Taggart 2007). The occurrence and severity of ship strikes has been shown to decrease with reduced ship speeds (Laist et al. 2001; Van Waerebeek and Leaper 2008; Vanderlaan and Taggart 2007).Vessels in the RSA that are associated with the Project will be travelling at speeds less than 15 knots and at 5 to 8 knots as they enter the channel to Fairview.

Given the abundance of suitable foraging habitat in waters adjacent to the RSA, it is unlikely that the localized displacement of low numbers of humpback whales from the RSA will have adverse effects on the health of these animals.

Although displaced harbour porpoises may expend additional energy moving to a new foraging habitat, there is no evidence to suggest that foraging efficiency will be reduced once the harbour porpoises have left the zone of acoustic influence, and the displacement of harbour porpoises as a result of acoustic emissions is not expected to have adverse effects on harbour porpoise health.

Temporal and geographic separation between projects and use of similar mitigation measures (e.g., observing regulated vessel speed in the Harbour) during construction and operations will reduce the potential for adverse cumulative effects on marine mammals. Based on this assessment, cumulative environmental effects on marine mammals are considered to be not significant.

7.3.9 Socio-Economic Conditions

The spatial boundary for the cumulative effects assessment of Socio-Economic Conditions is the VEC RSA, which includes the City of Prince Rupert and the Skeena-Queen Charlotte Regional District. Potential cumulative effects that have been identified for the Socio-Economic Conditions VEC include the loss of informal recreational lands and development of lands for intended purposes.

There are a number of planned projects in the local and regional area that could interact with the Project resulting in cumulative effects to Socio-Economic Conditions. Many of the development projects listed in Table 7-1 will contribute to a loss of greenspace and potential recreational opportunity (mostly informal), while also contributing to the economic activity and land use development for the RSA. Due to availability of formal recreational infrastructure in the RSA as well as informal recreational opportunities throughout the RSA, cumulative adverse effects on recreation are predicted to be not significant. The lands proposed for Project development are intended, through the municipal planning process, for port-related industrial use; therefore the Project is considered a consistent use and an improvement of the lands for the intended purpose. This is expected to result in a positive cumulative effect as the Project will complement existing and future port infrastructure and improve economic opportunities for Canadian importers and exporters. This positive cumulative effect can be maximized with the ongoing communication between

[4] Based on projection for 2017 (Gary Paulson, pers. comm. 2011) and up to 14 Fairview bound vessels at full build out. However, it is not yet known when Stage 2 of Fairview construction (full build out) will take place or be completed.

PRPA and other stakeholders (e.g., CN, port operators, regional planners) during Project planning and implementation.

In summary, the low magnitude of the cumulative loss of recreational land use is outweighed by the high magnitude of the predicted positive cumulative effect of land development for its intended use.

7.3.10 Archaeological and Heritage Resources

The spatial boundary for the cumulative effects assessment of Archaeological and Heritage Resources includes Kaien Island and Prince Rupert Harbour (i.e., RSA). The potential cumulative effect that has been defined for Archaeological and Heritage Resources is the disturbance or preservation by record of identified, known, and previously unidentified archaeological and heritage resources (e.g., displacement of middens, canoe runs, CMTs, or destruction of historical buildings). This also includes potential disturbance of human burial remains and burial sites.

Within the RSA, the adverse residual effects on Archaeological and Heritage Resources as a result of the Project will overlap primarily with similar effects from past projects. For example, any project within the RSA that resulted in land disturbance or clearing of forested areas may have contributed to the cumulative loss of Archaeological and Heritage Resources.

Assessment of the cumulative effect of development on Archaeological and Heritage Resources is difficult to quantify. The inventory of archaeological sites in the LSA and RSA has been compiled primarily through impact assessment studies. As a result, the annual growth of Archaeological and Heritage Resources inventories is an indication of the cumulative effects of development.

To date, cumulative effects on Archaeological and Heritage Resources in the Prince Rupert area are primarily related to the development of Prince Rupert, commercial and industrial infrastructure, as well as specific events such as the US military fortifications constructed during World War II. Nearly all of the large shell midden sites on Kaien Island have been destroyed over the last 100 years of development of the railway and the City. Forest harvesting activities have had a cumulative negative effect on CMTs. In this context, approximately 96 percent of the CMT sites on record have been or will be disturbed with consequent loss of information and cultural features. Three of the remaining shell midden sites on Kaien Island have been adversely affected by construction-related activities. Overall, it is expected that the development of the Project will have a negligible cumulative effect on Archaeological and Heritage Resources after the implementation of detailed mitigation measures established through the pending ATWG. In general, the sites impacted by the Project will be recorded and/or conserved, in accordance with the mitigation measures agreed to by the ATWG in the Archaeological Mitigation Report.

While it is difficult to predict potential adverse effects on Archaeological and Heritage Resources from other projects and activities, it is assumed that all current and future developments will be required to comply with all relevant regulatory requirements regarding the assessment and mitigation of archeological resources. Therefore the cumulative disturbance or preservation by record of Archaeological and Heritage Resources associated with Fairview Terminal Phase II Expansion Project is considered to be small.

7.3.11 Current Traditional Use by Aboriginal Persons

The spatial boundary for the cumulative effects assessment of Current Traditional Use by Aboriginal persons is defined by the approximate boundary of the claimed traditional territory of the Tsimshian Nation (refer to Figure 17-1, EIS Vol. I, Section 17): extending south to Kitasoo, north to the mouth of the Nass River, and up the Skeena River just east of Terrace. The potential cumulative effect that has been defined for Current Traditional Use by Aboriginal persons is a change to current traditional use patterns.

Residual effects on Current Traditional Use by Aboriginal persons from all of the projects and activities listed in Table 7-1 above, have the potential to overlap with residual effects from the Fairview Terminal Phase II Expansion Project. The specific interactions between the Project and other projects and activities are addressed in the preceding sections (Vegetation Resources, Freshwater Environment, and Marine Environment), where applicable. No significant cumulative effects on any of these resources have been identified and therefore will not result in significant cumulative effects on Current Traditional Use by Aboriginal persons, as it relates to subsistence harvesting. The loss of access to Country Food resources at the Project site is not expected to significantly reduce the overall availability of Country Foods in the RSA and it is noted that access along the rail line is currently not permitted and fishing is closed or otherwise restricted in some cases in the Project area.

The potential cumulative loss of culturally significant Aboriginal resources is not expected to significantly reduce the overall availability of Aboriginal traditional resources in the claimed traditional territory. Mitigation including implementation of a HCP has been prepared for the Project which will further reduce the opportunity for cumulative effects with respect to these resources; the Project contribution to cumulative effects is therefore predicted to be not significant. It is expected that other planned and future projects and activities within the RSA potentially affecting Aboriginal traditional resources will similarly be required to provide mitigation and compensatory habitat restoration thereby further reducing cumulative effects on these resources. PRPA, CN, and the Government of Canada have worked with the Aboriginal communities to define the effects of the Project on Aboriginal rights. Accommodation offers were negotiated and agreed to with each of the five Aboriginal Groups, whose rights will be adversely affected by the Project, with respect to use of traditional lands and marine areas adjacent to Fairview Terminal and along the CN right-of-way.

7.3.12 Country Foods

The spatial boundary for the cumulative effects assessment of Country Foods is the RSA, defined as Kaien Island and Prince Rupert Harbour. The potential cumulative effect that has been defined for Country Foods is a change in the availability of or accessibility to Country Foods.

The specific cumulative interactions between the Project and other projects and activities are addressed in previous sections above (Vegetation Resources, Wildlife and Wildlife Habitat, Freshwater Environment, and Marine Environment) where applicable. No significant effects on any of these resources have been identified and therefore will not result in significant cumulative effects when combined with the effects of other projects on Country Foods. While residual cumulative effects are anticipated to be low to moderate in magnitude, at a regional level, the loss of access to Country Food resources at the Project site is not expected to significantly reduce the overall availability of Country Foods in the RSA. Access along the rail line is currently not permitted and fishing is restricted in some cases in the harbor. Also, hunting and fishing regulations for the region (Skeena) are intended to maintain sustainable populations of game and are continually subject to review and change. A HCP has been developed for this Project and will be implemented where necessary to offset potential adverse residual environmental effects to freshwater and marine habitats.

While the potential exists for shellfish to uptake contaminants during dredging activities, the risk of human exposure through contamination of shellfish is considered to be low and manageable. The existing year-round shellfish harvesting ban, in place due to existing concern regarding fecal coliform contamination, should routinely prevent collection of bi-valves such as clams and cockles. While bioaccumulation of metals such as arsenic and copper (as found in the sediments around Fairview Terminal) by shellfish can occur, the depuration rates for these metals for common shellfish species are fairly short (7 to 14 days). A period of up to one month following dredging should be more than sufficient for shellfish to return to pre-disturbance conditions, thereby limiting the risk of human exposure.

7.4 Summary

In summary, the evaluation of potential cumulative effects for the Fairview Phase II Project has considered other past, present or likely future projects and activities that may have environmental effects that overlap temporally and spatially with Project-related residual environmental effects. These potential cumulative effects were considered for VECs and assessment boundaries described above and with additional detail provided in the EIS. In general, the adverse Project-related residual environmental effects (i.e., after application of mitigation) are temporally and spatially limited and of small-to-medium magnitude. Other major development projects and activities will likely be subject to the same environmental permitting requirements as the Fairview II Project (e.g., fish habitat compensation programs). None of the Project-related residual environment effects are expected to overlap with effects from other projects and activities to result in cumulative environmental effects with potential to shift a component of the natural or human environment to an unacceptable state. It is concluded therefore that significant adverse cumulative environmental effects related to the proposed Fairview Terminal Project are not likely to occur.

7.4.1 Government, Public and Aboriginal Comments and Proponent's Response

The majority of the comments received regarding cumulative effects were similar in nature to those raised for the effects of the Project on its own, and have been captured in the relevant VEC sections on Government, Public and Aboriginal Comments. The key issues raised with respect to cumulative effects were in relation to potential cumulative effects of increased vessels in the harbour (potential for ship strikes to marine mammals; potential for ship collisions), and increased noise in Prince Rupert as a result of additional train traffic. The occurrence and severity of ship strikes has been shown to be positively correlated with reduced ship speeds. Ship speeds are controlled within the harbour and are between 5 and 8 knots as vessels make the run up to Fairview. With respect to ship collisions, additional information on historical incidents and the likelihood of ship collisions was provided to support the conclusions of the assessment. Construction of the rail sidings will reduce the need for the Terminal Operator to use the CN downtown yard, which will consequently reduce whistling. Additionally, a joint effort by CN, PRPA and the City of Prince Rupert to make the Mile 92.96 Ferry and Mile 92.70 Highway 16 Crossings anti-whistling will reduce noise disturbances.

The full list of comments, concerns and recommendations from provincial governments, federal authorities and public and Aboriginal consultations is included in the following two IR documents:

- Environmental Impact Statement Information Request Document (PRPA and CN 2011b)
- Mitigation Strategy Report Information Request Document, November 2011 (PRPA and CN 2011c)

These IR documents include the dissenting perspectives, Proponent responses, and commitments. Table 9-1 of this CSR also provides a detailed list of all of the Proponent commitments.

8 BENEFITS OF THE EA TO CANADIANS

The Project was subject to the BCEAA as well as CEAA. Under the terms of the Canada-British Columbia Agreement for Environmental Assessment Coordination (2004), projects that require an EA by both the Government of Canada and the Government of British Columbia undergo a single, cooperative assessment, where possible to meet the EA requirements of both governments. A Memorandum of Agreement was signed by federal agencies and the BC Environmental Assessment Office establishing that the federal EA process for the Project will be equivalent to the provincial process established under Section 27 of BCEAA.

As part of the EA process the CEA Agency, RAs, Aboriginal Groups, and Federal Authorities, have rigorously evaluated and assessed the proposed Project with respect to potential environmental effects on VECs and other criteria of concern to Canadians. As a result of this process the Project has been designed to ensure that adverse effects of the Project on the environment are reduced and, where necessary, that mitigations, monitoring and follow-up protocols are in place. Management of environmental issues through Project design and the EA process improves the net benefit to Canadians considering environmental and economic factors.

The public have been given the opportunity to participate in this process through public review at key points in the assessment. Aboriginal Groups have been a key part of the Working Group, and engagement has been undertaken through various processes with respect to the assessment by the Proponents and government. As a result of these initiatives, and the feedback received, the Proponents have made efforts to modify Project design to accommodate issues and concerns wherever feasible. In response to key concerns raised during review of the EIS by the Project Working Group, the Proponents undertook a mitigative re-design of the Project. This mitigative re-design resulted in the following:

- 87 percent reduction in the volume of material proposed for disposal at sea
- 100 percent retention of Casey Creek east of the existing CN mainline
- Reduction of freshwater habitat (aquatic and riparian) losses by 65 percent
- Avoidance of adverse effects to a tidal marsh lagoon
- Reduction in upland (terrestrial) clearing by 52 percent
- Provides a direct route for truck traffic between the Terminal and Ridley Island

Field studies were completed to determine biological, physical and human characteristics of the receiving environment potentially affected by the Project. Collection of this data has increased local knowledge in such areas as: archaeological and heritage resources on and around Ridley Island; wildlife (terrestrial and avifauna) and vegetation communities; aquatic environment; and air and noise quality. This data will be available for future assessments in the Prince Rupert area thus may enhance the sustainable development opportunities for future development, as well as providing residents with greater insight into Prince Rupert's biological and physical environment. The EA exercise also uncovered several opportunities to compensate for the loss of fish habitat where opportunities were previously unknown.

The assessment process has also provided insight into the capacity for furthering economic development in the Prince Rupert area and provided industrial and transportation infrastructure that will provide direct and indirect benefits (e.g., labour and expenditures) for Prince Rupert.

9 SUMMARY AND CONCLUSIONS

The PRPA is proposing to construct a wharf extension and expand container and intermodal facilities as a second phase of development at the Fairview Terminal on Kaien Island, in Prince Rupert, British Columbia. In order to facilitate the land-based movement of containers to and from North America, CN is proposing to construct two sidings, a CN inspection road, and wye adjacent to the existing mainline, between Fairview Terminal and Zanardi Rapids. The Project also includes construction of a Port-dedicated road between the terminal and Ridley Island to the south. The purpose of the Project is to expand the existing Fairview Terminal and associated rail infrastructure in order to serve the growing needs of the shipping community regionally, provincially, nationally, and in the mid-west United States.

Project details are provided in Section 2.4 of this document.

The purpose of this CSR is to provide information to support environmental regulatory approvals under CEAA and CPAEAR. The CSR evaluates potential environmental effects of the Project and proposes mitigation and follow-up measures as required. The CSR assesses all aspects of the Project included in the Scope of Assessment for the three main Project phases: construction, operation and decommissioning. The federal EA review of the proposed Project was completed on the basis of the information provided by the Proponents in the following documents:

- EIS and supporting documents (i.e., TDRs)
- MSR and supporting documents
- Comments from the Working Group and the public on the potential effects of the Project
- Responses by the Proponents to IR from the WG and public
- Discussions of the technical WG

9.1 Scope of Environmental Assessment

The CSR has focused on a number of key issues or VECs. These VECs are specified in the final Scope of Assessment including:

- Air Quality
- Noise and Vibration
- Light
- Vegetation Resources
- Wildlife and Wildlife Habitat
- Avifauna
- Freshwater Environment
- Marine Environment
- Socio-economic Conditions
- Human Health and Safety
- Archaeology and Heritage Resources
- Current Traditional Use by Aboriginal persons
- Country Foods

The methods and approach used to prepare this CSR were developed to satisfy the factors to be considered in accordance with Sections 16(1) and 16(2) of CEAA and the specific requirements for a comprehensive study level of EA under Section 21 of CEAA. The assessment methods included an evaluation of the potential environmental effects for each VEC that may arise from each Project phase (construction, operation and decommissioning) as well as malfunctions and accidental events and cumulative environmental effects.

Details on EA scoping are included in Section 5 of this document.

9.2 Mitigation, Follow-Up and Monitoring Summary

The Project is being designed to meet applicable codes, standards and specifications that define loads, performance, materials, and quality requirements. Environmental design features and BMPs will help to reduce or eliminate potential adverse environmental effects from the Project. Best Available Technology

Economically Achievable will be used where available and appropriate for construction and operational needs, to reduce release of air contaminants, pollutants, and GHG emissions. An EMP will be developed for the Project including BMPs and specific mitigative commitments made by the Proponents in the regulatory approval process. The EMP and associated Environmental Protection Plans will be developed as all regulatory requirements are determined through the EA process and subsequent permitting process. An environmental monitor will monitor compliance with the EMP and ensure that follow-up monitoring is conducted.

Table 9-1 summarizes environmental design features and VEC-specific mitigation and monitoring commitments that are technically and economically feasible to manage potential adverse environmental effects (including cumulative effects) of the Project. These proposed mitigation measures also make up part of the EMP for construction and operation. As stated in Section 5.6.3, an EMP will be developed for the Project. The draft EMP Framework has been appended to this CSR (Appendix B). The EMP will be developed prior to Project construction, and in accordance with permitting requirements.

Table 9-1 Summary of Design, Mitigation, Monitoring and Follow-up Commitments

Commitments	Timing	Delivered By	Approving / Lead Agencies	Advisory Agencies	Reference Section
Air Quality					
Container vessel speed limits are in place for vessels approaching and departing the Port of Prince Rupert	Operation	PRPA	PRPA	Transport Canada	CSR; Table 6-7
Shore power infrastructure (i.e., cold ironing conduits) will be installed to allow properly-equipped ships to use shore power while at the berth. Cold ironing reduces local air emissions while the ship is being loaded or unloaded	Operation	Terminal Operator	PRPA	N/A	CSR; 6.1.4
Best Available Technology Economically Achievable to reduce CACs, HAPs and GHG emissions will be incorporated into Project design wherever feasible. (See below for discussion of timing for incorporation of cold ironing, electric on-dock equipment, and low emission locomotives)	Operation	Terminal Operator	PRPA	N/A	CSR; 6.1.4
CN and PRPA will comply with all new Canadian standards for use of ultra-low sulphur diesel fuel as it applies to their operation and control	Construction, Operation	Terminal Operator, CN	CN, PRPA	N/A	CSR; 6.1.4
Equipment will be properly tuned and maintained and will use low sulphur fuel when available	Construction, Operation, Maintenance	Contractor(s), PRPA, CN, Terminal Operator	CN, PRPA	N/A	CSR; 6.1.4
Dust will be controlled through the use of dust suppressants (i.e., water, not oil), minimizing the area of activity, minimizing activities that generate large quantities of dust during high winds, covering truckloads of materials which could generate dust (as necessary), and paving areas as soon as feasible	Construction	Contractor(s)	CN, PRPA	N/A	CSR; 6.1.4
Materials stored on site will be wetted to prevent blowing dust. Large volume of dust is unlikely given the amount of rain in Prince Rupert. Materials stored on site will be watered down to prevent blowing dust when necessary	Construction	Contractor(s)	CN, PRPA	N/A	CSR; 6.1.4
Ship idling time will be minimized when at berth during vessel unloading and loading (construction and operation). Where tugs are used during construction, idling will be minimized to the extent feasible	Construction, Operation	Vessel operators, Contractor(s)	PRPA	N/A	CSR; 6.1.4
Tug operator(s) will tie off to a buoy and shut engines down or return to home base and power down the engine, if not in operation for a period of 30 minutes or longer	Construction, Operation	Tug operators, PRPA	PRPA	N/A	CSR; 6.1.4
Where ambient conditions permit (i.e., 4°C or above), it is standard procedure for locomotive engines to be shut down when not in motion.	Operation	CN	CN	N/A	CSR; 6.1.4
New diesel-powered equipment will meet the highest regulated emissions standards at the time of purchase. At such time when terminal throughput reaches sufficient volume to render the purchase of electric RTG and RMG's economically feasible and/or diesel-powered equipment must otherwise be replaced, the purchase of new electrified equipment will be preferentially considered	Operation	Terminal operator	PRPA	N/A	CSR; 6.1.4
Due to the international nature of CN's rail infrastructure it cannot be determined if the locomotive units will always be newest low emission locomotives; however, the intermodal nature of Fairview traffic generally requires newer locomotive units that will rarely be used for switching activities. CN complies with the US EPA tiered locomotive standards for new purchases and major overhaul of locomotives with the long-term goal of shifting the locomotive fleet to lower emission standards	Operation	CN	CN	N/A	CSR; 6.1.4
CN locomotive units are being equipped with SmartStart technology which will automatically shut off or power up units based on time idling and temperature conditions. The newer units typically used in the Intermodal trains already have this technology, while the remainder are being upgraded	Operation	CN	CN	N/A	CSR; 6.1.4
PRPA will develop an Air Quality Action Plan for follow-up air quality monitoring. The plan will include a description of data collection and interpretation and actions to be taken based on results If there are concerns with respect to Air Quality identified at sensitive receptors (i.e., Port Edward Elementary School), the Proponents will investigate and implement actions as necessary.	Operation	PRPA, Terminal Operator	EC, PRPA	N/A	CSR; 6.1.4
PRPA, in consultation with the Province will implement monitoring to validate predicted results and prevent potential human health impact. PRPA will establish passive SO_2, NO_x, and O_3 monitoring sites around the Project site, as well as one background monitoring site. If there are no issues within 3 years of the Project being operational, and there are no issues with respect to SO_2 levels, the sites will be removed. The MAXXAM Analytics PASS system, or similar, will be used	Operation	PRPA	EC, PRPA	N/A	CSR; 6.1.4
Noise and Vibration					
Construction during night time hours and on weekends will be avoided where feasible	Construction	Contractor(s)	PRPA, CN	N/A	CSR; 6.2.4
Nearby residents will be advised of significant noise-causing activities	Construction	Contractor(s)	PRPA, CN	N/A	CSR; 6.2.4
If noise complaints related to traffic occur, they will be logged and investigated to assess whether they are linked with Project activities. The Terminal Operator will maintain the existing 24/7 complaint phone line. A website will be developed which informs the general public of planned construction activities and provide information for asking questions or registering concerns. If numerous complaints are received from a receptor, the Proponents will examine the validity (i.e., through monitoring if appropriate) and options available to mitigate	Construction, Operation	Terminal Operator	PRPA	N/A	CSR; 6.2.4
The number of pieces of equipment operating simultaneously and engine speed will be reduced where feasible	Construction, Operation	Contractor, Terminal operator	PRPA	N/A	CSR; 6.2.4

Commitments	Timing	Delivered By	Approving / Lead Agencies	Advisory Agencies	Reference Section
Welding Method: ensuring that the new sidings are continuously welded rail to avoid additional noise from jointed rail	Construction	CN	CN	N/A	CSR; 6.2.4
Ship idling time will be minimized when at berth during vessel unloading and loading (construction and operation). During operations, vessel idling time will be minimized at berth	Construction, Operation	Vessel operators, Contractor(s)	PRPA	N/A	CSR; 6.2.4
Tug operator(s) will tie off to a buoy and shut engines down or return to home base and power down the engine, if not in operation for a period of 30 minutes or longer	Construction, Operation	Tug operators, PRPA	PRPA	Transport Canada	CSR; 6.1.4
The Port-dedicated road between Fairview Terminal and Ridley Island will move trucks and associated noise away from the downtown core of Prince Rupert	Operation	PRPA	PRPA	N/A	CSR; 6.2.4
Construction of the sidings will reduce the need for the Terminal Operator to use the CN downtown yard, which will consequently reduce whistling	Operation	Terminal operator	PRPA, CN	N/A	CSR; 6.2.4
The joint effort between CN, PRPA and the City of Prince Rupert to make the Mile 92.96 Ferry and Mile 92.70 Highway 16 Crossings anti-whistling will reduce noise disturbances	Operation	CN, PRPA, City of Prince Rupert	PRPA, CN	N/A	CSR; 6.2.4
Light					
Lighting will be reduced in areas that are not being used for construction or operational activities, using a centralized lighting control system that is able to selectively turn off lighting where it is not required	Construction, Operation	Terminal operator	PRPA	N/A	CSR; 6.3.4
HPS luminaires will have sharp cut-off flood light racks on the outer rows to mitigate for light spillover	Operation	Terminal operator	PRPA	N/A	CSR; 6.3.4
Light shielding will be installed on the high mast terminal lighting. Shielding is required for safe navigation but must be balanced with providing adequate light in the yard.	Operation	Terminal operator	PRPA	N/A	CSR; 6.3.4
If nighttime construction for the CN siding and wye is required, lighting will be directed at the specific construction location	Construction, Operation	CN, Contractor(s)	CN	N/A	CSR; 6.3.3
Terminal lights will be directed onto the Terminal uplands as much as possible to minimize light trespass to the environment and surrounding communities	Operation	Terminal operator	PRPA	N/A	CSR; 6.3.4
Project infrastructure (e.g., loading cranes, approximately 80 m high) will be equipped with down-shielded lighting to reduce spillover. Safe operations will be the governing criteria	Operation	Terminal operator	PRPA	N/A	CSR; 6.3.4
Terminal lighting will be the same as currently used (approved terminal lighting) or will meet the most recent navigational code lighting requirements (at time of construction). The high mast lights currently in use at Fairview Terminal are considered to be bird-friendly. No bird deterrents are proposed. Light shielding will be installed on the high mast terminal lighting	Operation	Terminal operator	PRPA	Transport Canada	CSR; 6.3.4
Vegetation Resources					
Limit the extent of grubbing, stripping and removal of understory vegetation (e.g., shrubs, grasses and forbs) to the minimum required for terminal construction and operation without compromising safety and security requirements. Clearing limits (i.e., the extent of the vegetated area that is required to be cleared for construction purposes) will be clearly identified (i.e., flagged or otherwise demarcated) prior to clearing commencing. This will be based on detailed design, field conditions at the time, and any new guidelines or regulations in place at the time of construction	Construction	Contactor(s)	PRPA, CN	N/A	CSR; Table 6-4
Minimize disturbance of intact vegetation during the operations phase (e.g., confine storage of materials to the established Project footprint; do not dump rock and other materials on intact vegetated areas)	Operation	Terminal operator, Contractor(s), CN	PRPA, CN	N/A	CSR; Table 6-4
Avoid or minimize extent and duration of stream course diversions	Construction	Contractor(s)	PRPA, CN	N/A	CSR; Table 6-4
Conform to restrictions (e.g. maintenance of 30-m riparian buffer in Stream Riparian Area Development Permit Areas along watercourses. Note: Rail maintenance regulations as required by the *Railway Safety Act*, administered by Transport Canada, have primacy over mitigations outlined in this document	Construction, Operation, Maintenance	Contractor(s), CN	PRPA, CN	N/A	CSR; Table 6-4
Re-establish native vegetation on disturbed areas as soon as possible (i.e., within two weeks of the disturbance)	Construction, Maintenance	Contractor(s)	PRPA, CN	N/A	CSR; Table 6-4
Reduce windthrow risk as per BC Ministry of Forests, Lands and Natural Resource Operations guidelines	Construction, Maintenance	Contractor(s)	BCMOF	N/A	CSR; Table 6-4
Prevent erosion through application of the Erosion and Sediment Control Plan	Construction	Contractor(s)	DFO	N/A	CSR; Table 6-4
During construction, ensure all equipment brought on site is thoroughly cleaned (e.g., remove dirt from other work sites that has accumulated on the tracks, undercarriage, tires) prior to arrival	Construction	Contractor(s)	PRPA, CN	N/A	CSR; Table 6-4
Avoid using fill from known sites of invasive plant infestation	Construction	Contractor(s)	PRPA, CN	N/A	CSR; Table 6-4

Commitments	Timing	Delivered By	Approving / Lead Agencies	Advisory Agencies	Reference Section
Conduct a pre-disturbance assessment of the old forest ecological community of conservation concern (HM) in the vicinity of the proposed Wye Junction to identify and evaluate options to minimize loss or alteration of this ecosystem	Pre-construction	CN	CN	N/A	CSR; Table 6-4
Construct berms and install culverts in appropriate sites for maintaining drainage to and from wetlands, if determined to be appropriate (CWS)	Construction, Operation	Contractor(s)	PRPA, CN	EC (CWS)	CSR; Table 6-4
Develop a wetland compensation plan for the direct loss of 0.3 ha of peat margin swamp (seepage swamp), as well as up to 0.1 ha of indirect loss of the same seepage swamp. and share with the interested local Aboriginal Groups	Pre-construction	PRPA	PRPA	EC (CWS)	CSR; Table 6-4
Wildlife and Wildlife Habitat					
Avoid all unnecessary vegetation clearing around the facility and roads. Clearing limits (i.e., the extent of the vegetated area that is required to be cleared for construction purposes) will be clearly identified (i.e., flagged or otherwise demarcated) prior to clearing commencing. Further commitments regarding clearing are provided under Vegetation Resources	Construction	Contractor(s)	PRPA, CN	N/A	CSR; 6.5.4
Keep human disturbance to a minimum by restricting and managing access and human activity (e.g., posting signs, security access)	Construction, Operation, Maintenance	Contractor(s), Terminal operator	PRPA, CN	N/A	CSR; 6.5.4
Enforce low vehicle speeds (e.g., 30 km/h) on site roads during construction	Construction	Contractor(s)	PRPA, CN	N/A	CSR; 6.5.4
Road profiles should be kept as flat and straight as possible to maintain a clear line of vision and well lit at night to increase roadside visibility during periods of high deer activity	Construction	PRPA, Engineers	PRPA, CN	N/A	CSR; Table 6-4
Maintain fencing around the Terminal site large enough to exclude large mammals from entry and provide one-way escape exits to avoid entrapment	Construction, Operation	Terminal operator	PRPA	N/A	CSR; 6.5.4
Implement employee wildlife education program regarding the potential presence and behaviour of wildlife on the Project site as well as prohibitions on unauthorized hunting	Construction, Operation	Terminal operator, PRPA, CN	PRPA, CN	N/A	CSR; 6.5.4
Minimize the size and extent of disturbed soil and vegetation during construction, including brushing, pruning and clearing activities, and preserve existing habitat conditions wherever and whenever possible. Clearing limits (i.e., the extent of the vegetated area that is required to be cleared for construction purposes) will be clearly identified (i.e., flagged or otherwise demarcated) prior to clearing commencing. Further commitments regarding clearing are provided under Vegetation Resources	Construction	Contractor(s)	PRPA, CN	N/A	CSR; 6.5.4
Ensure staff are trained in bear awareness and the importance of minimizing trash and other bear attractants; a secure waste disposal system should also be implemented during the construction and operations of the Project to avoid attracting wildlife onto the site	Pre-construction, Construction, Operation	Terminal operator, CN, Contractor(s)	PRPA, CN	N/A	CSR; 6.5.4
CN will continue to participate in the Telkwa Moose Working Group whose studies investigate the underlying factors causing moose collisions. The results of this work will continue to provide CN with the information required to evaluate and apply effective mitigation measures to high collision areas on the rail line to reduce moose mortality. Additionally, CN proposes to develop a plan to: i) improve mortality counts for all wildlife within the Skeena Subdivision through improved reliability of reporting; and ii) track the effect of increasing train traffic. CN will track the effect of increasing traffic on the Telkwa, as the pre-increase levels are already known	Operation	CN	BC MOE	N/A	CSR; 6.5.4
Sounding of horn upon sighting of animal on rail right-of-way	Operation	CN, Terminal operator	PRPA, CN	N/A	CSR; 6.5.4
Conduct a review of SARA listed species within the Project footprint area prior to Project commencement to assess whether species found in baseline studies have been listed, or re-classified. The proponent will conduct a vascular and non–vascular plant survey in areas where they may be potentially found, prior to construction, and avoid and/or obtain any required permits for any SARA listed species that may be found	Pre-construction	CN, PRPA	EC	N/A	CSR; 6.5.4
Avifauna					
Implement a wildlife education program, within the worker health and safety training that will apprise employees of the possible presence and behaviour of wildlife, including birds, on the Project site	Pre-construction, Construction, Operation	Terminal operator, CN, Contractor(s)	PRPA, CN	N/A	CSR; 6.6.4
Construction activities such as dredging and perimeter berm construction will be scheduled in consideration of periods when the North Coast has high marine bird populations (i.e., November to April). Given the duration of some of the construction activities, construction may overlap with some periods of higher bird use	Construction	Contractor(s), Terminal operator	EC (CWS)	N/A	CSR; 6.6.4
Construction and operation activities should be scheduled during daylight hours whenever feasible to minimize the need for staging lights	Construction, Operation	Contractor(s)	PRPA, CN	N/A	CSR; 6.6.4
Where permissible under safety and navigation requirements, outdoor lights will be shielded to minimize light spillage beyond the wharf face	Operation	Terminal operator	PRPA	N/A	CSR; 6.6.4

Commitments	Timing	Delivered By	Approving / Lead Agencies	Advisory Agencies	Reference Section
Avoid physical disturbance to bird nesting habitat during the nesting season (May 1 to July 31) to prevent mortality of birds, nests or eggs in accordance with section 34 of the British Columbia *Wildlife Act* and sections 5 and 6(a) of the *Migratory Birds Regulations* of the *Migratory Birds Convention Act.* The Proponents will refer to advice posted on Environment Canada's website, available through the following link: http://www.env.gov.bc.ca/wld/BMP/bmpintro.html#second	Pre-construction, construction	Contractor(s)	EC (CWS)	N/A	CSR; 6.6.4
Enforce speed limits for vehicle and vessel traffic	Construction, Operation	Contractor(s)	PRPA, CN	N/A	CSR; 6.6.4
Vibratory pile installation method will be used where technically feasible over impact driving in an effort to reduce marine noise levels. Bubble curtains will be deployed to minimize underwater noise for the duration of any impact pile-driving activity where vibratory pile installation is not feasible	Construction	Contractor(s)	DFO	N/A	CSR; 6.6.4
Retain raptor nest trees with the appropriate vegetated buffer (i.e., according to MOE 200 – Best Management Practices for Raptor Conservation during Urban and Rural Land Development in British Columbia) to reduce the impacts of disturbance, where technically and economically feasible	Construction	Contractor(s)	PRPA, CN	N/A	CSR; 6.6.4
Conduct a pre-construction survey to identify important wildlife habitat features (e.g. raptor nests). If habitat features are located a mitigation plan will be developed to minimize effects. If removal of significant habitat features is unavoidable, a permit for removal will be sought under the British Columbia *Wildlife Act*	Pre-construction	CN, Terminal Operator	BC MOE	N/A	CSR; 6.6.4
Minimize disturbance of intact vegetation during the operations phase (e.g., confine storage of materials to the established Project footprint; do not dump rock and other materials on intact vegetated areas)	Operation	Terminal operator	PRPA, CN	N/A	CSR; Table 6-4
Complete the surveys required by CWS, and detailed in Section 6.6 (12 months of surveys for marine birds). Provide final survey data report to CWS and the BC Ministry of Environment. Adapt environmental management plan as necessary	Pre-construction	CN, PRPA	EC (CWS)	N/A	CSR; 6.6.6
Conduct a review of SARA listed species within the Project footprint area prior to Project commencement to assess whether species found in baseline studies have been listed, or re-classified	Pre-construction	CN, PRPA	EC (CWS)	N/A	CSR; 6.5.4
Freshwater Environment					
Minimize disturbance of intact vegetation during the operations phase (e.g., confine storage of materials to the established Project footprint; do not dump rock and other materials on intact vegetated areas)	Operation	Contractor(s)	PRPA, CN	N/A	CSR; Table 6-4
Work that will disturb soils will be stopped during periods of high precipitation (i.e., greater than 100 mm of precipitation in a 24 hour period) if it is likely to lead to sediment deposition into streams	Construction	Contractor(s)	PRPA, CN	N/A	CSR; 6.7.4
Temporary work spaces (spoil areas, equipment storage areas, etc.) will not be located within 30 m of the top-of-bank of fish-bearing streams. Note: Much of the CN construction, spoil areas, equipment will be within 30 m of fish bearing waters (marine and freshwater) given the location of the mainline	Construction	Contractor(s)	DFO	N/A	CSR; 6.7.4
Stream diversions and culvert extensions/replacement will be conducted in isolation of stream flows (e.g., dam and pump, flume, diversion). Conduct fish salvages prior to dewatering areas for in stream work	Pre-construction, Construction	Contractor(s)	DFO	N/A	CSR; 6.7.4
Soil stockpiles will be at a minimum of 15 m from top of stream bank and will be isolated with silt fencing and covered if site topography drains towards a stream. Note: Much of the CN construction, spoil areas, equipment will be within 30 m of fish bearing waters (marine and freshwater) given the location of the mainline	Construction	Contractor(s)	DFO	N/A	CSR; 6.7.4
Install and maintain appropriate erosion and sediment control measures such as silt fencing, temporary diversion berms, clear crush check dams, or straw bales. All on-shore and in-water construction activities will be conducted using task-specific BMPs to reduce sediment disturbances and prevent excessive re-suspension of sediment during site-preparation and construction. A sediment and erosion control plan will be in place for on-shore activities. These will be detailed in the EMP and include total suspended solids monitoring and the installation of diversion ditches and sediment screens where appropriate	Construction	Contractor(s)	DFO	N/A	CSR; 6.7.4
Regularly (i.e., daily during storm events) monitor instream turbidity levels and sediment control measures during construction, particularly following major storm events	Construction	Contractor(s)	DFO	N/A	CSR; 6.7.4
Concrete pours will be protected from rainfall with an impermeable cover for a minimum 48 hours (or min. of 72 hours when ambient conditions are below 0°C), or until the concrete cures, in order to prevent high pH runoff. Instream cast-in-place concrete will be isolated from fish-bearing waters until the concrete has properly cured (minimum of 48 to 72 hours). Where appropriate, accelerants will be used to shorten curing times. Open bags of concrete mix will be stored in a protected dry area. A CO_2 tank with regulator, hose, and diffuser will be available onsite during concrete work to neutralize pH levels	Construction	Contractor(s)	DFO	DFO	CSR; 6.7.4
Wastewater and wash waters will be treated to PAL criteria (between pH 6.5 and 9.0) and the turbidity will be less than 25 NTU above background when it is discharged. Wastewater and wash water discharges will follow guidance from DFO's Land Development Guidelines for the Protection of Aquatic Habitat (1993) and the CCME guidelines for the protection of aquatic habitat	Construction	Contractor(s), Terminal operator	DFO	EC	CSR; 6.7.4

Commitments	Timing	Delivered By	Approving / Lead Agencies	Advisory Agencies	Reference Section
Wastewater discharges from the terminal will be subject to compliance with the *Fisheries Act, Environmental Management Act*, Petroleum Storage and Distribution Facilities Stormwater Regulation, and the Special Waste Regulation	Construction. Operation	Terminal operator	DFO, BC MOE	N/A	CSR; 6.7.4
A Habitat Compensation Plan will be implemented to compensate for the loss of freshwater fish habitat in anticipation of a requirement for the authorization of a HADD under section 35(2) of the *Fisheries Act.*	Pre-construction	PRPA, CN	DFO	N/A	CSR; 6.7.5
Construction scheduling will adhere to least risk timing window for instream works. If preferred work windows are not feasible, additional mitigative steps will be considered in consultation with DFO	Construction	Contractor(s)	DFO	N/A	CSR; 6.7.4
Follow DFO's Guidelines for use of Explosives in Canadian Fisheries Waters during blasting design and blasting activities (Wright and Hopky 1998)	Construction	Contractor(s)	DFO	N/A	CSR; 6.7.4
Complete instream work in isolation of flowing water (e.g., using dam and pump method)	Construction	Contractor(s)	DFO	N/A	CSR; 6.7.4
Conduct fish salvages prior to dewatering areas for instream work	Pre-construction	Contractor(s)	DFO	N/A	CSR; 6.7.4
Screen pump intakes in fish-bearing waters as per DFO's Intake End-of-Pipe Fish Screen Guidelines (DFO 1995)	Construction	Contractor(s)	DFO	N/A	CSR; 6.7.4
All on-shore and in-water construction activities will be conducted using task-specific BMPs to reduce sediment disturbances and prevent excessive re-suspension of sediment during site-preparation and construction. A sediment and erosion control plan will be in place for on-shore activities. These will be detailed in the EMP and include total suspended solids monitoring and the installation of diversion ditches and sediment screens where appropriate	Construction	Contractor(s)	DFO	N/A	CSR; 6.7.4
Restrict the use of hazardous materials around watercourses	Construction, Operation, Maintenance	Contractor(s)	DFO	N/A	CSR; Table 6-7
Ensure all industrial equipment is clean, in good mechanical shape, and free of leaks	Construction, Operation, Maintenance	Contractor(s), Terminal operator, CN	PRPA, CN	N/A	CSR; 6.7.4
Spill kits onsite and spill response training for equipment operators will ensure fuel spills; oil leaks, hydraulic line ruptures and similar accidental spills of hazardous or deleterious materials are identified and cleaned up promptly. Ensure appropriate Spill Response Plan is in place and implemented	Construction, Operation, Maintenance	Contractor(s), Terminal operator, CN	DFO	N/A	CSR; 6.7.4
PRPA and CN will complete the final habitat compensation plan and enter into the authorization process with DFO as soon as there is commercial certainty for the Project. Both PRPA and CN understand that substantial changes in the affected habitats may require additional information or modifications to the HCP. DFO will require assurance of feasibility of the proposed compensation prior to finalizing the HCP and issuing an authorization.	Pre-construction	PRPA, CN	DFO	N/A	CSR; 6.7.4
Marine Environment					
Pre-construction surveys and mapping of eelgrass beds affected or potentially affected by Project construction will be undertaken	Pre-construction	PRPA, CN	DFO	N/A	CSR; 6.8.4
PRPA and CN commit to conducting field surveys for abalone prior to commencement of in-water works associated with terminal construction. The abalone survey will be completed in accordance with the "Impact assessment protocol for works and developments potentially affecting abalone and their habitat"	Pre-construction	PRPA, CN	DFO	N/A	CSR; 6.8.4
Construction and operation equipment will be properly maintained, and precautions will be taken when refuelling and performing maintenance activities. Oil and hydraulic fluids will not be changed at the shoreline without secondary containment in place. Absorbent pads will be used to absorb small spills; pads will be disposed of at an appropriate disposal site	Construction, Operation, Maintenance	Contractor(s), Terminal operator, CN	PRPA, CN	N/A	CSR; 6.8.4
Vessel operators will stay clear of shallow waters where eelgrass is present ("no-go" zones, marked by buoys or other appropriate method). If required, vessels that will minimize prop-wash and scouring for work in shallow waters will be selected where technically feasible	Construction	Vessel operators, Contractor(s)	PRPA	N/A	CSR; 6.8.4
Vibratory pile installation method will be used where technically feasible over impact driving in an effort to reduce marine noise levels. Bubble curtains will be deployed to minimize underwater noise for the duration of any impact pile-driving activity where vibratory pile installation is not feasible	Construction	Contractor(s)	DFO	N/A	CSR; 6.8.4
Spill kits onsite and spill response training for equipment operators will ensure fuel spills; oil leaks, hydraulic line ruptures and similar accidental spills of hazardous or deleterious materials are identified and cleaned up promptly. Ensure appropriate Spill Response Plan is in place and implemented	Construction, Operation, Maintenance	Contractor(s), Terminal operator, CN	DFO	N/A	CSR; 6.7.4
All terminal drainage will be routed through oil-water separators before being discharged into the ocean	Operation	Terminal operator	DFO, EC	N/A	CSR; 2.4.8.1
Hazardous materials will be stored, handled, and used in compliance with applicable standards, codes, and regulations	Construction, Operation, Maintenance	Terminal operator, Contractor(s)	PRPA, CN	N/A	CSR; 6.8.4

Commitments	Timing	Delivered By	Approving / Lead Agencies	Advisory Agencies	Reference Section
Marine fill material will be free of organics and other deleterious material	Construction	Contractor(s)	EC	DFO	CSR; 6.8.4
Wastewater and wash waters (including concrete effluent from concrete production) will be treated to PAL criteria (between pH 6.5 and 9.0) and the turbidity will be less than 25 NTU above background prior to marine discharge. All marine discharges will comply with CCME Water Quality and Sediment Guidelines for the Protection of Aquatic Life as mandated by EC	Construction, Operation, Maintenance	Contractor(s), Terminal operator	DFO, EC	N/A	CSR; 6.7.4
Wastewater discharges to the marine environment from the Terminal will be subject to compliance with the *Environmental Management Act*, Petroleum Storage and Distribution Facilities Stormwater Regulation, and the Special Waste Regulation	Construction, Operation, Maintenance	Contractor(s), Terminal operator	DFO, BC MOE	N/A	CSR; 6.7.4
Ballast water from incoming ships will be exchanged or treated at sea, at least 200 nautical miles from shore, as per the *Canada Shipping Act, Ballast Water Control and Management Regulations*	Operation	Vessel operators	Transport Canada, DFO, PRPA	N/A	CSR; 6.8.4
All on-shore and in-water construction activities will be conducted using task-specific BMPs to reduce sediment disturbances and prevent excessive re-suspension of sediment during site-preparation and construction. A sediment and erosion control plan will be in place for on-shore activities. These will be detailed in the EMP and include total suspended solids monitoring and the installation of diversion ditches and sediment screens where appropriate	Construction	Contractor(s)	DFO	N/A	CSR; 6.8.4
Marine riparian clearing will be kept to the minimum required by rail maintenance regulations	Construction, Maintenance	Contractor(s)	PRPA, CN	N/A	CSR; 6.8.4
During dredging, preference will be given to the most efficient dredging technology, where technically and economically feasible, to minimize sedimentation	Construction	Contractor(s)	PRPA	N/A	CSR; 6.8.4
If feasible silt curtains will be in place around the equipment and at other locations during dredging to protect sensitive habitats	Construction	Contractor(s)	DFO	N/A	CSR; 6.8.4
Dredging, infilling, and pile installation work windows will be scheduled in consideration of sensitive time frames for salmon including migration, spawning and egg development of salmon in consultation with DFO. If preferred work windows are not feasible, additional mitigative steps will be considered in consultation with DFO. Disposal at sea activities will take place between October 1 and November 15, which takes into consideration sensitive timing periods of species such as halibut and humpback whale.	Construction	Contractor(s)	DFO	N/A	CSR; 6.8.4
Environment Canada will place a note on the Project file requesting the Brown Passage be included as a "high priority" monitoring site for follow-up monitoring	Permitting	EC	EC	DFO	CSR; 6.8.4
Disposal at sea activities will be monitored in accordance with any conditions set out in the CEPA permit (conditions to be determined at later date, during the permitting phase)	Construction	Terminal Operator, EC	EC	DFO	CSR; 6.8.4
A Habitat Compensation Plan will be implemented to compensate for the loss of fish habitat, including benthic communities, eel grass and kelp beds, in anticipation of a requirement for the authorization of a HADD under section 35(2) of the *Fisheries Act*	Pre-construction (permitting)	PRPA, CN	DFO	N/A	CSR; 6.8.4
All in-water construction activities that have the potential to cause fish mortality will be regulated under Section 32 of the *Fisheries Act*; the proponent will abide by any applicable permit requirements and conditions	Construction	Contractor(s)	DFO	N/A	CSR; 6.8.4
A safety zone (approximately 500 m in radius) will be established around all loud construction activities (e.g., impact pile driving) of the Project in consultation with DFO. Trained and dedicated marine mammal observers will be on-site during loud construction activities to monitor the safety zone. In the unlikely event that a humpback whale approaches within the safety zone during loud construction activities, the activity will be halted until the animal moves outside the safety zone. The Proponents will consult with DFO to ensure that the marine mammal observers are considered to be qualified	Construction	Contractor(s)	DFO	N/A	CSR; 6.8.4
When the final terminal footprint and resultant dredge volumes have been determined, further sampling requirements and a detailed supplementary sampling plan will be developed in consultation with EC as part of the Disposal at Sea application process	Pre-construction (permitting)	PRPA	EC	DFO	CSR; 6.8.4
Any vessel strikes that do occur, during construction or operation, will be reported to DFO	Construction, Operation	Vessel Operators, Contractor(s)	DFO	N/A	CSR; 6.8.4
Terminal Operator will provide to DFO a report of marine mammal species observed during construction monitoring	Construction	Terminal Operator	DFO	N/A	CSR; 6.8.4
The existing PRPA Harbour Operations Practices and Procedures will continue to be implemented—speed limits, safe operation of vessels	Construction, Operation	PRPA	PRPA	N/A	CSR; 6.8.4
If a whale or group of whales is known to be present in the shipping lane, Marine Traffic will advise pilots and every precaution will be made to avoid them, assuming this does not put the safety of the vessel at risk. In addition, where practical, PRPA will request float plane operators to also report whale sightings inside Harbour limits to Marine Traffic. Tug operators will also be looking out for whales	Operation	PRPA, pilots, tug operators, float plan operators	PRPA	N/A	CSR; 6.8.4
PRPA will develop educational material (i.e., a brochure or poster) that will be distributed to boaters, pilots and tug operators to inform them of the species of whales in the area, their status, the risk of ship strikes and what they can do to help minimize those risks (e.g., reporting the sightings, reducing speeds, and avoiding them where possible)	Construction, Operation	PRPA	PRPA	N/A	CSR; 6.8.4

Commitments	Timing	Delivered By	Approving / Lead Agencies	Advisory Agencies	Reference Section
An adaptive management approach will be taken to further reduce risks of ship strikes if a whale is believed to have been struck by a vessel within the Port of Prince Rupert Harbour. PRPA will review the existing information at the time, assess whether further mitigation measures can be implements, and implement them where appropriate	Operation	PRPA	PRPA	N/A	CSR; 6.8.4
Marine works will be constructed in the dry, as tides and existing conditions permit (some areas are never dry)	Construction	Contractor(s)	DFO	N/A	CSR; 6.8.4
Conduct a review of SARA listed species within the Project footprint area prior to Project commencement to assess whether species found in baseline studies have been listed, or re-classified	Pre-construction	PRPA, CN	EC	N/A	CSR; 6.8.4
A monitoring plan for this area will be developed to monitor potential sediment deposition in the location of the Casey Creek Alluvial fan	Operations	PRPA	DFO	N/A	CSR; 6.8.1
Socio-economic Conditions					
Change in land access will be communicated to the public (e.g., signage and/or public notice) prior to and during construction	Construction	Terminal Operator	PRPA	N/A	CSR; 6.9.4
Archaeology and Heritage Resources					
Mitigation for Archaeology and Heritage Resources will comply with the Archaeology Mitigation Plan dated May 31, 2012, associated Addendum dated June 1, 2012, and Implementation Plan dated January 12, 2012.	Pre-construction, Construction	PRPA, CN	PRPA, CN	N/A	CSR; 6.11.4
Archaeological monitoring will be conducted during construction activities. CN and PRPA are responsible for the identification, documentation and protection of any Archaeological and Heritage Resources (including ancient human remains) collected during monitoring activities until such time as they legally dispose of their interest in the collection to another party. Once these Archaeological and Heritage Resources have been processed and assessed, CN and PRPA will arrange to transfer the entire collection and associated records to an acceptable repository in British Columbia.	Construction	PRPA, CN	PRPA, CN	N/A	CSR 6.11
CN and PRPA are responsible for the identification, documentation and protection of all Archaeology and Heritage Resources (including ancient human remains) recovered until such time as they legally dispose of their interest in the collection to another party. Once these Archaeological and Heritage Resources have been processed and assessed, CN and PRPA will arrange to transfer the entire collection and associated records to an acceptable repository in British Columbia. The transfer arrangements will ensure that the repository is able to provide acceptable care and protection of the entire collection; controlled and supervised access to the collection and associated records by researchers and the public where reasonable and practical; and a policy and procedure to deal with claims of cultural property to the collection.	Pre-construction, Construction Operation	PRPA, CN	Transport Canada	Parks Canada	CSR 6.11
Current Traditional Use by Aboriginal persons					
Impact Benefit Agreements have been formed with five of the Tsimshian Nations regarding use of traditional lands and marine areas adjacent to Fairview Terminal and along the CN right-of-way. PRPA and CN are committed to ongoing consultation with the five identified Aboriginal Groups, and to provide meaningful and effective opportunities for the Aboriginal Groups to engage in the EA process	Construction, Operation	PRPA, CN	AANDC	N/A	CSR; 6.12.4
Provide Aboriginal Groups with regular updates on activities and progress. Ensure Aboriginal Groups are aware of established marine/fishing exclusion zones during construction	Construction, Operation	PRPA, CN	PRPA, CN	N/A	CSR; 6.12.4
Post public notices (i.e., via a passive website or email distribution) as necessary to inform boaters of construction work. Marine traffic control for the harbour will advise boaters checking in about any marine construction work or restricted access areas	Construction	PRPA	PRPA	N/A	CSR; 6.12.4
Country Foods					
The public will be notified of the construction schedule and changes to access restrictions will be posted on signs and other public notices (i.e., via a passive website or email distribution)	Construction	Terminal Operator	PRPA	N/A	CSR; 6.13.4
Effects of the Environment on the Project					
Terminal design will account for extreme weather conditions and storms and sea level rise associated with climate change through the use of applicable codes and standards that will take into account the region’s climate and climate change	Pre-construction	Terminal operator, Engineers	PRPA	N/A	CSR; 6.15.2.3
The Project design will incorporate landscape mitigation measures, including construction of landslide barriers and catch ditches	Pre-construction	Terminal operator, Engineers	PRPA	N/A	CSR; 6.15.2.2
Outdoor work will be stopped at the discretion of the Project Manager or Site Supervisor when extreme rain events create unsafe working conditions (i.e., greater than 100 mm of precipitation in a 24-hr period)	Construction	Contractor(s)	PRPA, CN	N/A	CSR; 6.15.2.3
The Project’s wharf structure, berm and other supported structural works will be designed taking relevant seismic event performance criteria into account	Pre-construction	Terminal operator, Engineers	PRPA	N/A	CSR; 6.15.2.4
In the event of an earthquake that is expected to generate a tsunami or where a tsunami warning is issued, the Terminal will be secured and evacuated	Construction, Operation, Maintenance	Terminal operator	PRPA	N/A	CSR; 6.15.2.4

Commitments	Timing	Delivered By	Approving / Lead Agencies	Advisory Agencies	Reference Section
Accidents and Malfunctions					
An Emergency Response Management system will be adopted and implemented to achieve specific policy objectives for the operation of the Project with respect to reducing potential environmental and health and safety effects from Project-related accidental events	Construction, Operation, Maintenance	Terminal operator, PRPA	PRPA	N/A	CSR; Table 6-7
The Hazardous Materials Action Plan, the Terminal Operator Emergency Plan, and the PRPA Emergency Plan will be updated, where necessary, to accommodate the proposed Phase II Expansion. These plans will be in place during construction and operations phases and will include the location of spill equipment on site, methods to prevent containerized material spills from spreading and for recovering the materials in the water. The plan will also identify any sensitive habitats to best direct response efforts. Appropriate operations personnel will be trained to respond to hazardous materials spills, and to operate basic fire protection equipment. Emergency response actions will be directed towards identified areas of sensitive habitats, such as eelgrass beds. CN's Emergency Response Plan will be kept current and will be implemented as necessary. Appropriate CN personnel will be trained to respond to hazardous materials spills	Construction, Operation	PRPA, CN, Terminal operator	PRPA, CN	N/A	CSR; Table 6-7
All container vessels using Prince Rupert Harbour will carry an Oil Pollution Emergency Plan	Operation	Vessel operators	Transport Canada	N/A	CSR; Table 6-7
Terminal operators will ensure that their own Spill and Emergency Response Plans are up to date	Operation	Terminal operator	PRPA	N/A	CSR; Table 6-7
Spill containment kits will be present on site in locations where risk of spill is deemed the greatest (e.g., refuelling stations). These kits will include fencing, where appropriate, to restrict wildlife from entering the spill areas	Construction, Operation, Maintenance	Terminal operator, CN, Contractor(s)	PRPA, CN	N/A	CSR; Table 6-7
Construction management plans will include hazardous materials storage and handling procedures. Designated refuelling areas will be established, and will be a safe distance from fish habitat and ignition sources. Storage of hazardous materials near watercourses will be prohibited, and restricted near sensitive habitats	Construction	Terminal operator, CN, Contractor(s)	PRPA, CN	N/A	CSR; Table 6-7
For the terminal, drainage water will pass through oil water separators or sumps	Operation	Terminal operator	DFO, EC	N/A	CSR; Table 6-7
Appropriate operations personnel will be trained to respond to hazardous materials spills, and to operate basic fire protection equipment	Operation	Terminal operator	PRPA	N/A	CSR; Table 6-7
Ensure that individuals who use material substances and/or equipment on the Project site recognize the hazards and environmental consequences associated with their use	Construction, Operation	CN, Terminal operator	PRPA, CN	N/A	CSR; Table 6-7
At any time, if a hazardous material is seen to be leaking from a container, or anywhere else on site, the PRPA or CN Emergency Response Plan will be initiated and the site will be secured	Construction, Operation, Maintenance	Terminal operator, CN, Contractor(s)	EC, PRPA	N/A	CSR; Table 6-7
Ensure that spills are reported in accordance with the protocols and procedures set out by the Provincial Emergency Program, CN's Emergency Response Plan, and the PRPA's Practices, Procedures and Policy Emergency Plan	Construction, Operation, Maintenance	CN, Terminal operator	PRPA	N/A	CSR; Table 607
The Construction Contractor will provide a qualified Environmental Monitor to monitor general marine and riparian construction activities as necessary	Construction	Contractor(s)	DFO	N/A	CSR; Executive Summary, 6.3.6, 6.5.6, 6.6.6, 6.7.6, 8.2
Following clean up and restoration works associated with an accidental spill of hazardous material, a monitoring and follow up program will be designed and implemented that will assess the success of the cleanup and reclamation activities	Construction, Operation, Maintenance	Contractor(s)	PRPA, CN	N/A	CSR; 6.16.5
All marine vessel traffic entering, within, or leaving the Port is managed by PRPA, Canadian Coast Guard Marine Communication and Traffic Services, and the Pacific Pilotage Authority. Any vessels over 350 gross tons will require pilotage, in accordance with Port standard practices and procedures. Containerized materials will be properly secured, and regular checks will be undertaken to ensure efficient hold	Construction, Operation	PRPA	PRPA	Transport Canada	CSR; 6.16.2.1. Table 6-7
All land-based equipment will be regularly inspected and properly maintained	Construction, Operation, Maintenance	CN, Terminal Operator	PRPA, CN	N/A	CSR; 6.16.3
Spill containment measures will be in place	Construction, Operation, Maintenance	Contractor(s)	PRPA, CN	N/A	CSR; 6.16.3
Construction management plans will include hazardous materials storage and handling procedures	Construction	Contractor(s), CN, Terminal Operator	PRPA, CN	N/A	CSR; 6.16.3

Commitments	Timing	Delivered By	Approving / Lead Agencies	Advisory Agencies	Reference Section
Storage of hazardous materials near watercourses will be prohibited, and restricted near sensitive habitats	Construction, Operation, Maintenance	Terminal operator, CN, Contractor(s)	PRPA, CN	N/A	CSR; 6.16.3
Designated refueling areas will be established, and will be a safe distance from fish habitat and ignition sources	Construction, Operation, Maintenance	Terminal operator, CN, Contractor(s)	PRPA, CN	N/A	CSR; 6.16.3
Ensure that contingency plans are in place: Hazardous Spill Contingency Plan, Oil Pollution Emergency Plan, PRPA Hazardous Materials Action Plan, operators' Spill and Emergency Response Plan	Construction, Operation, Maintenance	Terminal operator, Contractor(s)	PRPA	N/A	CSR; 6.16.3
All transfer equipment will be regularly maintained	Construction, Operation	Contractor(s)	PRPA	N/A	CSR; 6.16.3
Where appropriate, personnel will complete appropriate emergency response and spill contingency training, and will be trained in the operation of emergency response equipment	Construction, Operation, Maintenance	Terminal operator, Contractor(s)	PRPA	N/A	CSR; 6.16.3
Containerized materials will be properly secured, and regularly checked to ensure efficient hold	Operation	Terminal operator	PRPA	N/A	CSR; 6.16.3
All marine vessel traffic entering, within, or leaving the Port will be managed by PRPA, CCG Marine Communication and Traffic Services, and the Pacific Pilotage Authority	Construction, Operation	PRPA, CCG, Pacific Pilotage	PRPA, CCG	TC	CSR; 6.16.3
Any vessels over 350 gross tons will require pilotage	Construction, Operation	PRPA, CCG, Pacific Pilotage	PRPA, CCG	TC	CSR; 6.16.3
Ensure the PRPA Emergency Plan is in place and implemented	Construction, Operation, Maintenance	Terminal Operator	PRPA	N/A	CSR; 6.16.3
Train speed limits will be observed and enforced	Operation	CN	CN	CTA	CSR; 6.16.3
National and international engineering codes and standards will be followed including the Manual for Railway Engineering	Operation	CN	CN	CTA	CSR; 6.16.3
Agreements with Western Canada Marine Response Corporation (formerly Burrard Clean) to respond to any incident, as necessary	Operation	Terminal Operator, CN	PRPA, CN	N/A	CSR; 6.16.3
Ensure that CN's Emergency Reponses Plan is in place and implemented	Construction, Operation, Maintenance	CN	CN	N/A	CSR; 6.16.3
The PRPA Emergency Plan and Hazardous Materials Action Plan will be updated annually	Operation	PRPA	PRPA	N/A	CSR; 6.16.3
An Emergency Response Management System will be developed and implemented	Operation	Terminal Operator	PRPA	N/A	CSR; 6.16.3
The PRPA will meet with Coastal Aboriginal Groups to discuss ways of improving communications to keep them appraised of PRPA's emergency preparedness efforts and associated responses	Operation	PRPA	PRPA	N/A	CSR; 6.16.3
General Commitments					
The Proponents commit to undertaking sampling programs to characterize any media that will be moved off property as part of the Project. Sampling programs will be undertaken at the pre-construction and construction phases of the Project, and will be based on final design, volumes of excavation, depths of cut, and disposal methods (re-use on site, upland disposal). Should contaminated sites be identified during pre-construction and/or construction sampling programs, PRPA and CN commit to maintaining records of volumes, characteristics, and deposition locations for all excavation and relocation of contaminated media from within the Project site, in accordance with Environment Canada—Pacific and Yukon General Guidelines for Contaminated Sites (Environment Canada, 2011) Material that will be used for construction in the marine environment will be screened against the lower action levels as set out in the Disposal at Sea Regulations under CEPA 1999, CCME Interim Sediment Quality Guidelines, or established background sediment concentrations for contaminants of potential concern. Material that will be used for upland construction and/or disposal will be screened against CCME soil quality guidelines The Proponents will take all reasonable measures to ensure that excavation, stockpiling of material, and relocation of contaminated media is conducted in accordance with best management practices Sampling protocol and disposal protocol (i.e., maintaining records of volumes, chemical/physical characterization, and source) will be defined in the Project EMP. All material will be disposed of in accordance with applicable legislation	Pre-construction, Construction	CN, PRPA, Contractor(s), Terminal Operator	EC, PRPA	N/A	

Commitments	Timing	Delivered By	Approving / Lead Agencies	Advisory Agencies	Reference Section
PRPA and the Terminal operator will characterize the infill material that will come from the on-site rock quarry. ARD/ML potential is being assessed, and a rock management plan will be developed. A Rock Management Plan will be developed prior to commencement of construction	Pre-construction	PRPA	EC	DFO	

9.3 Conclusions

In reaching a conclusion on the significance of adverse environmental effects associated with the construction, operation, and decommissioning of the Project, the RAs have considered:

- The EIS (and associated TDRs), MSR (and associated TDRs), and draft CSR, which includes a description of potential Project effects on biological, physical and human VECs, and the Proponents' evaluation of the significance of residual effects, including cumulative effects
- IR on the proposed Project made by federal agencies, Aboriginal Groups, stakeholders, and the public, and the Proponents' responses to those comments
- Mitigation measures (including habitat compensation plans) that the RAs are satisfied will be implemented by the Proponents as described throughout this CSR and in Table 5-1, Section 5.6), including development of a detailed EMP for the Project
- Commitments made by the Proponents to carry out environmental monitoring programs for the construction, operation, and decommissioning of the proposed Project

Pursuant to the requirements of CEAA, the RAs (DFO, EC, CTA) along with PRPA have determined that, on the basis of this comprehensive study, and taking into account the CSR and the implementation of the proposed mitigation and commitments, the Fairview Terminal Phase II Expansion Project, including Kaien siding, is not likely to cause significant adverse environmental effects for any of the VECs. A positive effect is predicted on socio-economic conditions due to the development of port lands according to their planned use, as well as predicted local and regional economic benefits from the expanded cargo handling and shipping facilities and increase level of commercial activity.

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APPENDIX A

ENVIRONMENTAL ASSESSMENT TABLES

Table A-1 Project-Environment Interaction Matrix

Project Activities and Physical Works	Air Quality	Noise and Vibration	Light	Vegetation	Wildlife and Wildlife Habitat	Avifauna	Freshwater Environment	Marine Environment	Socio-economic Conditions	Human Health and Safety	Archaeology and Heritage Resources	Current Traditional Use by Aboriginal Persons	Country Foods
Construction													
In water construction of Marine Berth Infrastructure (dredging, ocean disposal, infilling, caisson placement, perimeter berm construction, vibro-densification, decking, interface with land)	2	2	0	1	0	2	0	2	2	0	2	2	1
Equipment and supply marine transportation (barge/vessel)	2	2	0	0	0	2	0	2	0	1	0	2	1
Equipment and supply by land transport (rail/road)	2	2	0	1	2	2	0	0	0	1	0	2	1
On-shore site preparation (clearing, grubbing, blasting, rock cut, filling, grading)	2	2	0	2	2	2	2	2	2	0	2	2	2
Construction and installation of on-shore components (drainage system, landslide containment, intermodal yard, container yard, buildings, ancillary facilities, lighting, roads, sidings and wye)	2	2	0	2	2	2	2	2	2	0	2	2	1
On-shore concrete production	2	2	0	1	2	2	2	0	0	0	2	2	2
Site waste management	0	1	0	1	2	2	0	0	0	0	0	2	2
Vehicular traffic on terminal site	2	2	0	1	2	2	0	0	0	0	0	2	2
Operation													
Vessel physically connected to a berthing tug and/or the berthing facility	2	2	0	0	0	2	0	2	0	0	0	2	1
Container unloading	2	2	0	0	1	2	0	0	0	0	0	2	1
Tug operation while berthing	2	2	0	0	1	2	0	2	0	0	0	2	1
Terminal and rail facility operations	2	2	0	2	2	2	0	2	2	0	0	2	2
Maintenance and repairs to dock facilities, terminal and rail	0	2	0	0	2	2	0	2	0	0	0	2	2
Vehicular traffic on terminal site	2	2	0	1	2	2	0	0	0	0	0	2	1
Stormwater management	0	0	0	1	0	0	2	2	0	0	0	2	2
Waste management	0	2	0	1	2	2	0	0	0	0	0	2	1
Rail traffic as a result of the Project	2	2	0	0	2	0	0	0	0	0	0	0	0
Routine ditch maintenance along sidings and wye	0	1	0	0	0	0	0	0	0	0	2	0	0
Decommissioning and Reclamation													

Project Activities and Physical Works	Air Quality	Noise and Vibration	Light	Vegetation	Wildlife and Wildlife Habitat	Avifauna	Freshwater Environment	Marine Environment	Socio-economic Conditions	Human Health and Safety	Archaeology and Heritage Resources	Current Traditional Use by Aboriginal Persons	Country Foods
Decommissioning and reclamation of the container terminal and rail	2	2	0	1	2	2	2	2	2	0	0	2	2
Cumulative Effects (Other Projects and Activities)													
Fairview Terminal (Phase I)	2	2	1	2	2	2	2	2	2	0	2	2	2
Development of Prince Rupert (City and Port) and associated infrastructure, e.g. road and rail	-	-	-	-	-	-	-	-	-	-	2	-	-
US World War II military fortifications (Fort Barrett, Fort Casey, and associated military buildings, structures and docks within Prince Rupert harbour	-	-	-	-	-	-	-	-	-	-	2	-	-
Northlands Terminal	1	1	0	2	0	2	0	2	2	0	0	2	2
Atlin Terminal	1	1	0	2	0	2	0	2	2	0	0	2	2
Ridley Island Coal Terminal	2	1	0	0	2	2	0	2	2	0	2	2	2
Ridley Island Log Sort	0	1	0	0	0	0	0	0	2	0	2	2	2
Prince Rupert Grain Terminal	2	1	0	0	2	2	0	2	2	0	2	2	2
ICEC Terminals Company Ltd. Sulphur Forming, Handling and Storage Facility, Ridley Island	2	1	0	0	2	2	0	2	2	0	1	2	2
Sun Wave Forest Products, the BC division of the China Paper Group (CPG)	2	1	0	0	0	2	0	0	2	0	2	2	2
Port Shipping Activities (Westview, Lightering, Ocean Docks)	0	1	1	2	0	2	0	2	2	0	0	2	2
Houston Pellet Inc. Transfer Facility	0	1	0	0	2	2	0	2	2	0	0	2	1
Canpotex Potash Export Terminal	1	1	0	0	2	2	0	2	2	0	1	2	1
Ridley Island Road, Rail and Utility Corridor	1	1	0	0	0	2	1	2	2	0	1	2	1
Aero Point Ferry Terminal	1	0	0	2	2	2	1	2	2	0	1	2	2
Mount Hays Wind Farm Project	1	0	0	2	2	2	0	0	2	0	1	2	1
Prince Rupert Container Examination Facility	1	1	0	0	2	2	0	0	2	0	0	2	1
Mount McDonald Wind Power Project	1	0	0	0	2	2	1	2	2	0	1	2	1
NaiKun Wind Energy Project (sea cable landfall)	1	0	0	0	2	2	0	2	2	0	1	2	1
Accidents, Malfunctions and Unplanned Events													
Hazardous materials spill (including fuel, oil, hydraulic fluid, concrete) or ignition of spilled fuel	2	0	0	1	1	2	2	2	1	1	2	2	2
Spill of containerized material on land or in water	0	0	0	1	1	2	2	2	1	1	2	2	2

Project Activities and Physical Works	Air Quality	Noise and Vibration	Light	Vegetation	Wildlife and Wildlife Habitat	Avifauna	Freshwater Environment	Marine Environment	Socio-economic Conditions	Human Health and Safety	Archaeology and Heritage Resources	Current Traditional Use by Aboriginal Persons	Country Foods
Train Derailment at the Skeena River	0	0	0	1	1	1	2	2	1	1	2	2	0
Hazardous materials spill (including fuel, oil, hydraulic fluid, concrete) or ignition of spilled fuel	2	0	0	1	1	2	2	2	1	1	2	2	2

NOTES:

- = See Section 4.6.2

0 = No interaction

1 = Nominal interaction occurs; however, based on past experience and professional judgement, the interaction would not result in a significant environmental effect if no mitigation is applied; or interaction would not be significant due to application of codified environmental protection practices that are known to effectively mitigate the predicted environmental effects.

2 = Interaction may result in a significant environmental effect, considered in EIS

Table A-2 Effects Characterization and Residual Effects Rating Criteria

VEC	Magnitude	Geographic Extent	Duration/Frequency	Reversibility	Ecological Context	Residual Effects Rating Criteria[1]
Air Quality	**Negligible**: no measurable adverse effects are anticipated. **Low**: adverse effect occurs that is detectible but is within normal variability of baseline conditions. **Moderate**: adverse effect occurs that would cause an increase with regard to baseline but is within regulatory limits and objectives. **High**: adverse effect occurs that would singly or as a substantial contributor in combination with other sources cause exceedances of objectives or standards beyond the Project boundaries.	**Site-specific**: effects are restricted to the Project site (i.e., Project footprint). **Local**: effects extend beyond the Project site but remain localized within the LSA. **Regional**: effects extend to the RSA.	**<u>Duration</u>** **Short term**: air quality effect occurs for < 3 years. **Medium term**: air quality effect occurs for between 3 and 20 years. **Long term**: air quality effect persists beyond 20 years. **Permanent**: effects are permanent. **<u>Frequency</u>** **Once**: effect occurs once. **Sporadic**: effect occurs at sporadic intervals. **Regular**: effect occurs on a regular basis and at regular intervals. **Continuous**: effect occurs continuously throughout the Project life.	**Reversible**: effects cease when Project operations cease. **Irreversible**: effects continue after Project operations cease.	**Undeveloped**: area relatively pristine or not adversely affected by human activity. **Developed**: area has been substantially disturbed by human development or human development is still present.	**Significant Residual Adverse Effect**: ambient concentrations of air contaminants are likely to exceed relevant regulatory criteria for ambient air quality (i.e., to be high in magnitude) and are of concern relative to the geographical extent of predicted exceedances, their frequency of occurrence.
Noise and Vibration	**<u>Noise</u>** **Negligible**: no change or changes of less than 3 decibels in sound levels at a receptor site. **Low**: an increase of 4 to 5 decibels in predicted sound levels at receptors. **Moderate**: increase of 6 to 9 decibels in sound levels. **High**: increase of 10 decibels or more at a receptor site. **<u>Vibration</u>** **Negligible**: no change in vibration levels or changes of less than 3 decibels from the CN threshold of perception guideline (i.e., 0.14 mm/s RMS). **Low**: an increase of 4 to 5 decibels over the threshold of perception. **Moderate**: increases in vibration levels of 6 to 9 decibels over the threshold of perception. **High**: increase of 10 decibels or more order of magnitude below levels commonly associated with damage to building construction (i.e., 25 mm/s).	**Site-specific**: effects are generally constrained to a few hundred meters (e.g., 300 – 500 m). **Local**: effects would extend beyond a few hundred meters (e.g., 300 – 500 m to a few kilometers). **Regional**: effects would extend beyond a few kilometers.	**<u>Duration</u>** **Short term**: no measurable adverse effects anticipated after construction phase. **Medium term**: measurable effects anticipated for the extent of the Project life. **Long term**: measurable effects anticipated to remain after the completion of the Project life. **Permanent**: effects are permanent. **<u>Frequency</u>** **Once**: effects that may occur daily but for a brief (i.e., 10-15 minutes) period of time in any day (e.g., a train passby or container door slam). **Sporadic**: effect that occurs at sporadic intervals, potentially over a day or week (e.g., multiple train passbys or arrival of ships). **Regular**: effect occurs on a regular basis and at regular intervals, such as container loading and unloading and crane operation. **Continuous**: effect occurs without ceasing over the course of an hour or day, such as the operation of boilers, heaters or stationary engines.	**Reversible**: effects are reversible. **Irreversible**: effects are irreversible.	**Undeveloped**: area relatively pristine or not adversely affected by human activity. **Developed**: area has been substantially disturbed by human development or human development is still present.	**<u>Noise</u>** **Significant Residual Adverse Effect**: noise that is high in magnitude, for a medium-term duration and occurring at regular intervals for sensitive receptors (e.g., residential areas). **<u>Vibration</u>** **Significant Residual Adverse Effect**: associated with intermittent levels of vibration that are high in magnitude, or persistent vibrations with a medium-term duration that occur at sensitive receptor buildings.
Light	**Negligible**: no measurable adverse effects to the aesthetic environment. **Low**: measurable adverse effects to the aesthetic environments anticipated to low sensitivity environments only (i.e., effects to human environment). **Moderate**: measurable adverse effects to aesthetic environments anticipated to moderate sensitivity environments. **High**: measurable adverse effects to ecological or aesthetic environments anticipated to high sensitivity environments.	**Site-specific**: effects are restricted to the Project site (i.e., Project footprint). **Local**: effects extend 200 m from the Project footprint. **Regional**: effects extend to the RSA (Kaien Island and Prince Rupert Harbour).	**<u>Duration</u>** **Short term**: no measurable effects anticipated beyond the construction phase. **Medium term**: measurable effects anticipated beyond the construction phase, but not beyond 5 years. **Long term**: measurable effects are anticipated beyond 5 years. **Permanent**: effects are permanent. **<u>Frequency</u>** **Once**: effect occurs once. **Sporadic**: effect occurs sporadically at irregular intervals. **Regular**: effect occurs on a regular basis and at regular intervals.	**Reversible**: effects of light are reversible if effects end when the light source is no longer present. **Irreversible**: effects of light are irreversible if the effects remain after the light sources are removed.	**Undeveloped**: area relatively pristine or not adversely affected by human activity. **Developed**: area has been substantially disturbed by human development or human development is still present.	**Significant Residual Adverse Effect**: an effect that leads to the permanent loss of an aesthetic environment or habitat within the RSA, which cannot be offset by available mitigation or compensation measures.

VEC	Magnitude	Geographic Extent	Duration/Frequency	Reversibility	Ecological Context	Residual Effects Rating Criteria[1]
			Continuous: effect occurs continuously.			
Vegetation Resources	**Negligible**: no measurable adverse effects. **Low**: adverse effect occurs which may or may not be measurable, but is within the range of natural variability. **Moderate**: adverse effect occurs, but is unlikely to pose a serious risk to sensitive elements or present a management challenge. **High**: adverse effect is likely to pose a serious risk to sensitive element or present a management challenge.	**Site-specific**: effects confined to a small area within the Project footprint. **Local**: effect contained to the vegetation resources LSA. **Regional**: effect occurs in the vegetation resources RSA.	<u>**Duration**</u> **Short term**: no measurable effects anticipated beyond the construction phase. **Medium term**: measurable effects anticipated beyond that construction phase but not beyond 5 years. **Long term**: measurable effects anticipated beyond 5 years. **Permanent**: effects are permanent. <u>**Frequency**</u> **Once**: effect occurs once. **Sporadic**: effect occurs sporadically at irregular intervals. **Regular**: effect occurs on a regular basis. **Continuous**: effect occurs continuously.	**Reversible**: effects are reversible with reclamation and/or over time. **Irreversible**: effects cannot be reversed even with reclamation and/or over time.	**Undeveloped**: area relatively pristine or not adversely affected by human activity. **Developed**: area has been substantially disturbed by human development or human development is still present.	**Significant Residual Adverse Effect**: the significance of an environmental effect in the context of the sustainability of the KIR within an appropriate ecological context (e.g., the BC range of a rare plant species). This determination of significance was generally qualitative – consideration include conservation status; range of the species or community; level of existing disturbance; relevant thresholds, if available; and area-specific policies for land use and vegetation resources management; in combination with magnitude and duration (i.e., intensity of the effect).
Wildlife and Wildlife Habitat	**Negligible**: no measurable adverse effects to habitat, habitat function, or mortality risk anticipated. **Low**: definition varies depending on the effect, but general definition is: no measurable adverse effect on sustainability of terrestrial wildlife within the RSA. **Moderate**: definition varies depending on the effect, but general definition is: measurable adverse effect occurs, but unlikely to pose a serious risk to sustainability of terrestrial wildlife within the RSA. **High**: definition varies depending on the effect, but general definition is: measurable adverse effect occurs that will likely affect the sustainability of terrestrial wildlife within the RSA.	**Site-specific**: effects are restricted to the Project site (i.e., Project footprint) **Local**: effects extend beyond the footprint but remain localized within the LSA. **Regional**: effects extend to the RSA.	<u>**Duration**</u> **Short term**: effects are measurable for < 2 years. **Medium term**: effects are measurable for 2 to 20 years. **Long term**: effects are measurable for > 20 years. **Permanent**: effects are permanent. <u>**Frequency**</u> **Once**: effect occurs once. **Sporadic**: effect occurs sporadically at irregular intervals. **Regular**: effect occurs on a regular basis and at regular intervals. **Continuous**: effect occurs continuously.	**Reversible**: effects are reversible with mitigation and/or rehabilitation (e.g., the ability of a habitat or population to recover). **Irreversible**: effects are permanent and cannot be reversed with rehabilitation.	**Undeveloped**: area relatively pristine or not adversely affected by human activity. **Developed**: area has been substantially disturbed by human development or human development is still present.	**Significant Residual Adverse Effect**: an effect that alters terrestrial habitat within the LSA physically, chemically, or biologically, in quality or extent, in such a way as to cause a change or decline in the ecological function of that habitat, or a change or decline in the distribution or abundance of a wildlife population (as represented by the KIR) that is dependent upon that habitat, such that natural recruitment would not re-establish the population to its original level within two generations.
Avifauna	**Negligible**: no measurable adverse effects to habitat, habitat function, or mortality risk anticipated. **Low**: definition varies depending on the effect, but general definition is: no measurable adverse effect on sustainability of avifauna within the RSA. **Moderate**: definition varies depending on the effect, but general definition is: measurable adverse effect occurs, but unlikely to pose a serious risk to sustainability of avifauna within the RSA. **High**: definition varies depending on the effect, but general definition is: measurable adverse effect occurs that will likely affect the sustainability of avifauna within the RSA.	**Site-specific**: effects are restricted to the Project site (i.e., Project footprint) **Local**: effects extend beyond the footprint but remain localized within the LSA. **Regional**: effects extend to the RSA.	<u>**Duration**</u> **Short term**: effects are measurable for less than one breeding season (i.e., less than one year). **Medium term**: effects are measurable for one generation or several breeding seasons (i.e., 2 to 20 years). **Long term**: effects are measurable for multiple generations or multiple breeding seasons (i.e., > 20 years). **Permanent**: effects are permanent. <u>**Frequency**</u> **Once**: effect occurs once. **Sporadic**: effect occurs sporadically at irregular intervals. **Regular**: effect occurs on a regular basis and at regular intervals. **Continuous**: effect occurs continuously.	**Reversible**: effects are reversible with mitigation and/or rehabilitation (e.g., the ability of a habitat or population to recover). **Irreversible**: effects are permanent and cannot be reversed with rehabilitation.	**Undeveloped**: area relatively pristine or not adversely affected by human activity. **Developed**: area has been substantially disturbed by human development or human development is still present.	**Significant Residual Adverse Effect**: when the population of a species is sufficiently affected to cause a decline in the abundance and/or change in distribution beyond which natural recruitment (reproduction and immigration from unaffected areas) would not return the population to its former level within several generations.

VEC	Magnitude	Geographic Extent	Duration/Frequency	Reversibility	Ecological Context	Residual Effects Rating Criteria[1]
Freshwater Environment	**<u>Introduction of Deleterious Substances and Effects to Habitat or Habitat Function</u>** **Negligible**: no measurable adverse effects to habitat or habitat function anticipated. **Low**: measurable adverse effects to habitat function anticipated for low sensitivity habitat only (i.e., non-fish-bearing habitat or those used by coarse fish only). **Moderate**: measurable adverse effects to habitat function anticipated for moderate sensitivity habitat (i.e., common habitats used by sport fish or fish of importance to Aboriginal peoples). **High**: measurable adverse effects to habitat function anticipated to high sensitivity or critical habitat for *SARA*-listed species (i.e., high quality spawning, rearing or overwintering habitat). **<u>Fish Mortality</u>** **Negligible**: no measurable reduction in number of any fish species anticipated. **Low**: anticipated mortality risk to non-sport fish. **Moderate**: anticipated mortality risk to sport fish. **High**: anticipated mortality risk to BC red-listed or COSEWIC species.	**Site-specific**: effects are restricted to the streams within the specific construction activity area. **Local**: effects are restricted to streams within the specific construction activity area and immediately downstream to the ocean. **Regional**: effects extend to Prince Rupert Harbour and Porpoise Harbour.	**<u>Duration</u>** **Short term**: no measurable adverse effects anticipated beyond the construction phase. **Medium term**: measurable effects anticipated beyond the construction phase but < 5 years. **Long term**: measurable effects anticipated for > 5 years after construction is complete. **Permanent**: effects are permanent. **<u>Frequency</u>** **Once**: effect occurs once. **Sporadic**: effect occurs occasionally and at sporadic intervals. **Regular**: effect occurs on a regular basis and at regular intervals. **Continuous**: effect occurs continuously.	With respect to fish mortality, the reversibility of the effect is dependent upon the status of the affected population(s). The destruction of developing eggs or mortality of fishes is irreversible for the affected individual(s). For populations at risk, the loss of an individual or small number of fish is considered to be irreversible. For fish that are part of a secure population, the loss of an individual or small number of fish is considered a reversible effect with respect to the local population. With respect to deleterious substances and effects to habitat or habitat function, while culvert installation can be an alteration of habitat for an extended period, it would be considered reversible through restoration efforts.	**Undeveloped**: area relatively pristine or not adversely affected by human activity. **Developed**: evidence of existing adverse environmental effects (e.g., existing stream crossings).	**Significant Residual Adverse Effect**: • A change in water quality that would permanently affect the ability of the freshwater environment to support fish. • Mortality of individual fishes of a species at risk or mortality of fishes from a secure stock at a level that would influence the BC Ministry of Environment's approach to managing the stock at a regional level. • A permanent loss or alteration of habitat that is likely to result in a meaningful effect on the productive capacity of the habitat to support fish.
Marine Environment	**Negligible**: no measurable adverse effects to the marine environment. The magnitude effects for biotic KIRs was defined as: **Low**: temporary disturbance within the LSA with no permanent loss or degradation of habitat. No permanent adverse effects on the abundance or distribution of the KIR population of its population parameters. **Moderate**: temporary disturbance within the LSA with limited loss or degradation of habitat. Abundance and/or distribution of the KIR population within the LSA may change over one generation. Adverse effects will be offset through mitigation and/or compensation measures. **High**: permanent disturbance or alteration within the LSA or RSA. Adverse effects may be associated with a decline in the abundance or distribution of the KIR population which will not be offset through mitigation and/or compensation measures. Natural recruitment will not re-establish the population to its original level in one or more generations. The magnitude effects for abiotic KIRs was defined as: **Low**: predicted annual average concentrations are below chronic threshold values for the most sensitive species at the site. **Moderate**: chronic toxicity threshold for a parameter is exceeded on an annual average basis for the most	**Site-specific**: effects are restricted to the Project site (i.e., Project footprint) **Local**: effects extend beyond the Project footprint but remain localized within the LSA. **Regional**: effects extend to the RSA.	**<u>Duration</u>** **Short term**: effects are measurable for < 2 years. **Medium term**: effects are measurable for 2 to 20 years. **Long term**: effects are measurable for > 20 years. **Permanent**: effects are permanent. **<u>Frequency</u>** **Once**: effect occurs once. **Sporadic**: effect occurs sporadically at irregular intervals. **Regular**: effect occurs on a regular basis. **Continuous**: effect occurs continuously.	**Reversible**: effects are reversible. **Irreversible**: effects are irreversible.	**Undeveloped**: area relatively pristine or not adversely affected by human activity. **Developed**: area has been substantially disturbed by human development or human development is still present.	**Significant Residual Adverse Effect**: an effect that leads to the permanent loss of a marine species or habitat within the RSA, which cannot be fully offset by available mitigation or compensation measures.

VEC	Magnitude	Geographic Extent	Duration/Frequency	Reversibility	Ecological Context	Residual Effects Rating Criteria[1]
	sensitive species (i.e., chronic, sublethal effects). **High**: the acute toxicity threshold for a parameter is exceeded on an annual basis for the most sensitive species.					
Socio-Economic Conditions	**Negligible**: no measurable adverse effects or change to socio-economic conditions. **Low**: socio-economic conditions are affected for a small portion of a local population. **Moderate**: socio-economic conditions are affected for a moderate portion of the local population. **High**: socio-economic conditions are affected for a high portion of the regional population.	**Site-specific**: effects are restricted to the Project site (i.e., Project footprint) **Local**: effects extend beyond the Project footprint but remain localized within the LSA. **Regional**: effects extend beyond the LSA to the RSA.	**<u>Duration</u>** **Short term**: effects are measurable for < 6 months. **Medium term**: effects are measurable up to 2 years. **Long term**: effects are measurable until decommissioning and closure. **Permanent**: effects are permanent. **<u>Frequency</u>** **Once**: effect occurs once. **Sporadic**: effect occurs sporadically at irregular intervals. **Regular**: effect occurs on a regular basis and at regular intervals. **Continuous**: effect occurs for duration of activity.	**Reversible**: effects are reversible if land use patterns and/or socio-economic conditions are returned to pre-Project state upon Project decommissioning. **Irreversible**: effects are irreversible if land use patterns and/or socio-economic conditions are permanent and are not reversed with mitigation or compensation.	**Undeveloped**: area relatively or not substantially affected by human activity. **Developed**: area has been substantially previously developed.	**Significant Residual Adverse Effect**: the proposed use of land for the Project and related facilities is not compatible with adjacent land use activities as designated through a regulatory land use process, and/or the proposed use of the land will create a change or disruption that widely restricts or degrades present land uses to a point where the activities cannot continue at current levels and for which the environmental effects are not mitigated or compensated.
Archaeological and Heritage Resources	**Negligible**: no measurable adverse effects to archaeological or heritage resources. **Low**: loss of a minor proportion of data at site, local or regional level; after a low impact, interpretive capacity of the remains is virtually intact, limited only by loss of minor items and/or features. **Moderate**: a proportion of the data at the site, local or regional level is lost but a significant proportion remains unimpaired; after a moderate impact, the interpretive capacity of the remains is hindered by loss of basic data about cultural descriptions and lifestyles. **High**: a significant proportion of data at the site, local or regional level is lost; interpretive capacity of the remains following impact is minimal.	**Site-specific**: effects are restricted to the Project site (i.e., Project footprint) **Local**: effects extend to within 2 km of the Project footprint. **Regional**: effects extend beyond 2 km from the Project footprint.	**<u>Duration</u>** **Short term**: no measurable adverse effects anticipated beyond the construction phase. **Medium term**: measurable effects anticipated beyond the construction phase but < 2 years. **Long term**: measurable effects anticipated for > 2 years after construction is complete. **Permanent**: effects are permanent. **<u>Frequency</u>** **Once**: effect occurs once during the construction phase. **Sporadic**: effect occurs at sporadic intervals throughout the construction phase. **Regular**: effect occurs on a regular basis and at regular intervals during the construction phase. **Continuous**: effect occurs continuously throughout all Project phases.	**Reversible**: effects are reversible if the archaeological or heritage resource can be avoided or relocated. **Irreversible**: effects are irreversible when the archaeological or heritage resource is damaged or destroyed.	**Undeveloped**: area relatively pristine or not adversely affected by human activity. **Developed**: there is evidence of existing negative environmental effects.	**Significant Residual Adverse Effect**: occurs when an archaeological or heritage resource is damaged or destroyed during the life of the Project without being first analyzed, curated, and reported on (as applicable). A residual effect would be adverse and significant if the recovered material and records are not retained at a repository mutually agreeable to the communities of Lax Kw'alaams, Metlakatla, Gitxaala, Kitselas, and Kitsumkalum.
Current Traditional Use by Aboriginal Persons	**Negligible**: no measurable adverse effects to traditional current use anticipated. **Low**: Aboriginal communities and land use are affected or subject to change for a period of < 1 year. **Moderate**: Aboriginal communities and land use are affected or subject to change for an extended period of time longer than 1 year, but less than the life of the Project. **High**: Aboriginal communities and land use are affected or subject to change for the life of the Project.	**Site-specific**: effects are restricted to the Project site (i.e., Project footprint) **Local**: effects extend beyond the Project footprint but remain localized within the Project development area. **Regional**: effects extend beyond the project development area to the overall claimed traditional territory.	**<u>Duration</u>** **Short term**: effects are measurable for < 6 months. **Medium term**: effects are measurable for 6 – 36 months. **Long term**: effects are measurable for > 36 months. **Permanent**: effects are permanent. **<u>Frequency</u>** **Once**: effect occurs once. **Sporadic**: effect occurs sporadically at irregular intervals. **Regular**: effect occurs on a regular basis and at regular intervals. **Continuous**: effect occurs continuously.	**Reversible**: effects are reversible with mitigation and/or rehabilitation (e.g., the ability of the traditional use resource to recover). **Irreversible**: effects are permanent and cannot be reversed with mitigation or rehabilitation.	**Undeveloped**: area relatively pristine or not adversely affected by human activity. **Developed**: area has been substantially disturbed by previous human development or human development is still present.	**Significant Residual Adverse Effect**: an effect affecting an entire definable group of people in such a way as to cause disturbance of established traditional resource use activity patterns that will not return to pre-Project patterns within several generations.

VEC	Magnitude	Geographic Extent	Duration/Frequency	Reversibility	Ecological Context	Residual Effects Rating Criteria[1]
Country Foods	**Negligible**: no measurable adverse effects to country foods anticipated. **Low**: adverse effect occurs which may or may not be measurable, but is within the range of natural variability. **Moderate**: adverse effect occurs, but is unlikely to pose a serious risk to country foods or present management challenges. **High**: adverse effect occurs and is likely to pose a serious risk to country foods or present a management challenge.	**Site-specific**: effects are restricted to the Project site (i.e., Project footprint) **Local**: effects extend beyond the Project footprint but remain localized within the Project LSA. **Regional**: effects extend beyond the LSA to the RSA.	**Duration** **Short term**: effects are measurable for < 2 years. **Medium term**: effects are measurable for 2 – 20 years. **Long term**: effects are measurable for > 20 years. **Permanent**: effects are permanent. **Frequency** **Once**: effect occurs once. **Sporadic**: effect occurs sporadically at irregular intervals. **Regular**: effect occurs on a regular basis and at regular intervals. **Continuous**: effect occurs continuously.	**Reversible**: effects are reversible with mitigation and/or rehabilitation (e.g., the ability of the country food to recover). **Irreversible**: effects are permanent and cannot be reversed with mitigation or rehabilitation.	**Undeveloped**: area relatively pristine or not adversely affected by human activity. **Developed**: area has been substantially disturbed by previous human development or human development is still present.	**Significant Residual Adverse Effect**: an effect that permanently alters the availability or quality of a country food resource within the assessment area physically, chemically, or biologically, such that natural recruitment would not re-establish the resource to its original levels within several generations. Cannot be offset by mitigation measures.

[1] Residual effects are those that remain after the implementation of mitigation and compensation measures.

Table A-3: Assessment of Effects on Air Quality

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics							Recommended Follow-up and Monitoring
		Adverse/ Positive	Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Environmental Context	Significance	
CAC Emissions									
Construction									
In water construction of Marine Berth Infrastructure (dredging, ocean disposal, infilling, caisson placement, perimeter berm construction, vibro-densification, decking, interface with land) Equipment and supply marine transportation (barge/vessel) Equipment and supply by land transport (rail/road) On-shore site preparation (clearing, grubbing, blasting, rock cut, filling, grading) Construction and installation of on-shore components (drainage system, landslide containment, intermodal yard, container yard, buildings, ancillary facilities, lighting, roads, sidings and wye) On-shore concrete production Vehicular traffic on terminal site	▪ Equipment maintenance ▪ Low sulphur fuel ▪ Dust suppressants ▪ Scheduling ▪ Minimize disturbance ▪ Preserve vegetation ▪ Erosion control structures ▪ Site paving ▪ Cold ironing ▪ BATEA ▪ Minimize ship idling	A	L	S	ST/R	R	D	N	N/A
Operations									
Vessel physically connected to a berthing tug and/or the berthing facility Container unloading Tug operation while berthing Terminal and rail facility operations Vehicular traffic on terminal site	▪ Equipment maintenance ▪ Dust suppressants ▪ Erosion control structures ▪ Site paving ▪ Low sulphur fuel ▪ Cold ironing ▪ BATEA ▪ Minimize ship idling	A	M-L	L	MT/R	R	D	N	SO_2, NO_x, O_3, and potentially PM Monitoring

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics: Adverse/ Positive	Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Environmental Context	Significance	Recommended Follow-up and Monitoring
Rail traffic as a result of the Project	▪ Equipment maintenance ▪ Low sulphur fuel ▪ BATEA	A	L	S	LT/S	R	D	N	N/A
Decommissioning and Reclamation									
Decommissioning and reclamation of the container terminal and rail	▪ Dust suppressants ▪ Low sulphur fuel ▪ Equipment maintenance ▪ Scheduling ▪ BATEA ▪ Minimize ship idling	A	L	S	ST/R	R	D	N	N/A
HAP Emissions									
Construction									
In water construction of Marine Berth Infrastructure (dredging, ocean dumping, infilling, caisson placement, perimeter berm construction, vibro-densification, decking, interface with land)	▪ Equipment maintenance ▪ Cold ironing ▪ BATEA ▪ Minimize ship idling	A	L	S	ST/R	R	D	N	N/A
Equipment and supply marine transportation (barge/vessel)									
Equipment and supply by land transport (rail/road)									
On-shore site preparation (clearing, grubbing, blasting, rock cut, filling, grading)									
Construction and installation of on-shore components (drainage system, landslide containment, intermodal yard, container yard, buildings, ancillary facilities, lighting, roads, sidings and wye)									
On-shore concrete production									
Vehicular traffic on terminal site									

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics: Adverse/ Positive	Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Environmental Context	Significance	Recommended Follow-up and Monitoring
Operations									
Vessel physically connected to a berthing tug and/or the berthing facility Container unloading Tug operation while berthing Terminal and rail facility operations Vehicular traffic at terminal site	▪ Equipment maintenance ▪ Cold ironing ▪ BATEA ▪ Minimize ship idling	A	L	L	MT/R	R	D	N	N/A
Decommissioning and Reclamation									
Decommissioning and reclamation of the container terminal and rail	▪ Equipment maintenance	A	L	S	ST/R	R	D	N	N/A
Cumulative Effects (Fairview Terminal (Phase I), Ridley Island Coal Terminal, Prince Rupert Grain Terminal, ICEC Terminals Company Ltd., Sun Wave Forest Products)									
CAC Emissions	▪ Equipment maintenance ▪ Low sulphur fuel ▪ Dust suppressants ▪ Scheduling ▪ Minimize disturbance ▪ Preserve vegetation ▪ Erosion control structures ▪ Site Paving ▪ Cold ironing ▪ BATEA ▪ Minimize ship idling	A	L	S	MT/R	R	D	N	SO_2, NO_x, O_3, and potentially PM Monitoring
HAP Emissions	▪ Equipment maintenance ▪ Cold ironing ▪ BATEA ▪ Minimize ship idling	A	L	S	MT/R	R	D	N	N/A

Mitigation:

- **Equipment maintenance:** Follow equipment maintenance schedules.
- **Low sulphur fuel:** Use low sulphur fuel for construction equipment.
- **Dust suppressants:** Dust will be controlled through the use of dust suppressants (i.e., water, not oil), minimizing the area of activity, and paving areas as soon as practicable. Materials stored on site will be covered or wetted to prevent blowing dust. Access and onsite roads will be watered as required to control fugitive dust emissions.
- **Scheduling:** Minimizing activities that generate large quantities of dust during high winds.
- **Minimize disturbance:** Minimize the area of activity
- **Erosion control structures:** Install erosion control structures such as silt fences and coffer dams
- **Site paving:** paving of the site as soon as practicable
- **Cover trucks:** Cover truck loads of materials which could generate dust, as necessary
- **Preserve vegetation:** Preserve natural vegetation where possible
- **Cold ironing:** Cold ironing conduits will be installed (for future connection when more technically feasible) to allow ships to use shore-based power for electrical needs while at berth, significantly reducing local air emissions while the ship is being loaded or unloaded. This will allow future cables to be run from the 69 kV substation out to the cold ironing pit.
- **BATEA: Best** Available Technology Economically Achievable (BATEA) to reduce Criteria Air Contaminants (CACs), Hazardous Air Pollutants (HAPs) and Greenhouse Gas (GHG) emissions will be incorporated into Project design wherever possible.
- **Minimize ship idling:** Ship idling time will be minimized during the unloading and loading phases during both construction and operation.

KEY

Magnitude:

- N Negligible: No measurable changes to a measurable parameter.
- L Low: Less than 10% change in a measurable parameter (e.g., habitat availability, mortality risk). Specifically, less than 10% of Moderate (Class 3) and/or High (Class 1 or 2) suitability habitats affected (alteration/loss) within the assessment area.
- M Moderate: Between 11-20% changes in a measurable parameter (e.g., habitat availability, mortality risk). Specifically, between 11-20% of Moderate (Class 3) and/or High (Class 1 or 2) suitability habitats affected (alteration/loss) within the assessment area.
- H High: Greater than 20% change in a measurable parameter (e.g., habitat availability, mortality risk). Specifically, greater than20% of Moderate (Class 3) and/or High (Class 1 or 2) suitability habitats affected (alteration/loss) within the assessment area.

Geographic Extent:

- S Site-specific: Environmental effects restricted to the Project site (i.e., Project footprint).
- L Local: Environmental effects extend beyond the Project footprint but remain localized within the assessment area.
- R Regional: Environmental effects extend to the watershed/regional level.

Duration:

- ST Short term: Effects are measurable for <2 years.
- MT Medium term: Effects are measurable for 2 to 20 years.
- LT Long term: Effects are measurable for >20 years.
- P Permanent: Effects are permanent.

Frequency:

- O Occurs once.
- S Occurs sporadically at irregular intervals.
- R Occurs on a regular basis and at regular intervals.
- C Continuous.

Reversibility:

- R Reversible.
- I Irreversible.

Environmental Context:

- U Undisturbed: Area relatively or not adversely affected by human activity.
- D Developed: Area has been substantially previously disturbed by human development or human development is still present.

Significance:

- S Significant: Ambient concentrations of air contaminants are likely to exceed relevant regulatory criteria for ambient Air Quality (i.e., to be high in magnitude) and are of concern relative to the geographical extent of predicted exceedances, their frequency of occurrence.
- N Not significant: Ambient concentrations of air contaminants are likely to be below relevant regulatory criteria for ambient Air Quality (i.e., always to be of low to moderate magnitude throughout the LSA).

N/A Not Applicable.

Table A-4 Assessment of Effects on Ambient Sound and Vibration

Potential Residual Environmental Effects	Proposed Mitigation / Compensation Measures	Residual Environmental Effects Characteristics: Adverse or Positive Effect	Magnitude	Geographic Extent	Duration/Frequency	Reversibility	Environmental Context	Significance	Recommended Follow-up and Monitoring
Noise Effect									
Construction									
In water construction of Marine Berth Infrastructure (dredging, infilling, caisson placement, perimeter berm construction, vibro-densification, decking, interface with land)	▪ scheduling ▪ public notification ▪ BMP ▪ Maintenance ▪ Minimize idling ▪ Equipment use	A	L	L	ST/R	R	U	N	Continued use of PRPA's complaint phone line, as well as the website to be developed to inform the public of planned construction activities.
Equipment and supply marine transportation (barge / vessel)		A	L	L	ST/ S	R	D	N	
Equipment and supply by land transport (rail / road)		A	L	L	ST/S	R	D	N	
On-shore site preparation (clearing, grubbing, blasting, rock cut, filling, grading)		A	L	L	ST/ R	R	U	N	
Construction and installation of on-shore components (drainage system, landslide containment, intermodal yard, container yard, buildings, ancillary facilities, lighting, roads, sidings and wye)		A	L	L	ST/R	R	U	N	
On-shore concrete production		A	L	L	ST/ S	R	D	N	
Vehicular traffic on terminal site		A	L	L	ST	R	D	N	
Operation									
Vessel physically connected to a berthing tug and/or the berthing facility	▪ Scheduling	A	L	L	MT/ S	R	D	N	Continued use of PRPA's complaint phone line, as well

Potential Residual Environmental Effects	Proposed Mitigation / Compensation Measures	Residual Environmental Effects Characteristics: Adverse or Positive Effect	Magnitude	Geographic Extent	Duration/Frequency	Reversibility	Environmental Context	Significance	Recommended Follow-up and Monitoring
Container unloading	▪ Public notification ▪ BMP ▪ Maintenance ▪ Minimize idling ▪ Equipment use	A	M	L	MT/ R	R	D	N	as the website to be developed to inform the public of planned construction activities.
Tug operation while berthing		A	L	L	MT/ R	R	D	N	
Terminal and rail facility operations		A	M	L	MT/ R	R	D	N	
Maintenance & repairs to dock facilities, Terminal and rail		A	L	L	MT/ S	R	D	N	
Vehicular traffic on terminal site		A	L	L	MT/ R	R	D	N	
Decommissioning and Reclamation									
Decommissioning and reclamation of the container terminal and rail	▪ Scheduling ▪ Public notification ▪ BMP ▪ Maintenance ▪ Minimize idling ▪ Equipment use	A	L	S	ST/ O	R	D	N	None recommended
Vibration Effect									
Construction									
In water construction of Marine Berth Infrastructure	▪ See noise mitigation above	A	L	S	ST/ S	R	U	N	None recommended
Equipment and supply by land transport (rail / road)		A	L	L	ST/ S	R	D	N	
On-shore site preparation (clearing, grubbing, blasting, rock cut, filling, grading)		A	L	S	ST/ R	R	U	N	
Construction and installation of on-shore components (drainage system, landslide containment, intermodal yard, container		A	L	S	ST/ S	R	D	N	

Potential Residual Environmental Effects	Proposed Mitigation / Compensation Measures	Residual Environmental Effects Characteristics						Significance	Recommended Follow-up and Monitoring
		Adverse or Positive Effect	Magnitude	Geographic Extent	Duration/Frequency	Reversibility	Environmental Context		
yard, buildings, ancillary facilities, lighting, roads, sidings and wye)									
Operation									
Maintenance & repairs to dock facilities, Terminal and rail	See noise mitigation above	A	L	S	ST/S	R	D	N	None recommended
Decommissioning									
Decommissioning the container terminal and rail	▪ Same as construction	A	L	S	ST/O	R	D	N	None recommended
Cumulative Effects (Fairview (Phase I))									
Noise effect Vibration effect	▪ None recommended	A	L	L	MT/S	R	D	N	None recommended

Mitigation:

- **Scheduling:** avoid construction during night time hours and on weekends where practical (By-Laws)
- **Public notification:** Nearby residents will be advised of significant noise-causing activities and these will be scheduled to create the least disruption to receptors. If noise complaints related to traffic occur, they will be logged and investigated to assess whether they are linked with Project activities
- **BMP:** standard BMPs such as mufflers and maintained equipment
- **Maintenance:** ensuring the new sidings are continuously welded rail to avoid additional noise from jointed rail; ability to cold iron ships while at port
- **Minimize idling:** Ship idling time will be minimized during the unloading and loading phases during both construction and operation
- **Equipment use:** The number of pieces of equipment operating simultaneously and engine speed will be reduced where practical

KEY:

Magnitude:

Noise

- N Negligible: no change or changes of less than 3 decibels in sound levels at a receptor
- L Low: an increase of 4 to 5 decibels in predicted sound levels at receptors
- M Moderate: increases of sound levels of 6 to 9 decibels
- H High: increases of 10 decibels or more at a receptor

Vibration

- N Negligible: no change in vibration levels or changes of less than 3 decibels from the CN threshold of perception guideline (i.e., 0.14 mm/s RMS)
- L Low: an increase of 4 to 5 decibels over the threshold of perception
- M Moderate: increases in vibration levels of 6 to 9 decibels over the threshold of perception due to the Project
- H High: increases of 10 decibels or more order of magnitude below levels commonly associated with damage to building construction (i.e., 25 mm/s)

Geographic Extent:

- S Site-specific: effects would generally be constrained to a few hundred meters (e.g., 300-500m)
- L Local: effects would extend beyond a few hundred meters (e.g., 300-500m to a few kilometres)
- R Regional: effects would extend beyond a few Kilometres

Duration:

- ST Short term: no measureable adverse effects anticipated after construction season
- MT Medium term: measureable effects anticipated for the extent of the Project life
- LT Long term: measureable effects anticipated to remain after the completion of the Project life

Frequency:

- O Occurs once.
- S Occurs sporadically at irregular intervals.
- R Occurs on a regular basis and at regular intervals.
- C Continuous.

Reversibility:

- R Reversible
- I Irreversible

Ecological Context:

- U Undeveloped: Area relatively or not adversely affected by human activity.
- D Developed: Area has been substantially previously disturbed by human development or human development is still present
- N/A Not Applicable

Significance:

- S Significant
- N Not Significant

Table A-5: Assessment of Potential Effects on Light

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics							Recommended Follow-up and Monitoring
		Adverse or Positive Effect	Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Environmental Context	Significance	
Increased Light trespass and sky brightness									
Construction									
During all nighttime Construction activities	▪ directing light ▪ controlling light levels	A	L	L	LT/S	R	D	N	follow-up program
Operation									
Additional lighting which will be installed for the Operations phase along the waterfront on gantry cranes to facilitate the loading and unloading of ships	▪ light shielding and cut off racks ▪ (directing light ▪ controlling light levels ▪ centralized light control system	A	L	L	LT/S	R	D	N	follow-up program
High mast lights (45 m tall) being located on the east side of the Terminal, between the CN mainline track and the switching track, to facilitate railcar loading and unloading	▪ light shielding and cut off racks ▪ directing light ▪ controlling light levels ▪ centralized light control system	A	L	L	LT/S	R	D	N	follow-up program
Cumulative Effects (Fairview Phase I, Port Shipping Activities (Westview, Lightering); both identified as 1's only in table 4-4)									
Increased light trespass and sky brightness	None proposed	A	L	L	LT/S	R	D	N	None proposed

MITIGATION:

- **Light shielding and cut off racks:** Using light shielding and cut off racks to prevent light pollution and trespass.
- **Directing light:** Ensuring light is efficiently directed to where it is required.
- **Controlling Light levels:** Keeping control over light levels including reducing the use of light where activities are not occurring.
- **Centralized light control system:** Having a centralized light control system providing the ability to selectively turn off lights where they are not required
- **Follow-up Program:** Develop and implement a follow-up program to monitor success of mitigation measures

KEY

Magnitude:

N Negligible: No measurable effects to the aesthetic environment.

L Low: Measurable effects to aesthetic environments anticipated to low sensitivity environments only (i.e. effects to human environment).

M Moderate: Measurable effects to aesthetic environments anticipated to moderate sensitivity environments.

H High: Measurable effects to ecological or aesthetic environments anticipated to high sensitivity environments.

Geographic Extent:

S Site-specific: Measurable effects do not extend beyond the Project footprint (Phase II Terminal and CN Rail siding expansion).

L Local: Measurable effects extend 200 m from the Project footprint.

R Regional: Measurable effects extend into the RSA (Kaien Island and Prince Rupert Harbour).

Duration:

ST Short term: No measurable effects anticipated beyond construction season.

MT Medium term: Measurable effects anticipated beyond construction season but not beyond five years.

LT Long term: Measurable effects anticipated beyond five years.

Frequency:

O Once: Effect occurs once.

S Sporadic: Effect occurs sporadically at irregular intervals.

R Regular: Effect occurs on a regular basis and at regular intervals.

C Continuous: Effect occurs through all phases of the Project.

Reversibility:

R Reversible: Effects of Light are reversible if effects end when the light source is not longer present.

I Irreversible: Effects of Light are irreversible if the effects remain after the light sources are removed.

Ecological Context:

U Undeveloped: Area relatively or not adversely affected by human activity.

D Developed: Area has been substantially previously disturbed by human development or human development is still present.

Significance:

S Significant.

N Not Significant.

N/A Not Applicable.

Table A-6: Summary of Project Residual Environmental Effects: Ecological Communities of Conservation Concern

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics							Recommended Follow-up and Monitoring
		Adverse or Positive Effect	Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Ecological Context	Significance	
Direct loss of Ecological Communities of Conservation Concern									
Construction									
On-shore site preparation (clearing, grubbing, blasting, rock cut, filling, grading) Construction and installation of on-shore components (drainage system, landslide containment, intermodal yard, container yard, buildings, ancillary facilities, lighting, roads, sidings and wye)	▪ Conduct a pre-disturbance assessment of the old forest Western Hemlock–Sitka Spruce–Lanky Moss ecosystem unit (HM) in the vicinity of the proposed wye to identify opportunities for avoidance ▪ Mitigation measures for Vegetation in general are also applicable (see below)	A	Loss of 2.6 ha (-10%)	L	P/O	I	D	N	No follow-up or monitoring recommended
Changes in Abiotic Conditions of Ecological Communities of Conservation Concern									
Construction									
On-shore site preparation (clearing, grubbing, blasting, rock cut, filling, grading) Construction and installation of on-shore components (drainage system, landslide containment, intermodal yard, container yard, buildings, ancillary facilities, lighting, roads, sidings and wye)	No KIR-specific mitigation measures proposed, but mitigation measures for Vegetation in general are applicable (see below)	A	L	L	P/C	I	D	N	No follow-up or monitoring recommended
Operations									
Terminal and rail facility operations	▪ No KIR-specific mitigation measures proposed, but mitigation measures for Vegetation in general are	A	L	L	L/C	R	D	U	No follow-up or monitoring recommended

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics							Recommended Follow-up and Monitoring
		Adverse or Positive Effect	Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Ecological Context	Significance	
	applicable (see below)								
Changes in Structure and Composition of Ecological Communities of Conservation Concern									
Construction									
On-shore site preparation (clearing, grubbing, blasting, rock cut, filling, grading) Construction and installation of on-shore components (drainage system, landslide containment, intermodal yard, container yard, buildings, ancillary facilities, lighting, roads, sidings and wye)	No KIR-specific mitigation measures proposed, but mitigation measures for Vegetation in general are applicable (see below)	A	L	L	L/C	R	D	N	Regular invasive plant surveys (see Section 9.5.6)
Operations									
Terminal and rail facility operations	No KIR-specific mitigation measures proposed, but mitigation measures for Vegetation in general are applicable (see below)	A	L	L	L/C	R	D	N	Regular invasive plant surveys (see Section 9.5.6)
Cumulative Effects (Fairview Phase I, Northlands Terminal, Atlin Terminal, Port Shipping Activities (Westview, Lightering, Ocean Dock), Aero Point Ferry Terminal and Mount Hays Wind Farm Project)									
Direct loss	▪ Minimize Vegetation loss	A	L	R	P/O	I	D	N	No follow-up or monitoring recommended
Changes in Abiotic Conditions	▪ Minimize Vegetation loss	A	L	R	P/O	I	D	N	No follow-up or monitoring recommended
Changes in Structure and Composition	▪ Minimize Vegetation loss	A	L	R	P/O	I	D	N	No follow-up or monitoring recommended

General Mitigation Measures for Vegetation Resources:

- **Minimize Vegetation loss:** minimize the extent of grubbing, stripping and removal of understory Vegetation; avoid additional Vegetation clearing and cutting in areas adjacent to the Project footprint during the Operations phase; minimize disturbance of intact Vegetation during the Operations phase; and conform to DPA requirements.
- **Minimize changes to natural drainage patterns:** minimize the linear extent of roads or rail beds crossing or paralleling wetlands avoid or minimize extent and duration of stream course diversion; properly culvert all roadways; and conform to DPA requirements.
- **Minimize changes to soil conditions:** re-establish Vegetation on disturbed areas as soon as possible.
- **Reduce windthrow risk:** as per BCMOF guidelines.
- **Prevent erosion:** implement Erosion and Sediment Control Plan.
- **Minimize the further introduction and spread of invasive plant species:** minimize area of soil disturbance; re-establish Vegetation on disturbed areas as soon as possible; during construction, ensure all equipment brought on site is thoroughly cleaned prior to arrival; minimize the risk that gravel or other fill used for road or facility construction contains invasive plant seeds or rhizomatous plant parts; and conduct regular surveys for evidence of the introduction and/or spread of invasive plants, and implement prompt eradication measures if a problem area is identified.

KEY

Magnitude:

Quantitative Assessment

Expressed as hectares and/or as a percent change.

Qualitative Assessment

- N Negligible: No measurable effects
- L Low: effect occurs which may or may not be measurable, but is within the range of natural variability
- M Moderate: effect occurs, but is unlikely to pose a serious risk to sensitive elements or present a management challenge
- H High: effect is likely to pose a serious risk to sensitive elements or present a management challenge

Geographic Extent:

- S Site-specific: effect confined to small area within Project footprint
- L Local: effect confined to the Vegetation LSA
- R Regional: effect occurs in the Vegetation RSA

Duration:

- S Short term: no measurable adverse effects anticipated beyond the Construction phase
- M Medium term: measurable effects anticipated beyond the Construction phase but not beyond five years
- L Long term: measurable effects anticipated beyond five years
- P Permanent effect

Frequency:

- O Effect occurs once
- S Effect occurs at sporadic intervals
- R Effect occurs on a regular basis and at regular intervals
- C Continuous

Reversibility:

- R Reversible: effect reversible with reclamation and/or over time
- I Irreversible: effect cannot be reversed with reclamation and/or over time

Ecological Context:

- U Undisturbed: relatively undeveloped or not adversely affected by human activity
- D Developed: area has been substantially previously disturbed by human development or human development is still present

N/A Not Applicable

Significance:

- S Significant
- N Not Significant

Table A-7: Summary of Project Residual Environmental Effects: Wetland Ecosystems

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics							Recommended Follow-up and Monitoring
		Adverse or Positive Effect	Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Ecological Context	Significance	
Direct Loss of Wetland Ecosystems									
Construction									
On-shore site preparation (clearing, grubbing, blasting, rock cut, filling, grading) Construction and installation of on-shore components (drainage system, landslide containment, intermodal yard, container yard, buildings, ancillary facilities, lighting, roads, sidings and wye)	▪ Conduct a pre-disturbance assessment of the EA (estuarine ecosystem) in the vicinity of the proposed wye to identify options to minimize loss or alteration ▪ Buffer wetland areas by 30 m ▪ Mitigation measures for Vegetation in general are also applicable (see below)	A	Loss of 5.9 ha (-46%)	L	P/O	I	D	N	No follow-up or monitoring recommended
Changes in Abiotic Conditions of Wetland Ecosystems									
Construction									
On-shore site preparation (clearing, grubbing, blasting, rock cut, filling, grading) Construction and installation of on-shore components (drainage system, landslide containment, intermodal yard, container yard, buildings, ancillary facilities, lighting, roads, sidings and wye)	▪ Construct berms and install culverts for maintaining drainage to and from wetlands ▪ Maintain integrity of any wetland buffers ▪ Mitigation measures for Vegetation in general are also applicable (see below)	A	L	L	P/C	I	D	N	No follow-up or monitoring recommended

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics							Recommended Follow-up and Monitoring
		Adverse or Positive Effect	Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Ecological Context	Significance	
Operation									
Terminal and rail facility operations	▪ Construct berms and install culverts for maintaining drainage to and from wetlands ▪ Maintain integrity of any wetland buffers ▪ Mitigation measures for Vegetation in general are also applicable (see below)	A	L	L	P/C	I	D	N	No follow-up or monitoring recommended
Changes in Structure and Composition of Wetland Ecosystems									
Construction									
On-shore site preparation (clearing, grubbing, blasting, rock cut, filling, grading) Construction and installation of on-shore components (drainage system, landslide containment, intermodal yard, container yard, buildings, ancillary facilities, lighting, roads, sidings and wye)	No KIR-specific mitigation measures proposed, but mitigation measures for Vegetation in general are applicable (see below)	A	L	L	L/C	R	D	N	Regular invasive plant surveys (see Section 9.5.6)
Operation									
Terminal and rail facility operations	No KIR-specific mitigation measures proposed, but mitigation measures for Vegetation in general are applicable (see below)	A	L	L	L/C	R	D	N	Regular invasive plant surveys (see Section 9.5.6)
Cumulative Effects (Fairview Terminal (Phase 1), Northlands Terminal, Atlin Terminal, Aero Point Terminal, Port Shipping Activities (Westview, Lightering, Ocean Dock), Mount Hays Wind Farm Project**)**									
Direct Loss	▪ Minimize Vegetation loss	A	L	R	P/O	I	D	N	No follow-up or monitoring recommended
Changes in Abiotic Conditions	▪ Minimize Vegetation loss	A	L	R	P/O	I	D	N	No follow-up or monitoring

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics							Recommended Follow-up and Monitoring
		Adverse or Positive Effect	Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Ecological Context	Significance	
									recommended
Changes in Structure and Composition	▪ Minimize Vegetation loss	A	L	R	P/O	I	D	N	No follow-up or monitoring recommended

General Mitigation Measures for Vegetation Resources:

- **Minimize Vegetation loss:** minimize the extent of grubbing, stripping and removal of understory Vegetation; avoid additional Vegetation clearing and cutting in areas adjacent to the Project footprint during the Operations phase; minimize disturbance of intact Vegetation during the Operations phase; and conform to DPA requirements.
- **Minimize changes to natural drainage patterns:** minimize the linear extent of roads or rail beds crossing or paralleling wetlands avoid or minimize extent and duration of stream course diversion; properly culvert all roadways; and conform to DPA requirements.
- **Minimize changes to soil conditions**: re-establish Vegetation on disturbed areas as soon as possible.
- **Reduce windthrow risk:** as per BCMOF guidelines.
- **Prevent erosion:** implement Erosion and Sediment Control Plan.
- **Minimize the further introduction and spread of invasive plant species:** minimize area of soil disturbance; re-establish Vegetation on disturbed areas as soon as possible; during construction, ensure all equipment brought on site is thoroughly cleaned prior to arrival; minimize the risk that gravel or other fill used for road or facility construction contains invasive plant seeds or rhizomatous plant parts; and conduct regular surveys for evidence of the introduction and/or spread of invasive plants, and implement prompt eradication measures if a problem area is identified.

KEY

Magnitude:

Quantitative Assessment

Expressed as hectares and/or as a percent change.

Qualitative Assessment

- N Negligible: No measurable effects
- L Low: effect occurs which may or may not be measurable, but is within the range of natural variability
- M Moderate: effect occurs, but is unlikely to pose a serious risk to sensitive elements or present a management challenge
- H High: effect is likely to pose a serious risk to sensitive elements or present a management challenge

Geographic Extent:

- S Site-specific: effect confined to small area within Project footprint
- L Local: effect confined to the Vegetation LSA
- R Regional: effect occurs in the Vegetation RSA

Duration:

- S Short term: no measurable adverse effects anticipated beyond the Construction phase
- M Medium term: measurable effects anticipated beyond the Construction phase but not beyond five years
- L Long term: measurable effects anticipated beyond five years
- P Permanent effect

Frequency:

- O Effect occurs once
- S Effect occurs at sporadic intervals
- R Effect occurs on a regular basis and at regular intervals
- C Continuous

Reversibility:

- R Reversible: effect reversible with reclamation and/or over time
- I Irreversible: effect cannot be reversed with reclamation and/or over time

Ecological Context:

- U Undisturbed: relatively undeveloped or not adversely affected by human activity
- D Developed: area has been substantially previously disturbed by human development or human development is still present

N/A Not applicable

Significance:

- S Significant
- N Not Significant

Table A-8: Summary of Project Residual Environmental Effects: Riparian Areas

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics							Recommended Follow-up and Monitoring
		Adverse or Positive Effect	Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Ecological Context	Significance	
Direct Loss of Riparian Areas									
Construction									
On-shore site preparation (clearing, grubbing, blasting, rock cut, filling, grading) Construction and installation of on-shore components (drainage system, landslide containment, intermodal yard, container yard, buildings, ancillary facilities, lighting, roads, sidings and wye)	▪ Buffer riparian areas by 30 m ▪ Construct berms and install culverts for maintaining drainage to and from riparian areas ▪ Mitigation measures for Vegetation in general are also applicable (see below)	A	Loss of 2.8 ha (-3%)	L	P/O	I	D	N	No follow-up or monitoring recommended
Changes in Abiotic Conditions of Riparian Areas									
Construction									
On-shore site preparation (clearing, grubbing, blasting, rock cut, filling, grading) Construction and installation of on-shore components (drainage system, landslide containment, intermodal yard, container yard, buildings, ancillary facilities, lighting, roads, sidings and wye)	▪ Maintain and protect riparian area buffers ▪ Construct berms and install culverts for maintaining drainage to and from riparian areas ▪ Mitigation measures for Vegetation in general are also applicable (see below)	A	L	L	P/C	I	D	N	No follow-up or monitoring recommended

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics							Recommended Follow-up and Monitoring
		Adverse or Positive Effect	Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Ecological Context	Significance	
Operation									
Terminal and rail facility operations	▪ Maintain and protect riparian area buffers ▪ Maintain berms and culverts for maintaining drainage to and from riparian areas Mitigation measures for Vegetation in general are also applicable (see below)	A	L	L	P/C	I	D	N	No follow-up or monitoring recommended
Changes in Structure and Composition of Riparian Areas									
Construction									
On-shore site preparation (clearing, grubbing, blasting, rock cut, filling, grading) Construction and installation of on-shore components (drainage system, landslide containment, intermodal yard, container yard, buildings, ancillary facilities, lighting, roads, sidings and wye)	▪ Maintain and protect riparian area buffers ▪ Construct berms and install culverts for maintaining drainage to and from riparian areas ▪ Mitigation measures for Vegetation in general are also applicable (see below)	A	L	L	L/C	R	D	N	Regular invasive plant survey (see Section 9.5.6)
Operations									
Terminal and rail facility operations	▪ Maintain and protect riparian area buffers ▪ Maintain berms and culverts for maintaining drainage to and from riparian areas ▪ Mitigation measures for Vegetation in general are also applicable (see below)	A	L	L	L/C	R	D	N	Regular invasive plant survey (see Section 9.5.6)
Cumulative Effects (Fairview Terminal (Phase 1), Northlands Terminal, Atlin Terminal, Aero Point Ferry Terminal, Port Shipping Activities (Westview, Lightering, Ocean Dock), Mount Hays Wind Farm Project**)**									

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics							Recommended Follow-up and Monitoring
		Adverse or Positive Effect	Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Ecological Context	Significance	
Direct Loss	▪ Minimize Vegetation loss	A	L	R	P/O	I	D	N	No follow-up or monitoring recommended
Changes in Abiotic Conditions	▪ Minimize Vegetation loss	A	L	R	P/O	I	D	N	No follow-up or monitoring recommended
Changes in Structure and Composition	▪ Minimize Vegetation loss	A	L	R	P/O	I	D	N	No follow-up or monitoring recommended

General Mitigation Measures for Vegetation Resources:

- **Minimize Vegetation loss:** minimize the extent of grubbing, stripping and removal of understory Vegetation; avoid additional Vegetation clearing and cutting in areas adjacent to the Project footprint during the Operations phase; minimize disturbance of intact Vegetation during the Operations phase; and conform to DPA requirements.
- **Minimize changes to natural drainage patterns:** minimize the linear extent of roads or rail beds crossing or paralleling wetlands or riparian areas; avoid or minimize extent and duration of stream course diversion; properly culvert all roadways; and conform to DPA requirements.
- **Minimize changes to soil conditions:** re-establish Vegetation on disturbed areas as soon as possible.
- **Reduce windthrow risk:** as per BCMOF guidelines.
- **Prevent erosion:** implement Erosion and Sediment Control Plan.
- **Minimize the further introduction and spread of invasive plant species:** minimize area of soil disturbance; re-establish Vegetation on disturbed areas as soon as possible; during construction, ensure all equipment brought on site is thoroughly cleaned prior to arrival; minimize the risk that gravel or other fill used for road or facility construction contains invasive plant seeds or rhizomatous plant parts; and conduct regular surveys for evidence of the introduction and/or spread of invasive plants, and implement prompt eradication measures if a problem area is identified.

KEY

Direction:
- A Adverse (negative) effect relative to baseline
- P Positive effect relative to baseline
- N Neutral effect relative to baseline

Magnitude:

Quantitative Assessment

Expressed as hectares and/or as a percent change.

Qualitative Assessment
- L Low: effect occurs which may or may not be measurable, but is within the range of natural variability
- M Moderate: effect occurs, but is unlikely to pose a serious risk to sensitive elements or present a management challenge
- H High: effect is likely to pose a serious risk to sensitive elements or present a management challenge

Geographic Extent:
- S Site-specific: effect confined to small area within Project footprint
- L Local: effect confined to the Vegetation LSA
- R Regional: effect occurs in the Vegetation RSA

Duration:
- S Short term: no measurable adverse effects anticipated beyond the Construction phase
- M Medium term: measurable effects anticipated beyond the Construction phase but not beyond five years
- L Long term: measurable effects anticipated beyond five years
- P Permanent effect

Frequency:
- O Effect occurs once
- S Effect occurs at sporadic intervals
- R Effect occurs on a regular basis and at regular intervals
- C Continuous

Reversibility:
- R Reversible: effect reversible with reclamation and/or over time
- I Irreversible: effect cannot be reversed with reclamation and/or over time

Ecological Context:
- U Undisturbed: relatively undeveloped or not adversely affected by human activity
- D Developed: area has been substantially previously disturbed by human development or human development is still present

Significance:
- S Significant
- N Not Significant

Table A-9: Summary of Project Residual Environmental Effects: Old Forest

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics							Recommended Follow-up and Monitoring
		Adverse or Positive Effect	Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Ecological Context	Significance	
Direct Loss of Old Forest									
Construction									
Construction and installation of on-shore components (drainage system, landslide containment, intermodal yard, container yard, buildings, ancillary facilities, lighting, roads, sidings and wye)	No KIR-specific mitigation measures proposed, but mitigation measures for Vegetation in general are applicable (see below)	A	Loss of 1.2 ha (-4%)	L	P/O	I	D	N	No follow-up or monitoring recommended
Changes in Abiotic Conditions of Old Forest									
Construction									
Construction and installation of on-shore components (drainage system, landslide containment, intermodal yard, container yard, buildings, ancillary facilities, lighting, roads, sidings and wye)	No KIR-specific mitigation measures proposed, but mitigation measures for Vegetation in general are applicable (see below)	A	L	L	L/C	R	D	N	No follow-up or monitoring recommended
Operations									
Terminal and rail facility operations	No KIR-specific mitigation measures proposed, but mitigation measures for Vegetation in general are applicable (see below)	A	L	L	L/C	R	D	N	Regular invasive plant survey (see Section 9.5.6)
Changes in Structure and Composition of Old Forest									
Operation									
Terminal and rail facility operations	No KIR-specific mitigation measures proposed, but mitigation measures for	A	L	L	L/C	R	D	N	Regular invasive plant survey (see Section 9.5.6)

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics							Recommended Follow-up and Monitoring
		Adverse or Positive Effect	Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Ecological Context	Significance	
	Vegetation in general are applicable (see below)								
Cumulative Effects (Fairview Terminal (Phase 1), Northlands Terminal, Port Shipping Activities (Westview, Lightering, Ocean Dock))									
Direct Loss	Minimize Vegetation loss	A	L	R	P/O	I	D	N	No follow-up or monitoring recommended
Changes in Abiotic Conditions	Minimize Vegetation loss	A	L	R	P/O	I	D	N	No follow-up or monitoring recommended
Changes in Structure and Composition	Minimize Vegetation loss	A	L	R	P/O	I	D	N	No follow-up or monitoring recommended
Residual cumulative loss of old forest may be significant in the RSA and along the north coast as a whole; however, the Project's incremental contribution to this effect is predicted to be not significant so a quantitative cumulative effects assessment was not completed (see Section 9.9.4).									

General Mitigation Measures for Vegetation Resources:

- **Minimize Vegetation loss:** minimize the extent of grubbing, stripping and removal of understory Vegetation; avoid additional Vegetation clearing and cutting in areas adjacent to the Project footprint during the Operations phase; minimize disturbance of intact Vegetation during the Operations phase; and conform to DPA requirements.
- **Minimize changes to natural drainage patterns:** minimize the linear extent of roads or rail beds crossing or paralleling wetlands; avoid or minimize extent and duration of stream course diversion; properly culvert all roadways; and conform to DPA requirements.
- **Minimize changes to soil conditions:** re-establish Vegetation on disturbed areas as soon as possible.
- **Reduce windthrow risk:** as per BCMOF guidelines.
- **Prevent erosion:** implement Erosion and Sediment Control Plan.
- **Minimize the further introduction and spread of invasive plant species:** minimize area of soil disturbance; re-establish Vegetation on disturbed areas as soon as possible; during construction, ensure all equipment brought on site is thoroughly cleaned prior to arrival; minimize the risk that gravel or other fill used for road or facility construction contains invasive plant seeds or rhizomatous plant parts; and conduct regular surveys for evidence of the introduction and/or spread of invasive plants, and implement prompt eradication measures if a problem area is identified.

KEY

Magnitude:

Quantitative Assessment

Expressed as hectares and/or as a percent change.

Qualitative Assessment

- N Negligible: No measurable effects
- L Low: effect occurs which may or may not be measurable, but is within the range of natural variability
- M Moderate: effect occurs, but is unlikely to pose a serious risk to sensitive elements or present a management challenge
- H High: effect is likely to pose a serious risk to sensitive elements or present a management challenge

Geographic Extent:

- S Site-specific: effect confined to small area within Project footprint
- L Local: effect confined to the Vegetation LSA
- R Regional: effect occurs in the Vegetation RSA

Duration:

- S Short term: no measurable adverse effects anticipated beyond the Construction phase
- M Medium term: measurable effects anticipated beyond the Construction phase but not beyond five years
- L Long term: measurable effects anticipated beyond five years
- P Permanent effect

Frequency:

- O Effect occurs once
- S Effect occurs at sporadic intervals
- R Effect occurs on a regular basis and at regular intervals
- C Continuous

Reversibility:

- R Reversible: effect reversible with reclamation and/or over time
- I Irreversible: effect cannot be reversed with reclamation and/or over time

Ecological Context:

- U Undisturbed: relatively undeveloped or not adversely affected by human activity
- D Developed: area has been substantially previously disturbed by human development or human development is still present

Significance:

- S Significant
- N Not Significant

Table A-10: Assessment of Effects to Black-tailed Deer

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics: Adverse or Positive Effect	Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Environmental Context	Significance	Recommended Follow-up and Monitoring
HABITAT LOSS OR ALTERATION: ***Displacement of wildlife, changes in species composition and relative abundance; loss of breeding and/or foraging habitat; modification of predator-prey interactions***									
Construction									
On-shore site preparation (clearing, grubbing, blasting, rock cut, filling, grading)	▪ Minimize footprint	A	L-M	L	ST/O	I	D	N	On-site environmental monitor during Construction phase.
Decommissioning and Reclamation									
decommissioning and reclamation of the container terminal and rail	▪ N/A	P	L	S	ST/R	R	D	N	On-site environmental monitor during decommissioning.
SENSORY DISTURBANCE: ***Changes in movement patterns; changes in species composition and relative abundance***									
Construction									
Equipment and supply by land transport (rail/road) On-shore site preparation (clearing, grubbing, blasting, rock cut, filling, grading) construction and installation of on-shore components (drainage system, landslide containment, intermodal yard, container yard, buildings, ancillary facilities, lighting, access roads, sidings and wye) On-shore concrete production Site waste management Vehicular traffic on terminal site	▪ Minimize disruption ▪ Maintain equipment ▪ Wildlife awareness	A	L	L	ST/C	R	D	N	On-site environmental monitor during Construction phase.
Operations									
Terminal and rail facility operations Maintenance & repairs to dock facilities,	▪ Minimize disruption ▪ Maintain equipment	A	L	L	LT/R	R	D	N	None required unless a sensitive species issue arises during the

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics: Adverse or Positive Effect	Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Environmental Context	Significance	Recommended Follow-up and Monitoring
terminal and rail Vehicular traffic on terminal site Site waste management	▪ Wildlife awareness								Construction phase.
Decommissioning and Reclamation									
decommissioning and reclamation of the container terminal and rail	▪ Minimize disruption	P	L	S	ST/C	R	D	N	On-site environmental monitor during decommissioning.
DIRECT MORTALITY: ***Direct loss of individuals***									
Construction									
Equipment and supply by land transport (rail/road) On-shore site preparation (clearing, grubbing, blasting, rock cut, filling, grading) construction and installation of on-shore components (drainage system, landslide containment, intermodal yard, container yard, buildings, ancillary facilities, lighting, roads, sidings and wye) On-shore concrete production Vehicular traffic on terminal site	▪ Reduce speed limits ▪ Road lighting ▪ Minimize disruption ▪ Fencing ▪ Wildlife awareness	A	L	S	ST/S	I	D	N	On-site environmental monitor during Construction phase.
Operations									
Vehicular traffic on terminal site	▪ Reduce speed limits ▪ Minimize disruption ▪ Road lighting ▪ Fencing ▪ Wildlife awareness	A	L	S	LT/S	R	D	N	None required unless a sensitive species issue arises during the Construction phase.

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics							Recommended Follow-up and Monitoring
		Adverse or Positive Effect	Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Environmental Context	Significance	
Decommissioning and Reclamation									
decommissioning and reclamation of the container terminal and rail	▪ Reduce speed limits ▪ Minimize disruption ▪ Road lighting ▪ Wildlife awareness	A	L	S	ST/S	R	D	N	On-site environmental monitor during decommissioning.
Cumulative Effects (Fairview Terminal Phase I, Ridley Island Coal Terminal, Prince Rupert Grain Terminal, Sulphur Export Facility)									
Habitat Loss or Alteration	None recommended	A	L	S	LT/C	I	D	N	None recommended
Sensory Disturbance		A	L	L	LT/C	R	D	N	
Direct Mortality		A	L	S	LT/S	R	D	N	

Mitigation:

- **Minimize footprint:** Avoid all unnecessary vegetation clearing around facility and roads wherever and whenever practicable.
- **Minimize disruption:** Keeping human disturbance to a minimum by restricting and managing access and human activity (e.g., posting signs, security access).
- **Maintain equipment:** Maintain construction and operations equipment.
- **Road lighting:** Ensure roads are lit at night to increase roadside visibility.
- **Reduce speed limits:** Enforce low vehicle speeds on roads (30km/h) at the Terminal.
- **Fencing:** maintaining fencing around the Terminal site that excludes large mammal access but provides one-way escape exits to avoid entrapment.
- **Wildlife awareness:** Implement a wildlife education program, within the worker health and safety training that will inform employees of the possible presence and behaviour of wildlife on the Project site.

KEY

Magnitude:

- N Negligible: No measurable adverse effects to habitat, habitat function, or mortality risk anticipated
- L Low: Definition varies depending on the effect, but general definition is "no measurable effect(s) on sustainability of Wildlife within the RSA"
- M Moderate: Definition varies depending on the effect, but general definition is "measurable effect(s) occur, but unlikely to pose a serious risk to sustainability of Wildlife within the RSA"
- H High: Definition varies depending on the effect, but general definition is "measurable effect(s) occur that will likely affect the sustainability of Wildlife within the RSA"

Geographic Extent:

- S Site-specific: Environmental effects restricted to the Project site (i.e., Project footprint).
- L Local: Environmental effects extend beyond the Project footprint but remain localized within the Wildlife LSA.
- R Regional: Environmental effects extend to the watershed/regional level.

Duration:

- ST Short term: Effects are measurable for <2 years.
- MT Medium term: Effects are measurable for 2 to 20 years.
- LT Long term: Effects are measurable for >20 years.
- P Permanent: Effects are permanent.

Frequency:

- O Occurs once.
- S Occurs sporadically at irregular intervals.
- R Occurs on a regular basis and at regular intervals.
- C Continuous.

Reversibility:

- R Reversible
- I Irreversible

Environmental Context:

- U Undeveloped: Area relatively or not adversely affected by human activity.
- D Developed: Area has been substantially previously disturbed by human development or human development is still present

Significance:

- S Significant
- N Not Significant
- P Positive

N/A Not Applicable

Table A-11: Assessment of Effects to Black Bears

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics: Adverse or Positive Effect	Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Environmental Context	Significance	Recommended Follow-up and Monitoring
HABITAT LOSS OR ALTERATION: ***Displacement of wildlife; changes in species composition and relative abundance; loss of breeding and/or foraging habitat; modification of predator-prey interactions***									
Construction									
On-shore site preparation (clearing, grubbing, blasting, rock cut, filling, grading)	▪ Minimize footprint	A	M	L	ST/O	I	D	N	On-site environmental monitor during Construction phase.
Operations									
None identified									
Decommissioning and Reclamation									
decommissioning and reclamation the container terminal and rail	▪ N/A	P	L	S	LT/O	R	D	N	On-site environmental monitor during decommissioning.
SENSORY DISTURBANCE: ***changes in movement patterns; changes in species composition and relative abundance***									
Construction									
Equipment and supply by land transport (rail/road) On-shore site preparation (clearing, grubbing, blasting, rock cut, filling, grading) construction and installation of on-shore components (drainage system, landslide containment, intermodal yard, container yard, buildings, ancillary facilities, lighting, roads, sidings and wye) On-shore concrete production Site waste management Vehicular traffic on terminal site	▪ Minimize disturbance ▪ Maintain equipment ▪ Wildlife awareness	A	L	L	ST/C	R	D	N	On-site environmental monitor during Construction phase.
Operations									
Site waste management	▪ Minimize disturbance	A	L	L	LT/R	R	D	N	None required unless a

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics: Adverse or Positive Effect	Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Environmental Context	Significance	Recommended Follow-up and Monitoring
Terminal and rail facility operations Maintenance & repairs to dock facilities, terminal and rail Vehicular traffic on terminal site	▪ Maintain equipment ▪ Wildlife awareness								sensitive species issue arises during the Construction phase.
Decommissioning and Reclamation									
decommissioning and reclamation of the container terminal and rail	▪ Minimize disruption ▪ Maintain equipment ▪ Wildlife awareness	P	L	S	LT/C	R	D	N	On-site environmental monitor during decommissioning.
DIRECT MORTALITY: ***Direct loss of individuals***									
Construction									
Equipment and supply by land transport (rail/road) On-shore site preparation (clearing, grubbing, blasting, rock cut, filling, grading) Vehicular traffic on terminal site Waste management	▪ Reduce vehicle speed limits ▪ Terminal fencing ▪ Minimize disturbance ▪ Road lighting ▪ Wildlife awareness ▪ Waste management plan	A	L	S	ST/S	I	D	N	On-site environmental monitor during Construction phase.
Operations									
Vehicular traffic on terminal site Waste management	▪ Reduce speed limits ▪ Maintain fencing ▪ Minimize disturbance ▪ Road lighting ▪ Wildlife awareness ▪ Waste management plan	A	L	S	ST/S	I	D	N	None required unless a sensitive species issue arises during the Construction phase.

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics							Recommended Follow-up and Monitoring
		Adverse or Positive Effect	Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Environmental Context	Significance	
Decommissioning and Reclamation									
decommissioning and reclamation of the container terminal and rail	▪ Reduce speed limits ▪ Maintain fencing ▪ Minimize disturbance ▪ Road lighting ▪ Wildlife awareness ▪ Waste management plan	P	L	S	ST/S	R	D	N	On-site environmental monitor during decommissioning.
Cumulative Effects (Fairview Terminal (Phase I), Ridley Island Coal Terminal, Prince Rupert Grain Terminal, Sulphur Export Facility)									
Habitat Loss or Alteration	No mitigation recommended	A	L	S	LT/C	I	D	N	None recommended
Sensory Disturbance		A	L	L	LT/C	R	D	N	
Direct Mortality		A	L	S	LT/S	R	D	N	

Mitigation:

- **Minimize footprint:** Avoid all unnecessary vegetation clearing around facility and roads wherever and whenever practicable.
- **Minimize disruption**: Keeping human disturbance to a minimum by restricting and managing access and human activity (e.g., posting signs, security access).
- **Road lighting:** Ensure roads are lit at night to increase roadside visibility.
- **Reduce speed limits:** Enforce low vehicle speeds on roads (30km.h) within the Terminal.
- **Fencing:** maintaining fencing around the Project area that excludes large mammal access but provides one-way escape exits to avoid entrapment**.**
- **Wildlife awareness:** Implement a wildlife education program, within the worker health and safety training that will inform employees of the possible presence and behaviour of wildlife on the Project site. Ensure staff are trained in bear awareness and the importance of minimizing trash and other bear attractants
- **Wildlife management plan:** Implement a secure waste disposal system should also during construction and operations of the Project to avoid attracting bears onto the site.
- **Waste management:** Implement a secure waste disposal system should also during construction and operations of the Project to avoid attracting bears onto the site.

KEY

Magnitude:

- N No measurable adverse effects to habitat, habitat function, or mortality risk anticipated
- L Definition varies depending on the effect, but general definition is “no measurable effect(s) on sustainability of Avifauna within the RSA”
- M Definition varies depending on the effect, but general definition is “measurable effect(s) occur, but unlikely to pose a serious risk to sustainability of Avifauna within the RSA”
- H Definition varies depending on the effect, but general definition is “measurable effect(s) occur that will likely affect the sustainability of Avifauna within the RSA”

Geographic Extent:

- S Site-specific: Environmental effects restricted to the Project site (i.e., Project footprint).
- L Local: Environmental effects extend beyond the Project footprint but remain localized within the assessment area.
- R Regional: Environmental effects extend to the watershed/regional level.

Duration:

- ST Short term: Effects are measurable for <2 years.
- MT Medium term: Effects are measurable for 2 to 20 years.
- LT Long term: Effects are measurable for >20 years.
- P Permanent: Effects are permanent.

Frequency:

- O Occurs once.
- S Occurs sporadically at irregular intervals.
- R Occurs on a regular basis and at regular intervals.
- C Continuous.

Reversibility:

- R Reversible
- I Irreversible

Environmental Context:

- U Undeveloped: Area relatively or not adversely affected by human activity.
- D Developed: Area has been substantially previously disturbed by human development or human development is still present

Significance:

- S Significant
- N Not Significant
- N/A Not Applicable

Table A-12: Assessment of Effects to Moose

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics: Adverse or Positive Effect	Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Environmental Context	Significance	Recommended Follow-up and Monitoring
DIRECT MORTALITY: ***Direct loss of individuals***									
Construction									
Equipment and supply by land transport (rail/road) Vehicular traffic on terminal site	▪ Brush management	A	L	S	ST/S	I	D	N	On-site environmental monitor during Construction phase.
Operations									
Vehicular traffic on terminal site Rail traffic as a result of the Project	▪ Brush management ▪ Sounding of whistle ▪ Investigate fencing	A	L	R	LT/R	R	D	N	Annual reporting of moose mortality along the rail Subdivisions
Decommissioning and Reclamation									
decommissioning and reclamation the container terminal and rail	▪ None suggested	P	L	S	ST/S	R	D	N	On-site environmental monitor during decommissioning.
Cumulative Effects (Fairview Terminal Phase I, Northlands and Atlin Terminal, Ridley Island Coal Terminal, Prince Rupert Grain Terminal, Sulphur Export Facility)									
Direct Mortality	▪ None suggested	A	L	S	LT/S	R	D	N	

Mitigation:

- **Reduce speed limits:** Reduction of speed along Subdivision sections with limited line-of-sight visibility.
- **Fencing:** Investigate the feasibility of wildlife fencing along sections that are considered high collision areas.
- **Brush management:** Combination of brush management and snow wing-ploughing along Subdivision sections identified with high moose-train interactions
- **Sounding of whistle:** Sounding of whistle upon sighting of animal on rail right-of-way

KEY **Magnitude:**	**Geographic Extent:**	**Frequency:**	**Significance:**
N Negligible: No measurable adverse effects to habitat, habitat function, or mortality risk anticipated L Low: Definition varies depending on the effect, but general definition is “no measurable effect(s) on sustainability of Wildlife within the RSA” M Moderate: Definition varies depending on the effect, but general definition is “measurable effect(s) occur, but unlikely to pose a serious risk to sustainability of Wildlife within the RSA” H Definition varies depending on the effect, but general definition is “measurable effect(s) occur that will likely affect the sustainability of Wildlife within the RSA”	S Site-specific: Environmental effects restricted to the Project site (i.e., Project footprint). L Local: Environmental effects extend beyond the Project footprint but remain localized within the assessment area. R Regional: Environmental effects extend to the watershed/regional level. **Duration:** ST Short term: Effects are measurable for <2 years. MT Medium term: Effects are measurable for 2 to 20 years. LT Long term: Effects are measurable for >20 years. P Permanent: Effects are permanent.	O Occurs once. S Occurs sporadically at irregular intervals. R Occurs on a regular basis and at regular intervals. C Continuous. **Reversibility:** R Reversible I Irreversible **Environmental Context:** U Undeveloped: Area relatively or not adversely affected by human activity. D Developed: Area has been substantially previously disturbed by human development or human development is still present	S Significant N Not Significant P Positive N/A Not Applicable

Table A-13: Assessment of Effects to Marine Birds

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics: Adverse or Positive Effect	Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Environmental Context	Significance	Recommended Follow-up and Monitoring
HABITAT LOSS OR ALTERATION ***(Displacement of marine birds; changes in species composition and relative abundance; loss of breeding and/or foraging habitat; changes to predator-prey interactions)***									
Construction									
In water construction of Marine Berth Infrastructure (dredging, ocean disposal, infilling, caisson placement, perimeter berm construction, vibro-densification, decking, interface with land) On-shore site preparation (clearing, grubbing, blasting, rock cut, filling, grading)	• Sediment control plan • Wildlife awareness • Minimize clearing • Minimize disruption	A	L	L	ST/O	I	D	N	On-site environmental monitoring during the Construction phase
Decommissioning and Reclamation									
Decommissioning and reclamation of the container terminal and rail	• Sediment control plan • Wildlife awareness • Minimize clearing • Minimize disruption	P	L	S	ST/O	R	D	N	On-site environmental monitoring during the Decommissioning phase
SENSORY DISTURBANCE ***(Changes in movement or behavioural patterns; changes in species composition and relative abundance)***									
Construction									
In water construction of Marine Berth Infrastructure (dredging, ocean disposal, infilling, caisson placement, perimeter berm construction, vibro-densification, decking, interface with land) Equipment and supply marine transportation (barge/vessel) On-shore site preparation (clearing, grubbing, blasting, rock cut, filling, grading) Construction and installation of on-shore components (drainage system, landslide	• Work scheduling • Minimize disruption • Shield outdoor lights • Wildlife awareness • Use acoustic blankets and bubble curtain during drilling	A	L	L	ST/R	R	D	N	On-site environmental monitoring during the Construction phase

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics: Adverse or Positive Effect	Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Environmental Context	Significance	Recommended Follow-up and Monitoring
containment, intermodal yard, container yard, buildings, ancillary facilities, lighting, roads, sidings and wye)									
Onshore concrete production									
Operations									
Vessel physically connected to a berthing tug and/or the berthing facility	• Shield outdoor lights • Wildlife awareness	A	L	L	ST/R	R	D	N	None required unless a sensitive species issue arises during the Construction phase
Container unloading									
Tug operation while berthing									
Rail traffic as a result of the Project									
Terminal and rail facility operations									
Decommissioning and Reclamation									
Decommissioning and reclamation of the container terminal and rail	• Work scheduling • Minimize disruption • Wildlife awareness	P	L	S	LT/O	R	D	N	On-site environmental monitoring during the Decommissioning phase
DIRECT MORTALITY *(Direct loss of individual birds)*									
Construction									
Equipment and supply by land transport (rail/road)	• Work scheduling • Shield outdoor lights • Speed limits • Wildlife awareness	A	L	L	ST/S	R	D	N	On-site environmental monitoring during the Construction phase
On-shore site preparation (clearing, grubbing, blasting, rock cut, filling, grading)									
Site waste management									
Vehicular traffic on terminal site									
Operations									
Terminal and rail facility operations	• Shield outdoor lights	A	L	L	ST/S	R	D	N	

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics							Recommended Follow-up and Monitoring
		Adverse or Positive Effect	Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Environmental Context	Significance	
Vehicular traffic on terminal site	• Shield outdoor lights • Speed limits • Wildlife awareness	A	L	L	ST/S	R	D	N	None required unless a sensitive species issue arises during the Construction phase
Decommissioning and Reclamation									
Decommissioning and reclamation of the container terminal and rail	• Work scheduling • Shield outdoor lights • Speed limits • Wildlife awareness	P	L	S	ST/S	R	D	N	On-site environmental monitoring during the Decommissioning phase
Cumulative Effects (Fairview Terminal (Phase 1), Ridley Island Log Sort, Canpotex Potash Export Terminal, and Mount Hays Wind Farm Project)									
Habitat Loss or Alteration		A	L	L	LT/R	R	D	N	
Sensory Disturbance		A	L	L	LT/R	R	D	N	
Direct Mortality		A	L	L	LT/S	R	D	N	

Mitigation:

- **Sediment Control Plan:** a plan will be developed to help reduce the dispersion of suspended solids during construction activities and be included in the EMP. The plan will include appropriate selection of dredge technology, disposal of dredged material in an approved site, and minimization of spillage of materials during dredging.
- **Minimize clearing:** minimize wherever possible the amount of clearing required.
- **Work scheduling:** Where practical, construction activities will avoid the time of the year when the North Coast has high marine bird populations, particularly during spring migration (April – May). Schedule activities during daylight hours whenever practical to minimize the need for staging lights. Avoid disturbance to bird nesting habitat during the breeding bird period (May 1 to July 31). If disturbance is unavoidable an active nest survey will be conducted to locate and protect active nests.
- **Minimize disruption:** Construction activities should be scheduled during daylight hours whenever possible to minimize the need for staging lights.
- **Acoustic blankets and bubble curtain:** Noise effects will be minimized through the use of bubble curtains and acoustic absorbent blankets during drilling.
- **Shield outdoor lights:** Where permissible under safety and navigation requirements, outdoor lights will be shielded to minimize light spillage beyond the wharf face.
- **Speed limits:** Enforce low speeds for vehicle and vessel traffic.
- **Wildlife awareness:** Implement a wildlife education program, within the worker health and safety training that will apprise employees of the possible presence and behaviour of wildlife on the Project site.

KEY

Magnitude:

N Negligible: No measurable adverse effects to habitat, habitat function, or mortality risk anticipated

L Low: Definition varies depending on the effect, but general definition is “no measurable effect(s) on sustainability of Avifauna within the RSA”

M Medium: Definition varies depending on the effect, but general definition is “measurable effect(s) occur, but unlikely to pose a serious risk to sustainability of Avifauna within the RSA”

H High: Definition varies depending on the effect, but general definition is “measurable effect(s) occur that will likely affect the sustainability of Avifauna within the RSA”

Geographic Extent:

S Environmental effects restricted to the Project site (i.e., Project Footprint).

L Environmental effects extend beyond the Project footprint but remain localized within the assessment area.

R Environmental effects extend to the watershed/regional level.

Duration:

ST Effects are measurable for less than one breeding season (i.e., less than 1 year).

MT Effects are measurable for one generation or several breeding seasons (i.e., 2 to 20 years).

LT Effects are measurable for multiple generations or multiple breeding seasons (i.e., greater than 20 years).

P Effects are permanent.

Frequency:

O Occurs once.

S Occurs sporadically at irregular intervals.

R Occurs on a regular basis and at regular intervals.

C Continuous.

Reversibility:

R Reversible

I Irreversible

Ecological Context:

U Undeveloped: Area relatively or not adversely affected by human activity.

D Developed: Area has been substantially previously disturbed by human development or human development is still present

N/A Not Applicable

Significance:

S Significant

N Not Significant

Table A-14: Assessment of Effects to Land Birds

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics: Adverse or Positive Effect	Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Environmental Context	Significance	Recommended Follow-up and Monitoring
HABITAT LOSS OR ALTERATION ***(Displacement of land birds; changes in species composition and relative abundance; loss of breeding and/or foraging habitat; changes to predator-prey interactions)***									
Construction									
On-shore site preparation (clearing, grubbing, blasting, rock cut, filling, grading)	• Retain raptor nest trees • Retain natural habitat features • Wildlife awareness • Minimize clearing	A	M	L	ST/O	I	D	N	On site environmental monitor during the Construction phase
Decommissioning and Reclamation									
Decommissioning and reclamation of the container terminal and rail	• Retain raptor nest trees • Retain natural habitat features • Wildlife awareness	P	L	S	ST/O	R	D	N	On-site environmental monitor during Decommissioning phase
SENSORY DISTURBANCE ***(Changes in movement or behavioural patterns; changes in species composition and relative abundance)***									
Construction									
Equipment and supply by land transport (rail/road) On-shore site preparation (clearing, grubbing, blasting, rock cut, filling, grading) Construction and installation of on-shore components (drainage system, landslide containment, intermodal yard, container yard, buildings, ancillary facilities, lighting, roads, sidings and wye) On-shore concrete production Vehicular traffic on terminal site	• Retain natural vegetation • Maintain equipment • Shield outdoor lights • Wildlife awareness	A	L	L	ST/R	R	D	N	On site environmental monitor during the Construction phase

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics: Adverse or Positive Effect	Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Environmental Context	Significance	Recommended Follow-up and Monitoring
Operations									
Container unloading Terminal and rail facility operations Vehicular traffic on terminal site	• Maintain equipment • Shield outdoor lights • Wildlife awareness	A	L	L	ST/R	R	D	N	None required unless a sensitive species issue arises during the Construction phase
Decommissioning and Reclamation									
Decommissioning and reclamation of the container terminal and rail	• Maintain equipment • Shield outdoor lights • Wildlife awareness	P	L	L	ST/O	R	D	N	On site environmental monitor during the Construction phase
DIRECT MORTALITY *(Direct loss of birds)*									
Construction									
Equipment and supply by land transport On-shore site preparation (clearing vegetation, grubbing, blasting, rock cut, filling, grading) Site Waste Management Vehicular traffic on terminal site	• Work scheduling • Shield outdoor lights • Speed limits • Wildlife awareness	A	L	S	ST/S	R	D	N	
Operation									
Vehicular traffic on terminal site Waste management	• Shield outdoor lights • Speed limits • Wildlife awareness	A	L	S	ST/S	R	D	N	None required unless a sensitive species issue arises during the Construction phase
Decommissioning and Reclamation									
Decommissioning and reclamation of the container terminal and rail	• Shield outdoor lights • Speed limits • Wildlife awareness	P	L	S	ST/R	R	D	N	On site environmental monitor during the Construction phase
Cumulative Effects (Fairview Terminal (Phase 1), Ridley Island Log Sort, Canpotex Potash Export Terminal, and Mount Hays Wind Farm Project)									

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics							Recommended Follow-up and Monitoring
		Adverse or Positive Effect	Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Environmental Context	Significance	
Habitat Loss or Alteration Sensory Disturbance Direct Mortality		A	L	L	LT/R	R	D	N	

Mitigation:

- **Work scheduling:** Where practical, avoid vegetation clearing during the breeding bird window (May 1 – July 31).
- **Retain raptor nest trees:** Where practical retain raptor nest trees with the appropriate vegetated buffer (i.e., 1.5X the tree height) to reduce the impacts of disturbance.
- **Retain habitat features:** Retain natural habitat features such as wildlife trees; vegetation should be retained wherever practical (e.g. trees which are not deemed to be hazardous provide nesting opportunities for cavity-dependent birds).
- **Maintain equipment:** Maintain construction and operations equipment.
- **Retain natural vegetation:** Retain natural vegetation along the boundaries of the Project to provide noise buffers and to limit noise associated with clearing.
- **Shield outdoor lights:** Where permissible under safety and navigation requirements, outdoor lights will be shielded to minimize light spillage beyond the wharf face.
- **Speed limits:** Enforce low speeds for vehicle and vessel traffic.
- **Wildlife awareness:** Implement a wildlife education program, within the worker health and safety training that will apprise employees of the possible presence and behaviour of wildlife on the Project site.
- **Minimize clearing:** Minimize wherever possible the amount of clearing required.

KEY

Magnitude:

N No measurable adverse effects to habitat, habitat function, or mortality risk anticipated

L Definition varies depending on the effect, but general definition is “no measurable effect(s) on sustainability of Avifauna within the RSA”

M Definition varies depending on the effect, but general definition is “measurable effect(s) occur, but unlikely to pose a serious risk to sustainability of Avifauna within the RSA”

H Definition varies depending on the effect, but general definition is “measurable effect(s) occur that will likely affect the sustainability of Avifauna within the RSA”

Geographic Extent:

S Environmental effects restricted to the Project site (i.e., Project Footprint).

L Environmental effects extend beyond the Project footprint but remain localized within the assessment area.

R Environmental effects extend to the watershed/regional level.

Duration:

ST Effects are measurable for less than one breeding season (i.e., less than 1 year).

MT Effects are measurable for one generation or several breeding seasons (i.e., 2 to 20 years).

LT Effects are measurable for multiple generations or multiple breeding seasons (i.e., greater than 20 years).

P Effects are permanent.

Frequency:

O Occurs once.

S Occurs sporadically at irregular intervals.

R Occurs on a regular basis and at regular intervals.

C Continuous.

Reversibility:

R Reversible

I Irreversible

Ecological Context:

U Undeveloped: Area relatively or not adversely affected by human activity.

D Developed: Area has been substantially previously disturbed by human development or human development is still present

N/A Not Applicable

Significance:

S Significant

N Not Significant

Table A-15: Assessment of Potential Effects on Freshwater Environment

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics: Adverse or Positive Effect	Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Environmental Context	Significance	Recommended Follow-up and Monitoring
Effect #1: ***Introduction of deleterious substances (pH, conductivity, temperature, suspended solids levels, etc.)***									
Construction									
On-shore site preparation (clearing, grubbing, blasting, rock cut, filling, grading)	• undertake work in good weather • instream BMPs • erosion control measures • concrete washwater treatment	A	N	S	S/S	R	U	N	• environmental monitoring
Construction and installation of on-shore components (drainage system, landslide containment, intermodal yard, container yard, buildings, ancillary facilities, lighting, roads, sidings and wye)		A	N	S	S/S	R	U	N	
On-shore concrete production		A	N	S	S/S	R	U	N	
Effect #2: ***Habitat quality and availability – change in the productive capacity of freshwater habitats***									
Construction									
On-shore site preparation (clearing, grubbing, blasting, rock cut, filling, grading)	• limit footprint • limit clearing • undertake work in good weather • instream BMPs • erosion control measures • concrete washwater treatment • restoration and compensation	A	N	R	S/O	R	U	N	• environmental monitoring
Construction and installation of on-shore components (drainage system, landslide containment, intermodal yard, container yard, buildings, ancillary facilities, lighting, roads, sidings and wye)		A	N	R	S/O	R	U	N	
On-shore concrete production		A	N	R	S/O	R	U	N	

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics						Significance	Recommended Follow-up and Monitoring
		Adverse or Positive Effect	Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Environmental Context		
Effect #3: ***Fish mortality risk - change in number of potential fish mortality factors (i.e., population numbers)***									
Construction									
On-shore site preparation (clearing, grubbing, blasting, rock cut, filling, grading)	• scheduling • fish salvage • screen pumps • ensure flow • blasting measures • hazardous materials restrictions • concrete washwater treatment	A	N	S	S/O	R	U	N	• environmental monitoring
Construction and installation of on-shore components (drainage system, landslide containment, intermodal yard, container yard, buildings, ancillary facilities, lighting, roads, sidings and wye)		A	N	S	S/O	R	U	N	
On-shore concrete production		A	N	S	S/O	R	U	N	
Cumulative Effects (Fairview Phase I)									
Deleterious Substances	• minimize overlap • develop HCP	A	N	R	L/O	R	U	N	• follow-up program
Habitat Quality and Availability		A	N	R	L/O	R	U	N	
Fish Mortality		A	N	R	L/O	R	U	N	

Mitigation:

- **Limit Footprint:** Limit development of temporary extra workspace within 30 m of fish-bearing habitats; limit spatial extent of work in watercourses, fisheries sensitive zones and wetlands
- **Limit Clearing:** Limit spatial extent of clearing and removal of shrubs within RMA boundary of stream and wetlands. Vegetation clearing will consist of brushing, where vegetation is only cut down to a certain level above the ground, allowing root systems and lower limbs to remain and regenerate.
- **Undertake Work in Good Weather:** Do not schedule or undertake instream work during periods of precipitation if there is a risk of sediment deposition to streams or loss of containment; only undertake instream work when diversion methods have capacity to bypass 1.5x the estimated flow.
- **Scheduling:** Where practicable, undertake construction in fish-bearing waters during the least constrained time as per least risk timing windows.
- **Apply Instream Best Management Practices:** Follow applicable guidelines outlined in Standards and Best Practices for Instream Works (MWLAP 2004) and Fish-stream Crossing Guidebook (MoF 2002)
- **Fish Salvage:** Conduct fish salvage before dewatering work areas in fish-bearing watercourses.
- **Screen Pumps:** Ensure by-pass and water intake pumps are properly screened to prevent fish impingement, per DFO Freshwater Intake End-of-Pipe Fish Screen Guidelines (1995).
- **Ensure Adequate Flow:** When diverting flows around isolated work areas, ensure stream flow is not interrupted and downstream areas do not become dewatered.
- **Blasting Measures:** Conduct blasting in accordance with Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters (Wright and Hopky 1998)
- **Erosion Control Measures:** Implement Erosion and Sediment Control plan of EPP during construction activities. Stop work during periods of high precipitation if there is a risk of sediment deposition to streams (e.g., loss of containment) resulting from construction activities.
- **Hazardous Materials Restrictions:** Prohibit refueling and storage of hazardous materials near watercourses. Restrict use of hazardous materials near sensitive habitats.
- **Concrete Washwater Treatment**: Ensure proper storage, treatment and disposal of all concrete washwater as per BC Ministry permits (settling ponds, filtration, pH control, etc.).
- **Restoration and Compensation:** Fully revegetate riparian areas to pre-construction conditions following construction activities. Restore riparian cover to pre-construction condition (e.g., restore shrub vegetation within 30 m of fish habitat). Implement habitat compensation works for all harmful loss or alteration to fish habitat (riparian and aquatic).
- **Environmental Monitoring:** Provide monitoring of construction activities and water quality by qualified Environmental Inspector.
- **Minimize Overlap:** Minimize overlap of past, present and future projects and Fairview Phase II Project.
- **Develop Habitat Compensation Plan:** Develop plan to offset potential losses to aquatic and riparian habitat (Volume II).
- Follow-up Program: Develop and implement a follow-up program to monitor success of HCPs and other mitigation measures.

KEY

Magnitude:

For water quality and habitat quality and availability:

- N Negligible: No measurable adverse effects to habitat or habitat function anticipated.
- L Low: Measurable effects to habitat function anticipated to low sensitivity habitat only (i.e., non fish-bearing habitats or those used by forage fish only).
- M Moderate: Measurable effects to habitat function anticipated to moderate sensitivity habitat (i.e., common habitats used by sport fish or fish of importance to Aboriginal peoples).
- H High: Measurable effects to habitat function anticipated to high sensitivity habitat or critical habitat for SARA-listed species (i.e., quality spawning, holding or overwintering habitat).

For fish mortality:

- N Negligible: No measurable reduction in number of any fish species anticipated.
- L Low: Anticipated mortality risk to non-sport fish.
- M Moderate: Anticipated mortality risk to sport fish.
- H High: Anticipated mortality risk to BC red-listed or COSEWIC species.

Geographic Extent:

- S Site-specific: Effects restricted to the stream within specific construction activity area.
- L Local: Effects restricted to the stream within the specific construction activity area and immediately downstream.
- R Regional: Effects extend downstream to Prince Rupert or Porpoise Harbour.

Duration:

- S Short term: No measurable adverse effects anticipated beyond construction season.
- M Medium term: Measurable effects anticipated beyond construction season but not beyond five years.
- L Long term: Measurable effects anticipated beyond five years.
- P Permanent.

Frequency:

- O Effect occurs once.
- S Effect occurs at sporadic intervals.
- R Effect occurs on a regular basis and at regular intervals.
- C Continuous.

Reversibility:

- R Reversible.
- I Irreversible.

Ecological Context:

- U Undeveloped: Area relatively pristine or not adversely affected by human activity.
- D Developed: Evidence of existing adverse environmental effects (e.g., existing stream crossings).

Significance:

- S Significant.
- N Not Significant.

N/A Not Applicable.

Table A-16: Assessment of Effects to Sediment and Water Quality

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics: Adverse or Positive Effect	Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Environmental Context	Significance	Recommended Follow-up and Monitoring
ALTERATIONS IN SEDIMENT AND WATER QUALITY: ***On-shore and in-water activities during construction and operations may result in increases in suspended sediments and increases in contaminant***									
Construction									
In water construction of Marine Berth Infrastructure (dredging, ocean disposal, infilling, caisson placement, perimeter berm construction, vibro-densification, decking, interface with land)	▪ Environmental Management Plan (EMP) ▪ Dredging technology	A	L	L	ST/S	R	D	N	Follow-up will be required to verify the predictions for alterations to sediment and water quality. Both contaminants and total suspended solids will be monitored to verify the accuracy of the environmental assessment and determine the effectiveness of the mitigation measures used to limit suspended sediments and the introduction of contaminants. This will include construction monitoring for TSS and turbidity during dredging and monitoring of discharge water released from the site during operations according to parameters identified in any permits issued for the Project.
Equipment and supply marine transportation (barge/vessel)	▪ EMP ▪ Use of proper maintenance and refuelling methods	A	L	L	ST/S	R	D	N	Same as above
On-shore site preparation (clearing, grubbing, blasting, rock cut, filling, grading)	▪ Conservation (Minimize vegetation clearing) ▪ EMP (erosion and sediment controls)	A	L	L	ST/O	R	D	N	Same as above
Site waste management	▪ EMP ▪ Proper storage and disposal methods	A	L	L	ST/O	R	D	N	Same as above
Operation									

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics: Adverse or Positive Effect	Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Environmental Context	Significance	Recommended Follow-up and Monitoring
Tug operation while berthing	▪ EMP ▪ Minimize propeller wash and scouring	A	L	L	ST/S	R	D	N	Same as above
Maintenance & repairs to dock facilities, terminal and rail	▪ EMP ▪ Use of proper maintenance and refuelling methods ▪ Proper storage and disposal methods	A	L	L	ST/S	R	D	N	Same as above
Waste Management	▪ EMP ▪ Proper storage and disposal methods	A	L	L	ST /O	R	D	N	Same as above
Decommissioning									
Decommissioning and reclamation of the container terminal and rail	Same as Construction phase	A	L	L	ST/O	R	D	N	
Cumulative Effects (Fairview Phase I, Northlands Terminal, Atlin Terminal, Ridley Island Coal, Prince Rupert Grain, ICEC Terminals, Port shipping activities, Houston Pellet Inc., Canpotex, Ridley road/rail, Aero Point Ferry, Mt. McDonald Wind, Naikun Wind)									
Alteration in Sediment and Water Quality	▪ EMP	A	L	L	LT/O	R	D	N	Same as above

Mitigation:

- **Environmental Management Plan (EMP):** This plan details the protection measures developed by the PRPA for routine activities associated with construction and operations. The EMP lists mitigation measures to be implemented in all areas of construction and operations to limit potential impacts plus compliance and effects monitoring programs. This will include a sediment and erosion control plan, total suspended solids monitoring, mitigation techniques to reduce acoustic emissions, sediment chemistry and analysis, and proper maintenance and refuelling methods. All construction related best management practices (BMP) to reduce sediment disturbances and possible contaminant introduction will also be included.
- **Dredging equipment:** Preferential use of suction-cutter dredge where technically and economically feasible
- **Use of proper maintenance and refuelling methods:** maintain construction and operation equipment. Oil and hydraulic fluids will not be changed at the shoreline and absorbent pads will be used to absorb small spills; pads will be disposed of at an appropriate disposal site
- **Proper storage and disposal methods:** Storage, handling and use of all hazardous materials will be undertaken in compliance with applicable standards, codes, and regulations. Drainage water will be collected and pass through oil separators; proper bilge and ballast water management

KEY

Magnitude:
- N Negligible: No measurable adverse effects to the Marine Environment.
- L Low: Temporary disturbance within the LSA with no permanent loss or degradation of habitat. No permanent effects on the abundance or distribution of the KIR population or its population parameters.
- M Moderate: Permanent disturbance within the LSA with limited loss or degradation of habitat. Abundance and/or distribution of the KIR population within the LSA may change over one generation. Effects will be offset through mitigation and/or compensation measures.
- H High: Permanent disturbance or alteration within the LSA or RSA. Effects may be associated with a decline in the abundance or distribution of the KIR population which will not be offset through mitigation and/or compensation measures. Natural recruitment will not re-establish the population to its original level in one or more generations.

Geographic Extent:
- S Site-specific: Effects are restricted to the Project site (i.e. Project footprint).
- L Local: Effects extend beyond the Project site but remain localized within the LSA.
- R Regional: Effects extend to the RSA.

Duration:
- ST Short term: Effects are measurable for < 2 years.
- MT Medium term: Effects are measurable for 2 to 20 years.
- LT Long term: Effects are measurable for > 20 years.
- P Permanent: Effects are permanent.

Frequency:
- O Occurs once.
- S Occurs sporadically at irregular intervals.
- R Occurs on a regular basis and at regular intervals.
- C Continuous.

Reversibility:
- R Reversible.
- I Irreversible.

Ecological Context:
- U Undeveloped: Area relatively pristine or not adversely affected by human activity.
- D Developed: Area has been substantially disturbed by human development or human development is still present.

Significance:
- S Significant.
- N Not Significant.

N/A Not Applicable.

Table A-17: Assessment of Effects to Marine Riparian

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics: Adverse or Positive Effect	Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Environmental Context	Significance	Recommended Follow-up and Monitoring
HABITAT LOSS/ALTERATION: ***Project activities have the potential to result in the loss or alteration of marine riparian habitat.***									
Construction									
On-shore site preparation (clearing, grubbing, blasting, rock cut, filling, grading). Specifically, removal of marine riparian vegetation	▪ Habitat Compensation Plan ▪ EMP ▪ Establish work windows to reduce effects on migrating juvenile salmonids if feasible.	A	M	L	P/O	I	D	N	Habitat compensation effectiveness monitoring
Cumulative Effects (Fairview Phase I, Northlands Terminal, Atlin Terminal, Ridley Island Coal, Prince Rupert Grain, ICEC Terminals, Port shipping activities, Houston Pellet Inc., Canpotex, Ridley road/rail, Aero Point Ferry, Mt. McDonald Wind, Naikun Wind)									
Habitat loss and alteration	▪ Habitat Compensation Plan ▪ EMP	A	M	R	P/O	I	D	N	None

Mitigation:

- **Environmental Management Plan:** Will include total suspended solids monitoring, the installation of settling ponds, divergent ditches and sediment screens. All in-water construction activities will be conducted using task specific (dredging, densification, pile driving) best management practices (BMP) to reduce sediment disturbances.
- **Establish work windows to reduce effects on salmon at all life stages:** Work windows will be established in consultation with DFO to determine the best time of year to conduct activities while minimizing impacts on salmon. If preferred work windows are not feasible, additional mitigative steps will be considered in consultation with DFO.
- **Habitat Compensation Plan (HCP):** Will be implemented to compensate for the loss of marine habitat, and to restore the functionality of marine habitat along affected shorelines (Volume II).

KEY

Magnitude:

N Negligible: No measurable adverse effects to the Marine Environment.

L Low: Temporary disturbance within the LSA with no permanent loss or degradation of habitat. No permanent effects on the abundance or distribution of the KIR population or its population parameters.

M Moderate: Permanent disturbance within the LSA with limited loss or degradation of habitat. Abundance and/or distribution of the KIR population within the LSA may change over one generation. Effects will be offset through mitigation and/or compensation measures.

H High: Permanent disturbance or alteration within the LSA or RSA. Effects may be associated with a decline in the abundance or distribution of the KIR population which will not be offset through mitigation and/or compensation measures. Natural recruitment will not re-establish the population to its original level in one or more generations.

Geographic Extent:

S Site-specific: Effects are restricted to the Project site (i.e. Project footprint).

L Local: Effects extend beyond the Project site but remain localized within the LSA.

R Regional: Effects extend to the RSA.

Duration:

ST Short term: Effects are measurable for < 2 years

MT Medium term: Effects are measurable for 2 to 20 years.

LT Long term: Effects are measurable for > 20 years.

P Permanent: Effects are permanent.

Frequency:

O Occurs once.

S Occurs sporadically at irregular intervals.

R Occurs on a regular basis and at regular intervals.

C Continuous.

Reversibility:

R Reversible.

I Irreversible.

Ecological Context:

Undeveloped: Area relatively pristine or not adversely affected by human activity.

Developed: Area has been substantially disturbed by human development or human development is still present.

Significance:

S Significant.

N Not Significant.

N/A Not Applicable.

Table A-18: Assessment of Effects to Marine Benthos

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics							Recommended Follow-up and Monitoring
		Adverse or Positive Effect	Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Environmental Context	Significance	
DIRECT MORTALITY: ***Project activities have the potential to result in the direct mortality of marine benthos***									
Construction									
In water construction of Marine Berth Infrastructure (dredging and infilling)	▪ Best Management Practices ▪ EMP ▪ Sediment Control Plan	A	M	L	P/O	R	D	N	
HABITAT LOSS: ***Project activities have the potential to result in the loss of habitat for marine benthos***									
Construction									
In water construction of Marine Berth Infrastructure (dredging and infilling)	▪ EMP ▪ Habitat Compensation Plan	A	M	L	P/O	R	D	N	Habitat compensation effectiveness monitoring
HABITAT ALTERATION/DISTURBANCE: ***Project activities have the potential to alter and disturb marine benthos habitat***									
In water construction of Marine Berth Infrastructure (dredging and infilling)	▪ EMP ▪ Habitat Compensation Plan	A	M	L	P/O	R	D	N	Habitat compensation effectiveness monitoring
Cumulative Effects (Fairview Phase I, Northlands Terminal, Atlin Terminal, Ridley Island Coal, Prince Rupert Grain, ICEC Terminals, Port shipping activities, Houston Pellet Inc., Canpotex, Ridley road/rail, Aero Point Ferry, Mt. McDonald Wind, Naikun Wind)									
Direct Mortality	▪ EMP ▪ Habitat Compensation Plan	A	M	R	P/C	I	D	N	Habitat compensation Monitoring
Habitat Loss	▪ EMP ▪ Habitat Compensation plan	A	M	L	P/O	R	D	N	Habitat compensation Monitoring

Mitigation:

- **Environmental Management Plan (EMP):** see table 13-4
- **Habitat Compensation Plan:** see table 13-3

KEY

Magnitude:

N Negligible: No measurable adverse effects to the Marine Environment.

L Low: Temporary disturbance within the LSA with no permanent loss or degradation of habitat. No permanent effects on the abundance or distribution of the KIR population or its population parameters.

M Moderate: Permanent disturbance within the LSA with limited loss or degradation of habitat. Abundance and/or distribution of the KIR population within the LSA may change over one generation. Effects will be offset through mitigation and/or compensation measures.

H High: Permanent disturbance or alteration within the LSA or RSA. Effects may be associated with a decline in the abundance or distribution of the KIR population which will not be offset through mitigation and/or compensation measures. Natural recruitment will not re-establish the population to its original level in one or more generations.

Geographic Extent:

S Site-specific: Effects are restricted to the Project site (i.e. Project footprint).

L Local: Effects extend beyond the Project site but remain localized within the LSA.

R Regional: Effects extend to the RSA.

Duration:

ST Short term: Effects are measurable for < 2 years.

MT Medium term: Effects are measurable for 2 to 20 years.

LT Long term: Effects are measurable for > 20 years.

P Permanent: Effects are permanent.

Frequency:

O Occurs once.

S Occurs sporadically at irregular intervals.

R Occurs on a regular basis and at regular intervals.

C Continuous.

Reversibility:

R Reversible.

I Irreversible.

Ecological Context:

Undeveloped: Area relatively pristine or not adversely affected by human activity.

Developed: Area has been substantially disturbed by human development or human development is still present.

Significance:

S Significant.

N Not Significant.

N/A Not Applicable.

Table A-19: Assessment of Effects to Eelgrass

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics: Adverse or Positive Effect	Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Environmental Context	Significance	Recommended Follow-up and Monitoring
EELGRASS HABITAT LOSS: ***Infilling and other activities will result in permanent changes to the substrate and eelgrass habitat present in the area.***									
Construction									
In water construction of Marine Berth Infrastructure (dredging, infilling, caisson placement, perimeter berm construction, vibro-densification, decking, interface with land)	▪ EMP ▪ Habitat Compensation Plan	A	M	S	ST or MT/O	R	D	N	Habitat compensation effectiveness monitoring Survey of adjacent eelgrass beds at completion of construction
Equipment and supply marine transportation (barge/vessel)	▪ Vessel avoidance of shallows	A	L	S	ST/S	R	D	N	Survey of adjacent eelgrass beds at completion of construction
EELGRASS HABITAT DISTURBANCE: ***Activities will affect the environmental conditions required for eelgrass growth***									
Construction									
On-shore site preparation (clearing, grubbing, blasting, rock cut, filling, grading)	▪ EMP	A	L	L	ST/O	R	D	N	Survey of adjacent eelgrass beds at completion of construction
Equipment and supply marine transportation (barge / vessel)	▪ Vessel avoidance of shallows	A	L	L	ST/S	R	D	N	Survey of adjacent eelgrass beds at completion of construction
Operation									
Tug operation while berthing	▪ Vessel avoidance of shallows	A	L	S	ST/S	R	D	N	Survey of adjacent eelgrass beds at year 1, 3 and 5 after the start of operation
Storm water management	▪ EMP	A	L	L	ST/S	R	D	N	None required
Decommissioning and reclamation									
Decommissioning and reclamation of the container terminal and rail	▪ EMP	A	L	S	ST/O	R	D	N	Survey of adjacent eelgrass beds at completion of decommissioning
Cumulative Effects (Fairview Phase I, Northlands Terminal, Atlin Terminal, Ridley Island Coal, Prince Rupert Grain, ICEC Terminals, Port shipping activities, Houston Pellet Inc.,									

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics							Recommended Follow-up and Monitoring
		Adverse or Positive Effect	Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Environmental Context	Significance	
Canpotex, Ridley road/rail, Aero Point Ferry, Mt. McDonald Wind, Naikun Wind)									
Habitat Loss		A	M	L	MT/O	R	D	N	None required
Habitat Disturbance		A	M	L	MT/O	R	D	N	None required

Mitigation:

- **Environmental Management Plan (EMP):** see table 13-4
- **Habitat Compensation Plan:** see table 13-3
- **Vessel avoidance of shallows: Vessel** operators will stay clear of shallow waters where eelgrass is present (“no-go” zones). If required, vessels that will minimize prop-wash and scouring for work in shallow waters will be selected where technically feasible
- **Restoration:** see table 13-3

KEY

Magnitude:	**Geographic Extent:**	**Frequency:**	**Ecological Context:**
N Negligible: No measurable adverse effects to the Marine Environment.	S Site-specific: Effects are restricted to the Project site (i.e. Project footprint).	O Occurs once.	Undeveloped: Area relatively pristine or not adversely affected by human activity.
L Low: Temporary disturbance within the LSA with no permanent loss or degradation of habitat. No permanent effects on the abundance or distribution of the KIR population or its population parameters.	L Local: Effects extend beyond the Project site but remain localized within the LSA.	S Occurs sporadically at irregular intervals.	Developed: Area has been substantially disturbed by human development or human development is still present.
M Moderate: Permanent disturbance within the LSA with limited loss or degradation of habitat. Abundance and/or distribution of the KIR population within the LSA may change over one generation. Effects will be offset through mitigation and/or compensation measures.	R Regional: Effects extend to the RSA.	R Occurs on a regular basis and at regular intervals.	**Significance:**
H High: Permanent disturbance or alteration within the LSA or RSA. Effects may be associated with a decline in the abundance or distribution of the KIR population which will not be offset through mitigation and/or compensation measures. Natural recruitment will not re-establish the population to its original level in one or more generations.	**Duration:**	C Continuous.	S Significant.
	ST Short term: Effects are measurable for < 2 years.	**Reversibility:**	N Not Significant.
	MT Medium term: Effects are measurable for 2 to 20 years.	R Reversible.	**N/A** Not Applicable.
	LT Long term: Effects are measurable for > 20 years.	I Irreversible.	
	P Permanent: Effects are permanent.		

Table A-20: Assessment of Effects to Bull Kelp

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics: Adverse or Positive Effect	Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Environmental Context	Significance	Recommended Follow-up and Monitoring
HABITAT LOSS: ***Infilling and other activities will result in permanent changes to the substrate and eelgrass habitat present in the area.***									
Construction									
In water construction of Marine Berth Infrastructure (dredging, infilling, caisson placement, perimeter berm construction, vibro-densification, decking, interface with land)	▪ EMP ▪ Habitat Compensation Plan	A	M	S	ST/O	R	D	N	Habitat compensation effectiveness monitoring
Equipment and supply marine transportation (barge/vessel)	▪ Vessel avoidance of shallows	A	L	S	ST/S	R	D	N	Monitoring of adjacent bull kelp bed coverage based on aerial photographs taken after construction
Operation									
Tug operation while berthing	▪ Vessel avoidance of shallows	A	L	S	ST/S	R	D	N	Monitoring of adjacent bull kelp bed coverage based on aerial photographs taken at year 1, 3 and 5 after the start of operation
Decommissioning and Reclamation									
Decommissioning and reclamation of the container terminal and rail	▪ EMP	A	L	S	ST/O	R	D	N	None required
HABITAT ALTERATION/DISTURBANCE:									
Construction									
On-shore site preparation (clearing, grubbing, blasting, rock cut, filling, grading)	▪ EMP	A	L	L	ST/O	R	D	N	Monitoring of adjacent bull kelp bed coverage based on aerial photographs taken after construction
Equipment and supply marine transportation (barge/vessel)	▪ Vessel avoidance of shallows	A	L	L	ST/S	R	D	N	Monitoring of adjacent bull kelp bed coverage based on aerial photographs taken after construction

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics: Adverse or Positive Effect	Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Environmental Context	Significance	Recommended Follow-up and Monitoring
Operation									
Tug operation while berthing	▪ Vessel avoidance of shallows	A	L	L	ST/R	R	D	N	Monitoring of adjacent bull kelp bed coverage based on aerial photographs taken at year 1, 3 and 5 after the start of operation
Storm water management	▪ EMP	A	L	L	ST/S	R	D	N	Monitoring of adjacent bull kelp bed coverage based on aerial photographs taken at year 1, 3 and 5 after the start of operation
Decommissioning and Reclamation									
Decommissioning and reclamation of the container Terminal	▪ EMP	A	L	S	ST /O	R	D	N	None required
Cumulative Effects (Fairview Phase I, Northlands Terminal, Atlin Terminal, Ridley Island Coal, Prince Rupert Grain, ICEC Terminals, Port shipping activities, Houston Pellet Inc., Canpotex, Ridley road/rail, Aero Point Ferry, Mt. McDonald Wind, Naikun Wind)									
Habitat alteration/disturbance		A	M	L	MT/O	R	D	N	None required

Mitigation:

- **Environmental Management Plan (EMP):** See table 13-3
- **Habitat compensation Plan:** where possible, bull kelp habitat loss will be compensated for with other bull kelp habitat
- **Vessel avoidance of shallows:** see table 13-6

KEY

Magnitude: N Negligible: No measurable adverse effects to the Marine Environment. L Low: Temporary disturbance within the LSA with no permanent loss or degradation of habitat. No permanent effects on the abundance or distribution of the KIR population or its population parameters. M Moderate: Permanent disturbance within the LSA with limited loss or degradation of habitat. Abundance and/or distribution of the KIR population within the LSA may change over one generation. Effects will be offset through mitigation and/or compensation measures. H High: Permanent disturbance or alteration within the LSA or RSA. Effects may be associated with a decline in the abundance or distribution of the KIR population which will not be offset through mitigation and/or compensation measures. Natural recruitment will not re-establish the population to its original level in one or more generations.	**Geographic Extent:** S Site-specific: Effects are restricted to the Project site (i.e. Project footprint). L Local: Effects extend beyond the Project site but remain localized within the LSA. R Regional: Effects extend to the RSA. **Duration:** ST Short term: Effects are measurable for < 2 years. MT Medium term: Effects are measurable for 2 to 20 years. LT Long term: Effects are measurable for > 20 years. P Permanent: Effects are permanent.	**Frequency:** O Occurs once. S Occurs sporadically at irregular intervals. R Occurs on a regular basis and at regular intervals. C Continuous. **Reversibility:** R Reversible. I Irreversible.	**Ecological Context:** Undeveloped: Area relatively pristine or not adversely affected by human activity. Developed: Area has been substantially disturbed by human development or human development is still present. **N/A** Not Applicable. **Significance:** S Significant. N Not Significant.

Table A-21: Assessment of Effects to Pacific Salmon

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics: Adverse or Positive Effect	Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Environmental Context	Significance	Recommended Follow-up and Monitoring
HABITAT LOSS OR ALTERATION: ***Project activities have the potential to change water quality due to disturbance of marine sediments, and will reduce or alter subtidal and intertidal fish habitat***									
Construction									
In water construction of Marine Berth Infrastructure (dredging, infilling, caisson placement, perimeter berm construction, vibro-densification, decking, interface with land, CN line extensions)	▪ EMP ▪ Work scheduling ▪ Bubble curtains	A	L	L	ST/O	I	D	N	Construction monitoring for water quality
Equipment and supply marine transportation (barge/vessel)	▪ EMP	A	L	L	ST/S	R	D	N	None
Operation									
Vessel physically connected to a berthing tug and/or the berthing facility Tug operation while berthing	▪ EMP	A	L	S	ST/R	R	D	N	None
Decommissioning and Reclamation									
Decommissioning and reclamation of the container terminal and rail	▪ To be determined at the time of decommissioning	N/A	N/A	N/A	N/A	N/A	N/A	N/A	To be determined at the time of decommissioning
ACOUSTIC DISTURBANCE: ***Construction activities and increased vessel traffic have the potential to alter the underwater acoustic environment***									
Construction									
In-water construction of marine berth Infrastructure (dredging, infilling, caisson placement, perimeter berm construction, vibro-densification, decking, interface with land)	▪ EMP ▪ Work scheduling ▪ Bubble curtains	A	M	L	ST/S	R	D	N	None
Operation									

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics: Adverse or Positive Effect	Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Environmental Context	Significance	Recommended Follow-up and Monitoring
Vessel physically connected to a berthing tug and/or the berthing facility Tug operation while berthing	▪ EMP	A	L	S	LT/R	R	D	N	None
Terminal and rail facility operations	▪ EMP	A	L	S	LT/R	R	D	N	None
Decommissioning and Reclamation									
Decommissioning and reclamation of the container Terminal	▪ To be determined at the time of decommissioning	N/A	N/A	N/A	N/A	N/A	N/A	N/A	To be determined at the time of decommissioning
MORTALITY: ***Project activities have the potential to cause indirect or direct mortality***									
Construction									
In water construction of Marine Berth Infrastructure (dredging, infilling, caisson placement, perimeter berm construction, vibro-densification, decking, interface with land, CN line extensions)	▪ EMP • Work scheduling • Bubble curtains	A	L	S	ST/O	I	D	N	Construction monitoring for water quality
Cumulative Effects (Fairview Phase I, Northlands Terminal, Atlin Terminal, Ridley Island Coal, Prince Rupert Grain, ICEC Terminals, Port shipping activities, Houston Pellet Inc., Canpotex, Ridley road/rail, Aero Point Ferry, Mt. McDonald Wind, Naikun Wind)									
Changes in Habitat Quality	▪ EMP ▪ Work scheduling	A	L	L	ST/O	R	D	N	Construction monitoring for water quality
Sensory Disturbance	▪ EMP	A	M	R	LT/C	R	D	N	None

Mitigation:

- **Environmental Management Plan (EMP):** see table 13-3
- **Establish work scheduling to reduce effects on salmon at all life stages:** see table 13-4
- **Bubble curtains:** A wall of bubbles produced underwater from an air hose deployed for the duration of piling activity.

KEY

Magnitude:

N Negligible: No measurable adverse effects to the Marine Environment.

L Low: Temporary disturbance within the LSA with no permanent loss or degradation of habitat. No permanent effects on the abundance or distribution of the KIR population or its population parameters.

M Moderate: Permanent disturbance within the LSA with limited loss or degradation of habitat. Abundance and/or distribution of the KIR population within the LSA may change over one generation. Effects will be offset through mitigation and/or compensation measures.

H High: Permanent disturbance or alteration within the LSA or RSA. Effects may be associated with a decline in the abundance or distribution of the KIR population which will not be offset through mitigation and/or compensation measures. Natural recruitment will not re-establish the population to its original level in one or more generations.

Geographic Extent:

S Site-specific: Effects are restricted to the Project site (i.e. Project footprint).

L Local: Effects extend beyond the Project site but remain localized within the LSA.

R Regional: Effects extend to the RSA.

Duration:

ST Short term: Effects are measurable for < 2 years.

MT Medium term: Effects are measurable for 2 to 20 years.

LT Long term: Effects are measurable for > 20 years.

P Permanent: Effects are permanent.

Frequency:

O Occurs once.

S Occurs sporadically at irregular intervals.

R Occurs on a regular basis and at regular intervals.

C Continuous.

Reversibility:

R Reversible.

I Irreversible.

Ecological Context:

Undeveloped: Area relatively pristine or not adversely affected by human activity.

Developed: Area has been substantially disturbed by human development or human development is still present.

Significance:

S Significant.

N Not Significant.

N/A Not Applicable.

Table A-22: Assessment of Effects to Humpback Whales

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics: Adverse or Positive Effect	Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Environmental Context	Significance	Recommended Follow-up and Monitoring
HABITAT LOSS OR ALTERATION: ***Project activities have the potential to affect water and sediment quality in humpback whale habitat due to site runoff and disturbance of marine sediments.***									
Construction									
In water construction of Marine Berth Infrastructure (dredging, ocean disposal, infilling, caisson placement, perimeter berm construction, vibro-densification, decking, interface with land)	▪ EMP	A	L	S	ST/S	R	D	N	Water and sediment quality monitoring
Equipment and supply marine transportation (barge/vessel)	▪ EMP	A	L	L	ST/S	R	D	N	None
Operation									
Maintenance & repairs to dock facilities, terminal and rail	▪ EMP	A	L	S	ST/S	R	D	N	None
Terminal and rail facility operations	▪ EMP	A	L	S	ST/S	R	D	N	None
Decommissioning and Reclamation									
Decommissioning and reclamation of the container terminal and rail	▪ To be determined at the time of decommissioning	N/A	N/A	N/A	N/A	N/A	N/A	N/A	To be determined at the time of decommissioning
SENSORY DISTURBANCE: ***In-water and near-water Project activities will produce underwater sound that has the potential to disturb humpback whales.***									
Construction									
In water construction of Marine Berth Infrastructure (dredging, ocean disposal, infilling, caisson placement, perimeter berm construction, vibro-densification, decking, interface with land)	▪ Safety zone ▪ Marine mammal observers ▪ EMP	A	M	L	ST/S	R	D	N	Marine mammal monitoring during loud activities (dredging, pile driving)
Equipment and supply marine transportation (barge/vessel)	▪ EMP	A	L	L	ST/S	R	D	N	

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics: Adverse or Positive Effect	Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Environmental Context	Significance	Recommended Follow-up and Monitoring
Operation									
Vessel physically connected to a berthing tug and/or the berthing facility	▪ EMP	A	L	L	LT/R	R	D	N	Annual Marine Mammal Surveys Marine Mammal Reporting Program
Decommissioning and Reclamation									
Decommissioning and reclamation of the container Terminal and rail	▪ To be determined at the time of decommissioning	N/A	N/A	N/A	N/A	N/A	N/A	N/A	To be determined at the time of decommissioning
DIRECT MORTALITY: ***Collisions between vessels and humpback whales have the potential to cause injury or direct mortality***									
Construction									
Equipment and supply marine transportation (barge/vessel)	• EMP	A	M	S	ST/S	I	D	N	Marine Mammal Reporting Program
Operation									
Vessel physically connected to a berthing tug and/or the berthing facility	▪ EMP	A	M	S	ST/R	I	D	N	Annual Marine Mammal Surveys Marine Mammal Reporting Program
Decommissioning and Reclamation									
Decommissioning and reclamation of the container Terminal and rail	▪ To be determined at the time of decommissioning	N/A	N/A	N/A	N/A	N/A	N/A	N/A	To be determined at the time of decommissioning
Cumulative Effects (Fairview Phase I, Northlands Terminal, Atlin Terminal, Ridley Island Coal, Prince Rupert Grain, ICEC Terminals, Port shipping activities, Houston Pellet Inc., Canpotex, Ridley road/rail, Aero Point Ferry, Mt. McDonald Wind, Naikun Wind)									
Sensory disturbance	• EMP	A	M	R	LT/C	R	D	N	Annual Marine Mammal Surveys Marine Mammal Reporting Program

Mitigation:

- **Environmental Management Plan (EMP):** see table 13-3
- **Safety Zone:** DFO has established a 500 m safety radius around all seismic activities and therefore a similar radius will be established based on the construction activities of the Project in consultation with DFO. In the event that a humpback does come within the safety zone during loud construction activities, the activity will be halted until the animal moves outside the safety zone.
- **Marine Mammal Observer:** Marine mammal observers (MMO's) will be on-site during loud construction activities to monitor the safety zone

KEY **Magnitude:** N Negligible: No measurable adverse effects to the Marine Environment. L Low: Temporary disturbance within the LSA with no permanent loss or degradation of habitat. No permanent effects on the abundance or distribution of the KIR population or its population parameters. M Moderate: Permanent disturbance within the LSA with limited loss or degradation of habitat. Abundance and/or distribution of the KIR population within the LSA may change over one generation. Effects will be offset through mitigation and/or compensation measures. H High: Permanent disturbance or alteration within the LSA or RSA. Effects may be associated with a decline in the abundance or distribution of the KIR population which will not be offset through mitigation and/or compensation measures. Natural recruitment will not re-establish the population to its original level in one or more generations.	**Geographic Extent:** S Site-specific: Effects are restricted to the Project site (i.e. Project footprint). L Local: Effects extend beyond the Project site but remain localized within the LSA. R Regional: Effects extend to the RSA. **Duration:** ST Short term: Effects are measurable for < 2 years. MT Medium term: Effects are measurable for 2 to 20 years. LT Long term: Effects are measurable for > 20 years. P Permanent: Effects are permanent.	**Frequency:** O Occurs once. S Occurs sporadically at irregular intervals. R Occurs on a regular basis and at regular intervals. C Continuous. **Reversibility:** R Reversible. I Irreversible.	**Ecological Context:** Undeveloped: Area relatively pristine or not adversely affected by human activity. Developed: Area has been substantially disturbed by human development or human development is still present. **Significance:** S Significant. N Not Significant. **N/A** Not Applicable.

Table A-23: Assessment of Effects to Harbour Porpoises

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics: Adverse or Positive Effect	Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Environmental Context	Significance	Recommended Follow-up and Monitoring
HABITAT LOSS OR ALTERATION: ***Project activities have the potential to affect water and sediment quality in harbour porpoise habitat due to site runoff and disturbance of marine sediments.***									
Construction									
In water construction of Marine Berth Infrastructure (dredging, ocean disposal, infilling, caisson placement, perimeter berm construction, vibro-densification, decking, interface with land)	▪ EMP ▪ Bubble curtains used where appropriate	A	L	S	ST/S	R	D	N	Water and sediment quality monitoring
Equipment and supply marine transportation (barge/vessel)	▪ EMP	A	L	L	ST/S	R	D	N	None
Operation									
Maintenance and repairs to dock facilities and terminal	▪ EMP	A	L	S	ST/S	R	D	N	None
Terminal and rail facility operations	▪ EMP	A	L	S	ST/S	R	D	N	None
Decommissioning and Reclamation									
Decommissioning and reclamation of the container terminal and rail	▪ To be determined at the time of decommissioning	N/A	N/A	N/A	N/A	N/A	N/A	N/A	To be determined at the time of decommissioning
SENSORY DISTURBANCE: ***In-water and near-water Project activities will produce underwater sound that has the potential to disturb harbour porpoises.***									
Construction									
In water construction of Marine Berth Infrastructure (dredging, ocean disposal, infilling, caisson placement, perimeter berm construction, vibro-densification, decking, interface with land)	▪ EMP ▪ Marine Mammal Observer ▪ Bubble curtains	A	M	L	ST/S	R	D	N	Marine mammal monitoring during loud activities (dredging, pile driving)
Equipment and supply marine	▪ EMP	A	L	L	ST/S	R	D	N	

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics: Adverse or Positive Effect	Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Environmental Context	Significance	Recommended Follow-up and Monitoring
transportation (barge/vessel)	▪ Safety Zone								
Operation									
Tug operation during berthing procedures Vessel physically connected to a berthing tug and/or the berthing facility	▪ EMP ▪ Safety Zone	A	L	L	LT/R	R	D	N	Marine Mammal Reporting Program Annual Marine Mammal Surveys
Decommissioning									
Decommissioning and reclamation of the container terminal and rail	▪ To be determined at the time of decommissioning	N/A	N/A	N/A	N/A	N/A	N/A	N/A	To be determined at the time of decommissioning
DIRECT MORTALITY: ***Collisions between vessels and harbour porpoises have the potential to cause injury or direct mortality***									
Construction									
Equipment and supply marine transportation (barge/vessel)	▪ EMP ▪ Bubble curtains	A	M	S	ST/S	I	D	N	Marine Mammal Reporting Program
Operation									
Vessel physically connected to a berthing tug and/or the berthing facility	▪ EMP	A	M	S	ST/R	I	D	N	Marine Mammal Reporting Program Annual Marine Mammal Surveys
Decommissioning and Reclamation									
Decommissioning and reclamation of the container terminal and rail	▪ To be determined at the time of decommissioning	N/A	N/A	N/A	N/A	N/A	N/A	N/A	To be determined at the time of decommissioning
Cumulative Effects (Fairview Phase I, Northlands Terminal, Atlin Terminal, Ridley Island Coal, Prince Rupert Grain, ICEC Terminals, Port shipping activities, Houston Pellet Inc., Canpotex, Ridley road/rail, Aero Point Ferry, Mt. McDonald Wind, Naikun Wind)									
Sensory Disturbance	• EMP	A	M	R	LT/C	R	D	N	Annual Marine Mammal Surveys

Mitigation:

- **Environmental Management Plan (EMP):** see table 13-3
- **Safety Zone:** DFO has established a 500 m safety radius around all seismic activities and therefore a similar radius will be established based on the construction activities of the Project in consultation with DFO. In the event that a humpback does come within the safety zone during loud construction activities, the activity will be halted until the animal moves outside the safety zone.
- **Marine Mammal Observer:** Marine mammal observers (MMO's) will be on-site during loud construction activities to monitor the safety zone.

KEY **Magnitude:**	**Geographic Extent:**	**Frequency:**	**Ecological Context:**
N Negligible: No measurable adverse effects to the Marine Environment. L Low: Temporary disturbance within the LSA with no permanent loss or degradation of habitat. No permanent effects on the abundance or distribution of the KIR population or its population parameters. M Moderate: Permanent disturbance within the LSA with limited loss or degradation of habitat. Abundance and/or distribution of the KIR population within the LSA may change over one generation. Effects will be offset through mitigation and/or compensation measures. H High: Permanent disturbance or alteration within the LSA or RSA. Effects may be associated with a decline in the abundance or distribution of the KIR population which will not be offset through mitigation and/or compensation measures. Natural recruitment will not re-establish the population to its original level in one or more generations.	S Site-specific: Effects are restricted to the Project site (i.e. Project footprint). L Local: Effects extend beyond the Project site but remain localized within the LSA. R Regional: Effects extend to the RSA. **Duration:** ST Short term: Effects are measurable for < 2 years. MT Medium term: Effects are measurable for 2 to 20 years. LT Long term: Effects are measurable for > 20 years. P Permanent: Effects are permanent.	O Occurs once. S Occurs sporadically at irregular intervals. R Occurs on a regular basis and at regular intervals. C Continuous. **Reversibility:** R Reversible. I Irreversible.	Undeveloped: Area relatively pristine or not adversely affected by human activity. Developed: Area has been substantially disturbed by human development or human development is still present. **Significance:** S Significant. N Not Significant. **N/A** Not Applicable.

Table A-24: Assessment of Effects on Socio-economic Conditions

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics						Recommended Follow-up and Monitoring
		Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Environmental Context	Significance	
LOSS OF INFORMAL RECREATIONAL LANDS								
Construction								
In water construction of Marine Berth Infrastructure (dredging, ocean disposal, infilling, caisson placement, perimeter berm construction, vibro-densification, decking, interface with land) On-shore site preparation (clearing, grubbing, blasting, rock cut, filling, grading) Construction and installation of on-shore components (drainage system, landslide containment, intermodal yard, container yard, buildings, ancillary facilities, lighting, roads, sidings and wye)	Communication (e.g., signage, public notice) in advance of Project construction regarding restricted access to Project lands.	N	S	MT/C	R	D	N	None
Operations								
Terminal and rail facility operations	Communication (e.g., signage, public notice) in advance of Project construction regarding restricted access to Project lands.	L	S	LT/C	R	D	N	None
Decommissioning and Reclamation								
Decommissioning and reclamation of the container terminal and rail	Communication (e.g., signage, public notice) in advance of Project construction regarding restricted access to Project lands.	N	S	LT/O	R	D	N	None

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics: Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Environmental Context	Significance	Recommended Follow-up and Monitoring
DEVELOPMENT OF LANDS FOR INTENDED PURPOSES								
Construction								
In water construction of Marine Berth Infrastructure (dredging, ocean disposal, infilling, caisson placement, perimeter berm construction, vibro-densification, decking, interface with land) On-shore site preparation (clearing, grubbing, blasting, rock cut, filling, grading) Construction and installation of on-shore components (drainage system, landslide containment, intermodal yard, container yard, buildings, ancillary facilities, lighting, roads, sidings and wye)	None (positive effect predicted)	M	R	LT/C	R	D	N/P	None
Operations								
Terminal and rail facility operations	None (positive effect predicted)	M	R	LT/C	R	D	N/P	None
Decommissioning and Reclamation								
Decommissioning and reclamation of the container terminal and rail	None	M	R	MT/C	R	D	N	None
Cumulative Effects (e.g., Fairview Terminal Phase I, Northlands and Atlin Terminal, Ridley Island Coal Terminal, Ridley Island Log Sort, Prince Rupert Grain Terminal, ICEC Terminals Company Ltd., Sun Wave Forest Products, Port Shipping Activities (Westview, Lightering, Ocean Docks), Houston Pellet Inc. Transfer Facility, Canpotex Potash Export Terminal, Ridley Island Road, Rail and Utility Corridor, Aero Point Ferry Terminal, Mount Hays Wind Farm Project, Prince Rupert Container Examination Facility, Mount McDonald Wind Power Project, NaiKun Wind Energy Project (sea cable landfall)								
Loss of Informal Recreational Lands	None	L	R	LT/C	R	D	N	None
Development of Land for Intended Use	Development of lands to meet expectations of PRPA Land Use Plan and maximize cumulative benefit of regional development.	M	R	LT/C	R	D	N/P	None

Mitigation:

- **C**ommunication (e.g., signage, public notice) in advance of Project construction regarding restricted access to Project lands.
- Contribution (e.g., funding/in-kind support) to local recreation infrastructure (e.g., Thousand Steps Trail Park and/or proposed Kaien Island trail.
- Defining the goal for and location of informal and formal recreational lands within the reclamation plan.
- Development of lands to meet expectations of PRPA Land Use Plan and maximize cumulative benefit of regional development.

KEY

Magnitude:

N Negligible: No measurable effects to socio-economic conditions.
L Low: Socio-economic Conditions are affected for a small portion of a local population.
M Moderate: Socio-economic Conditions are affected for a moderate portion of the local population.
H High: Socio-economic Conditions are affected for a moderate or high portion of the regional population.

Geographic Extent:

S Site-specific: Environmental effects restricted to the Project site (i.e., Project footprint)
L Local: Environmental effects extend beyond the Project footprint but remain localized within the LSA
R Regional: Environmental effects extend beyond the LSA to the RSA

Duration:

ST Short term: Less than six months.
MT Medium term: Up to two years.
LT Long term: Until decommissioning of the facility (i.e., Project life).
P Permanent: Extend beyond Project decommissioning.

Frequency:

O Occurs once.
S Occurs sporadically at irregular intervals.
R Occurs on a regular basis and at regular intervals.
C Continuous.

Reversibility:

R Reversible.
I Irreversible.

Socio-Economic Context:

U Undeveloped: Area relatively or not substantially affected by human activity.
D Developed: Area has been substantially previously developed.

Significance:

S Significant.
N Not Significant.
P Positive.

N/A Not Applicable.

Table A-25: Assessment of Effects on Identified Archaeological and Heritage Resources

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics						Recommended Follow-up and Monitoring
		Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Environmental Context	Significance	
LOSS OR DESTRUCTION OF ARCHAEOLOGICAL AND HERITAGE RESOURCES: ***e.g., Displacement of middens, canoe runs, CMTs, or destruction of historical buildings***								
Construction								
In water construction activities (intertidal) of Marine Berth Infrastructure (infilling, perimeter berm construction, interface with land) On-shore site preparation (clearing, grubbing) Construction and installation of on-shore components (drainage system, landslide containment, intermodal yard, container yard, buildings, ancillary facilities, lighting, roads, sidings and wye) On-shore concrete production	▪ Detailed mitigation will be determined through the Archaeological Side Table	L-M	S	ST/O	I	D	N	None required unless undiscovered resources are identified during the Construction phase
Operations								
Routine ditch maintenance along sidings and wye	▪ Detailed mitigation will be determined through the Archaeological Side Table	L	S	ST/S	I	D	N	None required unless undiscovered resources are identified during the Operation phase
Decommissioning								
N/A	N/A							
Cumulative Effects (Fairview Terminal Phase I, Development of Prince Rupert (City and Port) and associated infrastructure e.g. road and rail, US World War II military fortifications (Fort Barrett, Fort Casey, and associated military buildings, structures and docks within Prince Rupert harbour), Ridley Island Coal Terminal, Ridley Island Log Sort, Prince Rupert Grain Terminal, Sun Wave Forest Products								
Loss or destruction of Archaeological and Heritage Resources	▪ Detailed mitigation will be determined through the	L-M	S	ST/O	I	D	N	None required unless undiscovered resources are

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics: Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Environmental Context	Significance	Recommended Follow-up and Monitoring
	Archaeological Side Table							identified during the Construction phase

Mitigation:

KEY

Magnitude:

- N Negligible: No measurable adverse effects to archaeological or heritage resources.
- L Low: Loss of a minor proportion of data at site, local or regional levels; after impact, interpretive capacity of the remains is virtually intact, limited only by the loss of minor items and/or features.
- M Moderate: A proportion of the data at the site, local or regional level is lost but a significant proportion remains unimpaired; after a moderate impact, the interpretive capacity of the remains is hindered by loss of basic data about cultural descriptions and lifestyles.
- H High: A significant proportion of data at the site, local or regional level is lost; interpretive capacity of the remains following impact is minimal.

Geographic Extent:

- S Site-specific: Effects limited to the Project footprint.
- L Local: Effects extend to within 2 km of the Project footprint.
- R Regional: effects extend beyond 2 km from the Project footprint.

Duration:

- ST Short term: No measurable effects are anticipated beyond construction.
- MT Medium term: Measurable effects are anticipated beyond construction but not beyond 2 years.
- LT Long term: Measurable effects are anticipated beyond 2 years.
- P Permanent: Effects are permanent.

Frequency:

- O Occurs once during construction.
- S Occurs sporadically at irregular intervals during construction.
- R Occurs on a regular basis and at regular intervals during construction.
- C Continuous throughout all Project phases.

Reversibility:

- R Reversible: Effects are reversible with mitigation (e.g., data and interpretive capacity are preserved)
- I Irreversible: Effects are permanent and cannot be reversed with mitigation or rehabilitation

Ecological Context:

- U Undeveloped: Area relatively pristine or not adversely affected by human activity.
- D Developed: There is evidence of existing negative environmental effects.

Significance:

- S Significant.
- N Not Significant.

N/A Not Applicable.

Table A-26: Assessment of Effects on Traditional Current Use by Aboriginal Persons

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics: Adverse or Positive Effect	Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Environmental Context	Significance	Recommended Follow-up and Monitoring
Effect #1 – Changes to Current Traditional Use Patterns (*i.e., Project Located within Land Claim Area*, *Changes to Access and Quality of Traditional Land and Marine Resources, Aboriginal Culturally Significant Areas*)									
Construction									
In water construction of Marine Berth Infrastructure (dredging, ocean disposal, infilling, caisson placement, perimeter berm construction, vibro-densification, decking, interface with land)	▪ Provide Aboriginal Groups with regular updates on activities and progress ▪ Provide environmental awareness training for all personnel ▪ Implement environmental protection/management plan and emergency response procedures ▪ Post public notices as necessary to inform motorists/boaters of construction work ▪ Ensure Aboriginal Groups are aware of established marine/fishing exclusion zones	A	M	S	MT/C	R	D	N	No specific monitoring or follow-up
Equipment and supply marine transportation (barge / vessel)	▪ As above (in-water construction) ▪ Schedule vessel arrival/departure times outside known times of traditional use	A	M	L	MT/C	R	D	N	
Equipment and supply by land transport (rail / road)	▪ As above (in-water construction)	A	M	L	MT/C	R	D	N	
On-shore site preparation (clearing, grubbing, blasting, rock cut, filling, grading)	▪ As above (in-water construction)	A	M	S	MT/C	R	D	N	

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics: Adverse or Positive Effect	Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Environmental Context	Significance	Recommended Follow-up and Monitoring
Construction and installation of on-shore components (drainage system, landslide containment, intermodal yard, container yard, buildings, ancillary facilities, lighting, roads, sidings and wye)	▪ As above (in-water construction)	A	M	S	MT/C	R	D	N	
On-shore concrete production	▪ Provide environmental awareness training for all personnel ▪ Implement environmental protection/management plan and emergency response procedures	A	M	S	MT/S	R	D	N	
Site waste management	▪ All waste to be placed in proper containers and regularly removed for disposal ▪ Procedures for waste management included in EMP	A	M	S	MT/C	R	D	N	
Vehicular traffic on Terminal site	▪ Inform communities/public of plans ▪ Post speed limits ▪ Post public notices as necessary to inform motorists of construction work ahead	A	M	S	MT/C	R	D	N	
Operation									
Vessel physically connected to a berthing tug and/or the berthing facility	▪ Same as for construction mitigation	A	M	L	LT/R	R	D	N	No specific monitoring or follow-up
Container unloading	▪ Same as for construction mitigation	A	L	S	LT/R	R	D	N	
Tug operation while berthing	▪ Same as for construction mitigation	A	M	S	LT/R	R	D	N	
Terminal and rail facility operations	▪ Same as for construction mitigation	A	L	S	LT/C	R	D	N	
Maintenance & repairs to dock facilities, Terminal and rail	▪ Same as for construction mitigation	A	L	S	ST/S	R	D	N	

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics: Adverse or Positive Effect	Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Environmental Context	Significance	Recommended Follow-up and Monitoring
Vehicular traffic on Terminal site	▪ Same as for construction mitigation	A	L	S	LT/C	R	D	N	
Stormwater management	▪ Same as for construction mitigation	A	L	S	LT/C	R	D	N	
Waste management	▪ Same as for construction mitigation	A	L	S	LT/C	R	D	N	
Decommissioning and Reclamation									
Decommissioning and reclamation of the container Terminal and rail	▪ To be determined at the time of decommissioning	P	M	L	MT/C	R	D	N	To be determined at the time of decommissioning
Cumulative Effects (e.g., Fairview Terminal Phase I, Northlands and Atlin Terminal, Ridley Island Coal Terminal, Ridley Island Log Sort, Prince Rupert Grain Terminal, ICEC Terminals Company Ltd., Sun Wave Forest Products, Port Shipping Activities (Westview, Lightering, Ocean Docks), Houston Pellet Inc. Transfer Facility, Canpotex Potash Export Terminal, Ridley Island Road, Rail and Utility Corridor, Aero Point Ferry Terminal, Mount Hays Wind Farm Project, Prince Rupert Container Examination Facility, Mount McDonald Wind Power Project, NaiKun Wind Energy Project (sea cable landfall)									
Changes to Current Traditional Use Patterns	▪ Same as for construction mitigation	A	L-H	L	MT-LT/S-C	R	D	N	No specific monitoring or follow-up

KEY

Magnitude:
- N Negligible: No measurable adverse effects to traditional current use anticipated.
- L Low: Aboriginal communities and land use are affected or subject to change for a period less than one year.
- M Moderate: Aboriginal communities and land use are affected or subject to change for an extended period of time longer than one year, but less than the life of the Project.
- H High: Aboriginal communities and land use are affected or subject to change for the life of the Project.

Geographic Extent:
- S Site-specific: Environmental effects restricted to the Project site (i.e., Project footprint).
- L Local: Environmental effects extend beyond the Project footprint but remain localized within the LSA.
- R Regional: Environmental effects extend beyond the LSA to the RSA

Duration:
- ST Short term: Effects are measurable for <6 months.
- MT Medium term: Effects are measurable for 6 months 36 months.
- LT Long term: Effects are measurable for >36 months.
- P Permanent: Effects are permanent.

Frequency:
- O Occurs once.
- S Occurs sporadically at irregular intervals.
- R Occurs on a regular basis and at regular intervals.
- C Continuous.

Reversibility:
- R Reversible: Effects are reversible with mitigation and/or rehabilitation (e.g., the ability of the traditional use resource to recover)
- I Irreversible: Effects are permanent and cannot be reversed with mitigation or rehabilitation

Environmental Context:
- U Undeveloped: Area relatively or not adversely affected by human activity.
- D Developed: Area has been substantially previously disturbed by human development or human development is still present

Significance:
- S Significant
- N Not Significant

N/A Not Applicable

Table A-27: Assessment of Effects on Country Food

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics: Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Environmental Context	Significance	Recommended Follow-up and Monitoring
Change in availability/accessibility of Country Foods and Contamination of Country Foods								
Construction								
On-shore site preparation (clearing, grubbing, blasting, rock cut, filling, grading) On-shore concrete production Site waste management Vehicular traffic on terminal site	▪ See mitigation measures for Wildlife and Wildlife Habitat (Section 10), Avifauna Resources (Section 11), Vegetation Resources (Section 9), Marine Environment (Section 13), Freshwater Environment (Section 12) ▪ Stakeholder communications with respect to site access restrictions	M	L	LT/O	R	D	N	▪ Restoration and compensation ▪ Monitoring/EMP ▪ Follow-up program
Operations								
Terminal and rail facility operations Maintenance and repairs to dock facilities, terminal and rail Stormwater management	See mitigation measures for Wildlife and Wildlife Habitat (Section 10), Avifauna Resources (Section 11), Vegetation Resources (Section 9), Marine Environment (Section 13), Freshwater Environment (Section 12)	L	L	LT/R	R	D	N	N/A
Decommissioning and Reclamation								
Decommissioning and reclamation of the container terminal and rail	• See mitigation measures for Wildlife and Wildlife Habitat (Section 10), Avifauna Resources (Section 11), Vegetation Resources (Section 9), Marine Environment (Section 13), Freshwater Environment (Section 12) • Stakeholder communications with respect to site access restrictions	L	S	ST/O	R	D	N	▪ Monitoring/EMP ▪ Follow-up program
Cumulative Effects (Fairview Terminal (Phase I), Northlands Terminal, Atlin Terminal, Ridley Island Coal Terminal, Ridley Island Log Sort, Prince Rupert Grain								

Potential Residual Environmental Effects	Proposed Mitigation and Compensation Measures	Residual Environmental Effects Characteristics: Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Environmental Context	Significance	Recommended Follow-up and Monitoring
Terminal, ICEC Terminals Company Ltd., Sun Wave Forest Products, Port Shipping Activities, Aero Point Ferry Terminal)								
Change in Availability and Access to Country Foods Contamination of Country Foods	See mitigation measures for Wildlife and Wildlife Habitat (Section 10), Avifauna Resources (Section 11), Vegetation Resources (Section 9), Marine Environment (Section 13), Freshwater Environment (Section 12)	L-M	R	MT/O	I/R	D	N	▪ Monitoring/EMP – during construction and operation ▪ Follow-up program

KEY

Magnitude:

- N Negligible: No measurable adverse effects to Country Food anticipated.
- L Low: Effect occurs, which may or may not be measurable, but is within the range of natural variability.
- M Moderate: Effect occurs, but is unlikely to pose a serious risk to sensitive elements or present a management challenge.
- H High: Effect is likely to pose a serious risk to sensitive elements or present a management challenge.

Geographic Extent:

- S Site-specific: Environmental effects restricted to the Project site (i.e., Project footprint).
- L Local: Environmental effects extend beyond the Project footprint but remain localized within the LSA.
- R Regional: Environmental effects extend beyond the LSA to the RSA.

Duration:

- ST Short term: Effects are measurable for <2 years.
- MT Medium term: Effects are measurable for 2 to 20 years.
- LT Long term: Effects are measurable for >20 years.
- P Permanent: Effects are permanent.

Frequency:

- O Occurs once.
- S Occurs sporadically at irregular intervals.
- R Occurs on a regular basis and at regular intervals.
- C Continuous.

Reversibility:

- R Reversible: Effects are reversible with mitigation and/or rehabilitation (e.g., the ability of the Country Food to recover).
- I Irreversible: Effects are permanent and cannot be reversed with mitigation or rehabilitation.

Ecological Context:

- U Undeveloped: Area relatively or not adversely affected by human activity.
- D Developed: Area has been substantially previously disturbed by human development or human development is still present.

Significance:

- S Significant.
- N Not Significant.

N/A Not Applicable.

Table A-28: Potential Interactions of Project Related Accidents and Malfunctions with Valued Environmental Components

Project Activities and Physical Works	Air Quality	Noise	Light	Vegetation Resources	Wildlife and Wildlife Habitat	Avifauna	Freshwater Environment	Marine Environment	Socio-economic Environment	Human Health and Safety	Archaeology and Heritage	Current Use by Aboriginal Persons	Country Food Resources
Hazardous materials spill (including fuel, oil, hydraulic fluid, concrete) or ignition of spilled fuel	2	0	0	1	1	2	2	2	1	1	2	2	2
Spill of containerized material on land or in water	0	0	0	1	1	2	2	2	1	1	2	2	2
Train Derailment at the Skeena River	0	0	0	1	1	1	2	2	1	1	2	2	0

NOTES:

0 = No interaction

1 = Interaction occurs; however, based on experience and professional judgment, the interaction would not result in a significant environmental effect, even if environmental protection measures (mitigation) are not applied

2 = Interaction may result in a significant environmental effect, considered in EIS

APPENDIX B

ENVIRONMENTAL MANAGEMENT PLANS

TABLE OF CONTENTS

Preamble

Reference: Environmental Management Plan for the Fairview Terminal Phase II Expansion Project, including Kaien Siding, Prince Rupert, BC

Please see below for a draft annotated table of contents summarizing the material proposed to be included in an Environmental Management Plan (EMP) for the Fairview Terminal Phase II Expansion Project (the Project). The intention is that all federal and provincial environmental obligations, together with associated environmental procedures and plans, will be rolled up into a single EMP document for ease of reference and implementation. The final EMP will be developed using a phased approach that corresponds with major phases of Project development, as well as associated permitting and other commitments. In accordance with the Project schedule, the EMP will be revised for each of the following phases:

1. **Terminal and Rail Construction**

   This phase will entail construction of all land-based Project components, including infilling, wharf construction, container yard, on and off-site rail works, site services, and terminal buildings. Commissioning of the terminal will also be completed within this phase.

   a. **Dredging and Disposal at Sea**

      Construction of the expanded terminal will require dredging to remove soft seabed deposits prior to installation of the caisson berth structure and perimeter containment berm, and to accommodate placement and performance of imported mattress and berm rock fills. This stage will also include the disposal at sea of dredged seabed materials. Disposal at sea is not planned to take place until at least 2016; details will be provided in an updated EMP at that time.

2. **Terminal and Rail Operation**

   Following Project construction and commissioning, this phase comprises all operation and maintenance activities throughout the lifespan of the Project.

The following is an outline of content to be included in the EMP for Terminal and Rail Construction. Ultimately two EMPs may be developed for each phase, one for the PRPA and one for CN. The final EMP will include all of the mitigation measures specified in the Comprehensive Study Report and Information Request documents. The list of Project commitments is currently provided in Table 9-1 of the Comprehensive Study Report.

1 DOCUMENT CONTROL

Identified EMP Holders will have controlled copies of the document at the point of original issue and will subsequently receive revisions as they occur. A Revision Control Record will be used to track any revisions made to each section and subsection of the EMP.

1.1 Controlled Copy Distribution Record

1.2 Revision Procedure and Revision Control Record

This section will provide details on the process and schedule for updating the EMP.

2 INTRODUCTION

This section will provide background information about the EMP and the Project, including an overview of PRPA and CN commitments with respect to environmental protection; the regulatory context; the purpose, scope, and organization of the EMP; and procedures for EMP maintenance.

2.1 Purpose of the EMP

2.2 Commitment to Environment, Health and Safety

2.2.1 PRPA

2.2.2 CN

2.3 Regulatory Background

2.4 Scope of the EMP / Project Description

This section will include Project Location, Terminal Layout and Rail figures.

2.5 Organization of the EMP

2.6 Maintenance of the EMP

3 RESPONSIBILITIES, TRAINING AND COMMUNICATION

This section will outline the roles and responsibilities of PRPA, CN and Contractor personnel with respect to environmental management of the Project, as well as requirements for a training/orientation program to ensure that all personnel working on the Project are familiar with the EMP and the procedures described therein.

3.1 Roles and Responsibilities

3.2 Training and Orientation

3.2.1 Environmental Orientation Training

3.2.2 Additional Training

3.3 Communication

4 SUMMARY OF KEY ENVIRONMENTAL ISSUES AND ENVIRONMENTALLY SENSITIVE AREAS

The primary purpose of the EMP will be to eliminate or reduce environmental damage caused by the Project. This section will flag key issues and areas of special environmental consideration for which impacts will be reduced through implementation of procedures contained in the EMP. A site map indicating key sensitive environmental features will be included; however, this mapping will not be intended to be exhaustive. For each of the following subsections, key resources will be identified and potential Project interactions will be summarized.

4.1 Freshwater Environment

This section will include information on ensuring that works do not contravene the *Fisheries Act* (i.e., Section 36(3) – deleterious substances).

4.2 Marine Environment

This section will include information on ensuring that works do not contravene the Fisheries Act (i.e., Section 36(3) – deleterious substances).

4.3 Disposal at Sea

This section will include information on ensuring that disposal at sea activities are carried out in accordance with the conditions of the Disposal at Sea permit issued under the Canadian Environmental Protection Act, and in accordance with the Disposal at Sea Regulations. Information provided will link to information provided in the Dredge Material Disposal Environmental Protection Procedure (Section 5.5).

4.4 Wildlife and Wildlife Habitat

4.5 Avifauna

This section will include avoidance of bird breeding season to comply with the *Migratory Birds Convention Act* and the BC *Wildlife Act*.

4.6 Archaeological and Heritage Resources

This section will include information from the Archaeological Impact Assessments completed by Millennia Research Ltd. This section will also include details as provided in the Archaeological Mitigation Report being prepared by the Archaeological Side Table.

4.7 Current Traditional Use by Aboriginal Persons

4.8 Noise and Vibration

5 ENVIRONMENTAL PROTECTION PROCEDURES AND PLANS FOR CONSTRUCTION PHASE

This section will provide concise and clear instructions regarding procedures for protecting the environment and minimizing potential environmental effects associated with Project construction. The EMP will be a living document that is revised as necessary to remain relevant to the applicable Project phase at any given time. Upcoming versions of the EMP will contain Environmental Protection Procedures and Plans potentially including, but not limited to, those listed below (i.e., Headings 5.1 through 5.14).Each subsection in Section 5.0 will include the following:

- Scope of the Program (i.e., specific inclusions/exclusions to the procedure)
- Environmental issues (i.e., the potential effect of uncontrolled activity on the environment)
- Relevant Regulations, Guidelines and Commitments (i.e., regulatory framework for this activity, including commitments made during the environmental assessment process)
- Environmental Protection Procedures (i.e., mitigative measures and procedures to be implemented and responsible parties)
- Training Requirements (i.e., specific training required by personnel to implement the procedure)
- Records (i.e., forms, reports, records to be prepared to document the procedural activities)
- References (i.e., cross reference to other applicable procedures within the EMP or other relevant documents)

5.1 Wildlife Management

5.2 Erosion and Sediment Control

5.3 On-site Water Management

5.4 Concrete Pouring

5.5 Dredge Material Disposal

5.6 Marine Construction Activities

5.7 Rock Management Plan

5.8 Archaeological and Heritage Resources

5.9 Traffic Management

5.10 Dust Control

5.11 Blasting

5.12 Waste Management

5.13 Hazardous Materials Management

5.14 Noise Management

5.15 Maintenance Activities

6 ENVIRONMENTAL MONITORING AND INSPECTION

This section summarizes monitoring plans, including environmental inspection and auditing and environmental effects monitoring to be conducted during Project construction activities. Monitoring programs will be developed to ensure that mitigation measures presented in the EIS, MSR, IR Documents, and CSR are implemented and functioning.

6.1 Environmental Monitoring

6.1.1 General Construction Monitoring

6.1.2 Surface Water Quality Monitoring

6.1.3 Marine Mammal Monitoring

6.1.4 Invasive Species Surveys

6.2 Inspection and Auditing

7 COMPENSATION PLANS

This section will provide details of all applicable compensation plans

7.1 Freshwater Habitat Compensation Plan

7.2 Marine Habitat Compensation Plan

8 PUBLIC COMMUNICATION AND ISSUE RESOLUTION PROGRAM

The EMP will contain a plan for ongoing public outreach, including an issue resolution program to deal with potential queries and/or complaints from stakeholders (e.g., local residents and Aboriginal Groups, various levels of government, etc.) as they arise. This section will also contain a key contact list in the event of questions, issues, or concerns related to Project construction activities.

8.1 Issue Resolution Plan

8.1.1 General Complaints

8.1.2 Noise Complaints

8.2 Ongoing Aboriginal and Public Involvement

9 ACCIDENTAL EVENTS AND CONTINGENCY PLANNING / EMERGENCY RESPONSE PLANS

This section will outline contingency plans for unplanned events that occur during Project construction, and will be organized in a manner consistent with Section 5.0 of the EMP.

9.1 Emergency Response (PRPA / CN)

9.2 Spill Management

9.3 Fires

9.4 Archaeological and Heritage Resource Discovery

9.5 Erosion Control Failure

9.6 Marine Vessel (Construction) Incident

This section will include measures related to general construction, as well as the transport of dredge material to the disposal at sea site.

9.7 Transportation Safety

9.8 Wildlife Encounters

10 CONTACT LIST AND INCIDENT REPORTING

The EMP will contain a key emergency contact list, as well as reporting procedures in the event of emergencies and other incidents requiring immediate attention to minimize potential effects to health, safety and the environment.

11 APPROVALS

The EMP will include copies of all federal and provincial environmental permits for ease of reference and use.

11.1 Federal Approvals

11.1.1 Fisheries and Oceans Canada (*Fisheries Act* Authorization)

11.1.2 Environment Canada (*Canadian Environmental Protection Act* - Disposal at Sea Permit)

11.1.3 Canadian Transportation Agency (*Canada Transportation Act*)

11.1.4 Environmental Assessment Approval and Conditions

11.2 Provincial Approvals

11.2.1 *Water Act*

11.2.2 Provincial Land Use Permits (if applicable)

TABLE OF CONTENTS

Preamble

Reference: Environmental Management Plan for the Fairview Terminal Phase II Expansion Project, including Kaien Siding, Prince Rupert, BC

Please see below for a draft annotated table of contents summarizing the material proposed to be included in an Environmental Management Plan (EMP) for the Fairview Terminal Phase II Expansion Project (the Project). The intention is that all federal and provincial environmental obligations, together with associated environmental procedures and plans, will be rolled up into a single EMP document for ease of reference and implementation. The final EMP will be developed using a phased approach that corresponds with major phases of Project development, as well as associated permitting and other commitments. In accordance with the Project schedule, the EMP will be revised for each of the following phases:

1. **Terminal and Rail Construction**

   This stage will entail construction of all land-based Project components, including infilling, wharf construction, container yard expansion, on and off-site rail works, site services, and terminal buildings. Commissioning of the terminal will also be completed within this stage.

   a. **Dredging and Disposal at Sea**

      Construction of the expanded terminal will require dredging to remove soft seabed deposits prior to installation of the caisson berth structure and perimeter containment berm, and to accommodate placement and performance of imported mattress and berm rock fills. This stage will also include the disposal at sea of dredged seabed and terrestrial overburden materials.

2. **Terminal and Rail Operation**

   Following Project construction and commissioning, this stage comprises all operation and maintenance activities throughout the lifespan of the Project.

The following is an outline of content to be included in the EMP for Terminal and Rail Operation. Ultimately two EMPs may be developed for each phase, one for the PRPA and one for CN. The final EMP will include all of the mitigation measures specified in the Comprehensive Study Report and Information Request documents. The list of Project commitments is currently provided in Table 9-1 of the Comprehensive Study Report.

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3.2.1 Environmental Orientation Training

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This section will include information on ensuring that works do not contravene the Fisheries Act (i.e., Section 36(3) – deleterious substances).

4.2 Marine Environment

This section will include information on ensuring that works do not contravene the Fisheries Act (i.e., Section 36(3) – deleterious substances).

4.3 Wildlife and Wildlife Habitat

4.4 Avifauna

4.5 Archaeological and Heritage Resources

This section will include information from the Archaeological Impact Assessments completed by Millennia Research Ltd.

4.6 Current Traditional Use by Aboriginal Persons

4.7 Noise and Vibration

5 ENVIRONMENTAL PROTECTION PROCEDURES AND PLANS FOR OPERATIONS PHASE

This section will provide concise and clear instructions regarding procedures for protecting the environment and minimizing potential environmental effects associated with Project operations. The EMP will be a living document that is revised as necessary to remain relevant to the applicable Project phase at any given time. Upcoming versions of the EMP will contain Environmental Protection Procedures and Plans potentially including, but not limited to, those listed below (i.e., Headings 5.1 through 5.7). Each subsection in Section 5.0 will include the following:

- Scope of the Program (i.e., specific inclusions/exclusions to the procedure)
- Environmental issues (i.e., the potential effect of uncontrolled activity on the environment)
- Relevant Regulations, Guidelines and Commitments (i.e., regulatory framework for this activity, including commitments made during the environmental assessment process)
- Environmental Protection Procedures (i.e., mitigative measures and procedures to be implemented and responsible parties)
- Training Requirements (i.e., specific training required by personnel to implement the procedure)
- Records (i.e., forms, reports, records to be prepared to document the procedural activities)
- References (i.e., cross reference to other applicable procedures within the EMP or other relevant documents)

5.1 Wildlife Management

5.2 Erosion and Sediment Control

5.3 Waste Management

5.4 Emergency Response (PRPA and CN)

5.4.1 Post-Incident Monitoring

5.5 Hazardous Materials Management

5.6 Noise Management

5.7 Maintenance Activities

6 ENVIRONMENTAL MONITORING AND INSPECTION

This section summarizes monitoring plans, including environmental inspection and auditing and environmental effects monitoring to be conducted during Project operation activities. Monitoring programs will be developed to ensure that mitigation measures presented in the EIS, MSR, IR Documents, and CSR are implemented and functioning.

6.1 Environmental Monitoring

6.1.1 Surface Water Quality Monitoring

6.1.2 Casey Creek Alluvial Fan Monitoring

6.1.3 Invasive Species Surveys

6.1.4 Air Quality Monitoring (if required)

6.1.5 Monitoring of the Disposal at Sea site

Monitoring in accordance with the Disposal at Sea permit issued under the Canadian *Environmental Protection Act*.

6.2 Inspection and Auditing

7 PUBLIC COMMUNICATION AND ISSUE RESOLUTION PROGRAM

The EMP will contain a plan for ongoing public outreach, including an issue resolution program to deal with potential queries and/or complaints from stakeholders (e.g., local residents and Aboriginal Groups, various levels of government, etc.) as they arise. This section will also contain a key contact list in the event of questions, issues, or concerns related to Project operations.

7.1 Complaint Resolution Plan

7.1.1 General Complaints

7.1.2 Noise Complaints

7.2 Ongoing Aboriginal and Public Involvement

8 ACCIDENTAL EVENTS AND CONTINGENCY PLANNING / EMERGENCY RESPONSE PLANS

This section will outline contingency plans for unplanned events that occur during Project operations, and will be organized in a manner consistent with Section 5.0 of the EMP.

8.1 Emergency Response (PRPA/CN)

8.2 Spill Management

8.3 Fires

8.4 Erosion Control Failure

8.5 Marine Vessel Incident

8.6 Transportation Safety

8.7 Wildlife Encounters

9 CONTACT LIST AND INCIDENT REPORTING

The EMP will contain a key emergency contact list, as well as reporting procedures in the event of emergencies and other incidents requiring immediate attention to minimize potential effects to health, safety and the environment.

APPENDIX C

PRELIMINARY HABITAT COMPENSATION PLAN

PRELIMINARY HABITAT COMPENSATION PLAN

Fairview Terminal Phase II Expansion Project Including Kaien Siding

Prepared for:

Prince Rupert Port Authority
200, 215 Cow Bay Road
Prince Rupert, BC V8J 1A2

and

Canadian National Railway Company
13477 – 116th Avenue
Surrey, BC V3R 6W4

Prepared by:

Stantec Consulting Ltd.
4370 Dominion Street, Suite 500
Burnaby, BC V5G 4L7
Tel: (604) 436-3014 Fax: (604) 436-3752

Project No.:

123110003 | 123110100

Date:

September 2012

Stantec

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1 INTRODUCTION

The Prince Rupert Port Authority (PRPA) and Canadian National Railway Company (CN) are proposing the construction and operation of a wharf extension, expanded container and intermodal facilities at the existing Fairview Terminal, the construction of two sidings, a CN inspection road, a wye, and a Port dedicated road between the terminal on Kaien Island and Ridley Island, British Columbia. Expansion of the existing Fairview Container terminal will increase the facility's current design capacity of 500,000 TEUs (twenty foot equivalent units) per annum to 2,000,000 plus TEUs per annum.

Fairview Terminal is located in an industrial, underdeveloped area within City of Prince Rupert (the City) limits. The site is over 1 km south of the more populated areas of the City, approximately 3 km south of the City centre, and over 4 km south of Cow Bay and the cruise ship district (Figure 1).

Project development will include construction and operation of a wharf expansion and expanded container and intermodal facilities at the existing Fairview Terminal. In conjunction with this terminal expansion, CN is proposing to construct two rail sidings and a maintenance road adjacent to the existing mainline between Fairview Terminal and the southern end of Kaien Island, and a wye near the existing CN bunkhouse in order to achieve terminal throughput design capacity. PRPA is also proposing to construct a Port-dedicated access road between the terminal and northern Ridley Island, to alleviate the need for trucks to travel through the downtown core of Prince Rupert to reach the terminal or to access Ridley Island. Collectively, the work described above is referred to as the Fairview Terminal Phase II Expansion Project including Kaien Siding (the Project).

The Environmental Impact Statement (EIS) and Conceptual Habitat Compensation Plan (CHCP) for the Project were submitted by Stantec Consulting Ltd. (Stantec) on November 27, 2009 on behalf of the proponents. Since this submission, the Project has undergone mitigative redesign to address key concerns that were raised by the Project's Federal Working Group (WG). This redesign has affected the amount of fish habitat impacted by the Project. In August 2011, Stantec submitted a Mitigation Strategy Report (MSR) intended to act as a bridging document between the EIS and the Comprehensive Study Report (CSR) and to describe the design changes and how they affect the anticipated residual environmental effects, as described in the EIS. This Preliminary Habitat Compensation Plan (PHCP) has been prepared to present the effects of the Project, including those resulting from the design changes, on fish habitat, and provide an up-to-date description of proposed habitat compensation designed to offset those effects.

The Project will be constructed in two stages: a Northern Expansion ("Stage 1") and a Southern Expansion ("Stage 2"). It is anticipated that the road between the terminal and Ridley Island will be constructed during Stage 1. One of the two CN sidings will also be constructed as part of Stage 1. The second CN siding and the wye will be constructed as part of Stage 2, or when deemed necessary. All disposal at sea activities are associated with Stage 2 and will not be undertaken until after 2016. This staged approach allows for consideration of economies and traffic volumes prior to construction of full build-out, and minimizes the level of disturbance to the environment (e.g., construction effects on air quality and noise) at any given time. Construction of Stage 1 is expected to commence in Q3/Q4 of 2012, following completion of the environmental assessment (EA) and permitting processes. The EA process and this Report address potential environmental effects associated with both Stage 1 and Stage 2 (i.e., full build-out). During a meeting between Stantec and DFO on January 11, 2012, DFO indicated that a staged approach could be taken for compensation construction; however, the compensation plan must contain all measures proposed to offset fish habitat effects at full build-out.

The Project will result in the harmful alteration, disruption and destruction of freshwater and marine fish habitat (HADD).

The Project works that affect fish habitat will include:

- Site clearing, grubbing, grading, stripping, and cut and fill
- Large volume rock cuts
- Construction of a pile and deck extension of the existing wharf
- Installation of concrete caissons and construction of the wharf topside
- Dredging in front of the proposed caissons and for the containment berm and wharf structure
- Construction of a rock berm and mattress
- In-filling (riparian, intertidal, and subtidal habitat) behind the containment berm
- Re-alignment of the existing CN mainline across the proposed terminal
- Construction of container and intermodal yard facilities
- Construction of two CN sidings, a CN maintenance road, and a Port-dedicated road between the terminal and the southern end of Kaien Island (infilling of riparian and intertidal habitat, and culvert extensions)
- Construction of a CN locomotive wye at the south end of Kaien Island (including infilling of brackish pond habitat)

1.1 Objective

Stantec has prepared this PHCP on behalf of the PRPA and CN to describe the habitat compensation strategies proposed by the Project to offset HADD. The intent of the PHCP is to meet Fisheries and Oceans Canada's (DFO's) policy of "net gain" and the guiding principal of "no net loss" of the productive capacity of fish habitat and support the issuance of a Section 35 (2) *Fisheries Act* Authorization. This report describes the Project activities that are expected to result in HADD, quantifies the areal extent of affected habitats, and describes the physical works that can be undertaken to compensate for this HADD. Additional details regarding the specific locations of compensation features as well as detailed engineering design plans will be submitted as part of the Final Habitat Compensation Plan (FHCP). The FHCP will be developed in consultation with DFO, and will incorporate feedback from the WG.

1.2 Regulatory Context

The legislative authority for the management and conservation of fish and fish habitat in Canada is provided by the federal *Fisheries Act*, which has been in effect in some form since 1867. Section 34 of the *Fisheries Act* defines fish habitat as:

> *"spawning grounds and nursery, rearing, food supply and migration areas on which fish depend directly or indirectly in order to carry out their life processes."*

The main provision of the *Fisheries Act* dealing with protection of fish habitat is Section 35. Section 35(1) states that: "no person shall carry on any work or undertaking that results in the harmful alteration, disruption or destruction (HADD) of fish habitat." However, Subsection 35(2) qualifies this prohibition, in that it allows for the authorization of a HADD to fish habitat by the Minister of Fisheries and Oceans, or through regulation.

The *Policy for the Management of Fish Habitat* (1986) provides direction for interpreting the broad powers mandated in the Act. It establishes DFO's long term policy objective of an overall "net gain" of the productive capacity of fish habitats through habitat conservation, restoration and development. The policy framework around conservation of fish habitat, and its linkage to Sections 35(1) and 35(2) of the Act, establishes the guiding principle of "no net loss" of productive capacity. Under this principle, DFO works with project proponents and other government agencies to ensure projects are designed to maintain the productive capacity of fish habitat while recognizing the potential or existing land use value. All projects plans that impact fish habitat must demonstrate that they meet the "no net loss" guiding principle and should achieve the "net gain" policy objective.

Proponents must pursue location, design and other mitigation options which will avoid impacts to fish habitat before DFO will consider authorizing works which will require habitat compensation to achieve "no net loss" of fish habitat. In cases where losses of fish habitat cannot be avoided, habitat replacement or enhancement, on a case by case basis, may be accepted as compensation for unavoidable losses. Project redesign was undertaken in response to key concerns expressed about the original design during EIS review by Government and First Nations (Mitigation Strategy Report; Stantec 2011a).

DFO's *Decision Framework for the Determination and Authorization of Harmful Alteration, Disruption or Destruction of Fish Habitat* (1998) provides two key pieces of information that are important to understanding the review process. First, it provides definitions for what a HADD is and second it provides guidance to DFO staff on how to determine what impacts to fish habitat are acceptable (i.e., can a HADD be authorized under Section 35(2) of the Act).

Definitions for HADD provided in the 1998 Decision Framework are as follows:

- **Harmful alteration**—any change to fish habitat that indefinitely reduces its capacity to support one or more life processes of fish but does not completely eliminate the habitat
- **Disruption**—any change to fish habitat occurring for a limited period which reduces its capacity to support one or more life processes of fish

- **Destruction**—any permanent change of fish habitat which completely eliminates its capacity to support one or more life processes

Compensation plans are typically developed with significant input from DFO and must balance construction feasibility and fiscal reality with fish habitat requirements. Each project poses specific challenges and opportunities; therefore, the process of developing the habitat compensation plan is unique to each new project.

1.3 Fisheries Resources of the Area

The objective of the habitat provisions of the *Fisheries Act* and the supporting policy is to manage fish habitats that support freshwater and marine fisheries—whether they are recreational, commercial, food or aboriginal fisheries. As a result, the focus of this compensation plan is on fish habitat that supports a fishery. In the Prince Rupert area the key species that are harvested for one or more fisheries are:

- Trout and char (rainbow trout, steelhead, cutthroat trout, and Dolly Varden)
- Pacific salmon (sockeye, chinook, coho, pink, and chum salmon)
- Halibut
- Yelloweye rockfish
- Lingcod
- Herring
- Cod
- Sole
- Dungeness and rock crab
- Prawns
- Bivalves

1.4 Factors Involved in Habitat Compensation

Habitat compensation is the modification of existing habitat or creation of new habitat to maintain or enhance the productive capacity of the fish habitat and ensure compliance with the “no net loss” habitat policy. The compensation strategies proposed in this plan have been developed with input from DFO as well as other members of the WG.

Productive capacity is defined in the *Policy for the Management of Fish Habitat* as the maximum natural capability of habitats to produce healthy fish, safe for human consumption, or to support or produce aquatic organisms upon which fish depend (DFO 1986). Because a quantitative value of productive capacity can rarely be measured with confidence, habitat loss and gain is often expressed as a measure of area. However, fish distribution and abundance across ecosystems are determined not only by the useable area, but also by the quality of the habitat available. Aside from the amount of physical space available for use by aquatic organisms, the productive capacity of habitat is influenced by a number of physical and biological features including:

- Habitat complexity (number of ecological niches available)
- Species diversity
- Food production
- Protection from predators
- Primary production
- Physical properties (water flow, currents, disturbance regimes, temperature, dissolved oxygen, pH, etc.)

Area-based habitat compensation ratios (i.e., the ratio of the habitat area created versus the habitat area impacted) are often used in habitat compensation planning. However, by using a direct measure of area, the quality of the habitat is essentially dismissed and the actual productive capacity of the habitat is often overlooked. In developing compensation opportunities for the Project, both quality and area of habitat have been considered. In balancing these two factors, it is considered that this compensation plan achieves no net loss of the productive capacity of fish habitat.

When determining the amount of habitat compensation needed, the following factors are considered:

- Type and productive capacity of impacted and created habitats
- Temporal loss of productivity associated with the time required for created habitats to reach full productive capacity
- Risk associated with failure of the proposed compensation habitat
- Regional and local availability of affected habitats

1.5 Report Structure

The following report sections are provided for freshwater and marine fish habitat components:

- Project components that affect fish habitat
- Overview of fish habitat that will be affected by the Project
- Quantification of fish habitat that will be affected by the Project
- Compensation measures that are proposed to offset effects of the Project on fish habitat
- Habitat Balance
- Monitoring provisions

2 PROJECT COMPONENTS THAT AFFECT FRESHWATER FISH HABITAT

The Project will affect freshwater fish and fish habitat in the area through activities such as site preparation and clearing, cut and fill associated with terminal expansion, rail siding and access road construction, and construction of the wye. The Northern Expansion (Stage 1) work is expected to commence in Q3 or Q4 of 2012.

3 EXISTING FRESHWATER FISH HABITAT

3.1 Freshwater Streams

There are 27 small creeks that lie within the Local Study Area (Figure 2). Of these, only four creeks are fish-bearing and fall within the Project footprint. The following fish species were found in these streams: Dolly Varden (*Salvelinus malma*), coho salmon (*Oncorhynchus kisutch*), sculpin (general) and prickly sculpin (*Cottus asper*). The numbers of fish present were very low with no more than nine individuals of any species being captured at any one site. This indicates that the productivity of the stream habitat is very low, which is not uncommon in small coastal creeks such as these. Three of the fish-bearing creeks (W2, W4, and W5) cross the proposed terminal footprint whereas the fourth (W22) will be affected by the siding works and wye turnaround. These creeks are generally small catchments characterized by limited spawning and rearing opportunities for fish.

3.2 Freshwater/Brackish Ponds

Freshwater/brackish ponds are transitional habitat for anadromous salmonids that are moving between freshwater stream habitats and the ocean. There are six ponds that lie within the Project area. Pond 4 is fish-bearing and falls within the Project footprint; this pond will be minimally affected by both the siding works and wye construction. Coastal pond habitat is not considered to be limiting in the Project area.

4 HADD QUANTIFICATION FOR FRESHWATER FISH HABITAT

4.1 Approach

The anticipated areas of HADD attributable to the Project are calculated based on current engineering and design plans. The FHCP will be updated to reflect the final Project design plans and will include confirmation of HADD areas.

The boundary between instream and riparian habitat was identified as the visible high water mark. The outer boundaries of riparian habitat (i.e., riparian setback widths) were 30 m for fish bearing streams measured perpendicular from the visible high water mark.

Non fish-bearing watercourses that drain directly into Prince Rupert Harbour were not considered fish habitat; therefore, project effects on these watercourses were not categorized as a HADD. The extension/replacement of culverts in non-fish-bearing streams was also not deemed to be a HADD.

4.2 Effects Summary

Four fish-bearing streams will be affected by the terminal and rail projects (Figure 3). The lower portions of Watercourse 2 (W2), composed of two channels supporting sculpin (general), will be eliminated by the construction of the terminal expansion area, resulting in 649 m^2 of fish habitat loss. Rail line siding work and wye construction will result in the loss of 254 m^2 of fish habitat at W22. CN siding works and construction of the wye will result in the loss of 1,403 m^2 of fish habitat in freshwater/brackish pond habitat (Pond 4) that support stickleback and tidepool sculpins. The Project will also affect the riparian areas of W2 (13,253 m^2), W4/W5 (720 m^2), and W22 (1,553 m^2).

Based on the footprint of the Project, the estimated quantity and type of affected aquatic habitat are outlined in Table 1 below and shown in Figure 3. In addition to the aquatic habitat affected by the Project, 15,527 m^2 of riparian habitat will be lost as a result of Project construction.

Table 1: Type and Amount of Impacted Freshwater Fish Habitat Associated with the Project

Habitat Type	Stream/Pond Identifier	Area (m^2)		
		Total	Terminal	Rail-Line + Wye
Freshwater Stream	W2 + CV3	649	649	0
	W22 + CV24,25	254	0	254
Freshwater/Brackish Pond	Pond 4	1,403	0	1,403
Riparian	W2, W4/W5, and W22	15,527	13,974	1,553
Total Aquatic Habitat Affected		**2,306**	**649 (28%)**	**1,657 (72%)**
Total Riparian Habitat Affected		**15,527**	**13,974 (90 %)**	**1,553 (10 %)**

NOTES:
W = Watercourse
CV = Culvert

5 FRESHWATER HABITAT COMPENSATION

The combined freshwater aquatic fish-bearing habitat loss associated with the four creeks and one pond affected by the Project is 2,306 m^2; the combined riparian habitat affected is 15,527 m^2. The creation and enhancement of instream and riparian habitat in the Exchamsiks backchannel area is proposed as compensatory habitat to offset this HADD. In addition, the creation of eulachon spawning beds in the Khyex River is described as an alternate/contingency option, in the unlikely event that the proposed compensatory habitat does not function as intended.

5.1 Preferred Option: Sacred Tree Creek and Hayes Pit Road Improvements

Through discussions with local DFO staff, Stantec was made aware of habitat enhancement opportunities associated with Exchamsiks Backchannel (UTM 9; 484244; 6020246) which is composed of two relatively large groundwater and wall-base meandering backchannels on the Skeena River floodplain, east of the Exchamsiks River. The backchannels are fed by groundwater and surface flows and feature a complex of channel and pond habitats that have been the subject of periodic fisheries assessments and surveys since the early 1990s (Bustard 1991 and Bustard, 1993). The lower Skeena Fish Passage Assessment (Rabnett 2006) stated that these backchannels have the highest potential habitat gains and the most promising potential in terms of restored coho production in the watershed. In addition to supporting coho salmon juveniles, these backchannel areas provide habitat for cutthroat trout (*Oncorhynchus clarkii*), Dolly Varden, and threespine stickleback (*Gasterosteus aculeatus*).

At the top of DFO's hierarchy of preferences is the creation or increase in productive capacity of like-for-like habitat in the same ecological unit. Previous proposals for compensation closer to the Project location proved unsuccessful. In an August 9, 2007 meeting between Stantec, DFO, and the proponents, DFO acknowledged that onsite fish habitat compensation options were extremely limited and therefore that offsite options should be explored. Based on the hierarchy of preferences, Stantec expects the compensation proposed herein to be considered by DFO as the creation of like-for-like habitat in a different ecological unit, although it should be noted that the productive capacity of the compensatory habitat is expected to be much higher than that affected by the Project and the argument could be made that both the affected and compensatory habitat are in the same macroecological unit.

Sacred Tree Creek is located near the Exchamsiks Backchannel (Figure 4). This preferred compensation option for the Project involves the creation and enhancement of high quality potential salmonid spawning and rearing habitat in a surface-fed stream. Currently, surface water from Sacred Tree Creek is conveyed west beneath Hayes Pit Road through a series of small, poorly installed/decrepit culvert structures. These include an iron pipe culvert, a corrugated steel pipe (CSP) culvert, numerous (Sandra Devcic, DFO, personal communication) wood/wood box culverts (although only one could be identified in the field, the rest having likely collapsed), and a recently-installed plastic overflow culvert. The plastic overflow culvert was not wetted during a May 9, 2012 site visit. Apart from through the road grade, fish access to the area east of Hayes Pit Road is currently only possible from the ponded area west of Hayes Pit Road and therefore through the existing subpar culvert structures.

As Figure 4 illustrates, Sacred Tree Creek currently has poor connectivity with the main backchannel in the area located either side of the plastic overflow culvert. This is due to the existence of ponded areas upstream of this point. These ponded areas are believed to be the result of long term beaver activity (Lana Miller, DFO, personal communication). In other words, prior to the beaver activity, these areas likely conveyed Sacred Tree Creek flow in channels which would have resembled upstream and downstream reaches in terms of gradient, flow, channel profile, and substrate composition (i.e., coarse fluvial bedload is expected to exist underneath the fine material which has deposited in these areas during ponding). Two beaver dams were observed during a May 2012 site visit (Figure 4) with a recently killed beaver being observed in a trap near the northernmost beaver dam.

Upstream of the northernmost ponded area (marked Section 4 in Figure 4), Sacred Tree Creek is without barriers to fish passage and is characterized by excellent potential salmonid spawning and rearing habitat for at least approximately 600 m, provided by loose and clean spawning gravels, deep pools, and good cover. Downstream of the northernmost ponded area (marked Section 2 in Figure 4), a defined channel flows for approximately 60 m before draining diffusely into the second ponded area north of the highway and east of Hayes Pit Road.

According to local DFO staff (Sandra Devcic and Lana Miller, personal communication), and supported by Stantec fish sampling results and professional judgment, the upstream connectivity challenges currently facing migratory salmonids in this area prevent the optimal utilization of this excellent potential habitat (considered to be some of the best potential salmonid spawning habitat in the Exchamsiks backchannel area). This assertion of under-utilization is supported by fish sampling data collected for the Exchamsiks backchannel area in 2009 on behalf of Fisheries and Oceans Canada North Coast Resource Restoration Unit (Sitka Environmental Consultants, unpublished), as only two adult coho were observed in Sacred Tree Creek (in November 2009), just upstream of the northernmost ponded area, and it is suspected that these fish were only able to gain access to the area east of Hayes Pit Road because the road was flooded at the time (Lana Miller, DFO, personal communication).

Fish sampling (24 h minnow traps baited with cat food) was conducted by Stantec on May 9, 2012 in locations both east and west of Hayes Pit Road with two traps being set upstream of the plastic overflow culvert (Figure 4). No fish were captured in Minnow Trap 4 which was set in the 60 m long well-defined section of Sacred Tree Creek immediately downstream of the northernmost ponded area (marked Section 2 in Figure 4). This adds further weight to the conclusion of under-utilization of Sacred Tree Creek by fish. Only stickleback were observed in the remaining minnow traps (Figure 4). Water chemistry upstream (i.e., east) of the plastic overflow culvert was conducive to salmonid residence with a pH of 6.3 and a dissolved oxygen level of 11.2 mg/L.

To improve access and utilization of Sacred Tree Creek by fish, PRPA and CN plan to create two sections of well-defined stream channel through existing ponded areas (see Figure C-03; Appendix

B for proposed channel typical design details). After the detailed design phase, the final dimensions of these new channel sections will resemble existing channel dimensions immediately upstream and downstream of these areas. Dimensions, cross-sectional areas, and flow capacities of existing channel habitat in Sacred Tree Creek are presented in Figure C-02 (Appendix B). The first of the new channel sections will be approximately 150 m long and located between the current location of the plastic overflow culvert and the 60 m long well-defined section of Sacred Tree Creek immediately downstream of the northernmost ponded area (marked Section 1 in Figure 4), in an area currently subject to ponding also. A second channel of approximately 100 m in length will be created through the northernmost ponded area connecting the two defined sections of Sacred Tree Creek (marked Section 3 in Figure 4). As these channels are proposed to be constructed in areas currently ponded, the wetted surface in those areas will necessarily be reduced. However, ponded rearing habitat of that nature is extremely prevalent in the Exchamsiks Backchannel area whereas access to suitable salmonid spawning habitat is limiting. Furthermore, the abundant ponded rearing habitat in the area is considered to be under-utilized due to the limited spawning habitat in the area (Lana Miller, DFO, personal communication)

Though the detailed design phase will provide more information on how these new channels will be constructed, the following approach is proposed at this preliminary stage:

1. Remove beaver dams in a controlled fashion to allow water level to drop naturally to pre-beaver activity state, salvaging fish as needed
2. Isolate remaining wetted areas (i.e., convey flow around them) using a dam and pump technique and conduct fish salvage
3. Allow the ponded areas to drain (use pump to dewater ponded areas if necessary and as needed)
4. If necessary, introduce a uniform layer of fill into the drained ponded area to help provide the conditions from which a channel with appropriate and stable side slopes can be excavated (quantity/elevation of fill to be determined through topographic work)
5. Introduce substrate into the new channels to simulate bedload conditions in upstream and downstream adjacent areas
6. After substrate is introduced into the new channel, appropriate habitat features such as boulders, large woody debris, and lunker[1] structures (to simulate undercut banks) would be added prior to removing the isolation measures and introducing flow
7. After channel construction and introduction of flow, an appropriate depth of planting medium (e.g., 0.5 m depth of topsoil) would be added to the proposed new riparian areas (i.e., where the footprint of the old ponded areas are within 30 m of the new channels, see Figure 4)
8. The riparian areas would then be planted with specific native shrub and tree species at prescribed densities (based on 5 m tree spacing and 1 m shrub spacing)

[1] Little Underwater Neighborhood Keepers Encompassing Rheotactic Salmonids

The forested nature of the surrounding local area indicates that local groundwater influence is unlikely to be an issue affecting the success of planted riparian areas adjacent to Sections 1 and 3 (Figure 4). PRPA and CN will consider hydro-geological assessment of the area to provide more information on this during the detailed design phase.

The current longitudinal linear profile of Sacred Tree Creek (based on a topographic survey) which is shown in Figure C-01 (Appendix B) is considered typical of a creek of this size and nature and conducive to carrying out the compensatory work described herein.

In combination, a 258 m length of new stream channel habitat will be created (Sections 1 and 3 in Figure 4). In addition, fully functional riparian habitat will be created adjacent to this new channel habitat within a 30 m riparian buffer on either side of Sacred Tree Creek (with the road as a cut-off on the west side). Furthermore, a 2,440 mm span by 1,240 mm rise arch culvert (i.e., open-bottomed with natural stream bed), which has been designed by a Professional Engineer, will be installed (Figure C-03; Appendix B) to replace the plastic overflow culvert near the junction of Hayes Pit Road and Highway 16 (Figure 4) and convey all Sacred Tree Creek flow beneath the Hayes Pit Road. Finally, it is considered that the overall connectivity improvements proposed will open up and thereby enhance the productive capacity of a combined 662 m length of existing under-utilized stream channel (Sections 2 and 4 in Figure 4) as well as enhancing the productive capacity of the adjacent riparian habitat (Figure 4). Instream and riparian enhancement habitat gains are attributed only to those areas accessible to fish (i.e., below barriers which were considered potentially impassable during the May 2012 survey). To increase the benefits of the work described above, it is proposed that the road grade between the new arch culvert location and iron pipe culvert located near the upstream boundary of the northernmost ponded area will be sealed to direct flow to the main channel of Sacred Tree Creek (Figure 4). In other words, existing crossing structures in that area will be blocked/plugged. This is not considered to result in a loss of habitat as connectivity will be enhanced as a result of the proposed work and these subpar crossing structures are currently considered to pose a risk of fish stranding under low flow conditions (Lana Miller, DFO, pers. comm.).

Hayes Pit Road is located on Crown land, and therefore belongs to the province of British Columbia. Stantec, on behalf of PRPA and CN, have established that a road permit (R17628A) has been issued to Coast Tsimshian Resources Limited Partnership (CTR) by the Ministry of Forests (now the Ministry of Forests, Lands and Natural Resource Operations; MFLNRO) giving CTR the right to build, maintain and use Hayes Pit Road (also known as Branch 500 in FLA16835). As part of the conditions of the permit, CTR is responsible for Hayes Pit Road until deactivation, or until another permit holder wishes to assume responsibility.

The following CTR representative was contacted by Ravi Chatterji (Stantec) on July 6, 2012. During this contact CTR expressed support for the Sacred Tree Creek and Hayes Pit Road Improvements proposal and gave permission for that expression of support to be included in this document.

Ryan Keswick
Coast Tsimshian Resources LP
4905 Keith Avenue
Terrace, BC V8G 5L8
Tel: 250-615-2040 ext 108
Fax: 250-635-2323
Email: Ryan_Keswick@brinkman.ca

Furthermore, the following representative of MFLNRO was contacted by Ravi Chatterji (Stantec) on August 27, 2012. During this contact, MFLNRO expressed that, given CTR support, they foresaw no issues with the proposed Sacred Tree Creek and Hayes Pit Road Improvements work, as long as future access to provincial resources is not restricted.

Brian Ness, Engineering Officer
R.O. Engineering
Ministry of Forests, Lands and Natural Resource Operations
Coast Mountains District
Tel: 250-638-5128
Fax: 250-638-5176
Email: Brian.Ness@gov.bc.ca

The works described above are expected to increase flow and connectivity in Sacred Tree Creek, and to improve fish passage to potential spawning areas. Target species include coho salmon and cutthroat trout. This work will build on previous DFO restoration projects to enhance access and improve fish habitat in this area and will afford fish access through “natural” means rather than a reliance on access through CN and Ministry of Transportation grades, as has historically been the case (Sandra Devcic, DFO, pers. comm.). Furthermore, the work is expected to increase the habitat productive capacity of the whole backchannel area, which is currently considered under-utilized due to the limited availability of spawning habitat (Lana Miller, DFO, pers. comm.).

It is anticipated that the construction of these works would occur during the summer months to correspond with periods of low precipitation with any tie-ins to fish bearing habitat occurring during the least risk timing window. Access to the site would be required to allow construction to take place but, given the proximity of the works to Hayes Pit Road, it is expected that access work would be minimal. Access routes will be designed to be as short as possible and to minimize the falling of trees. Construction equipment used for hauling and excavation will be as small as possible and maneuverable (i.e., tracked) to minimize impacts to stream banks and riparian habitat. Access routes will be restored at completion of the construction work, including planting native trees and shrubs to replace removed vegetation. Potential shrub species to be used for riparian revegetation include salmonberry, red elderberry, salal and snowberry.

It is expected that this habitat could be constructed during the summer of 2013 and would be utilized as spawning and rearing habitat by salmonids within one year of construction (i.e., there will be minimal time lag until compensatory habitat becomes functional). Based on professional experience and previous successes with this type of work, the risk of failure of compensation is considered to be low.

This option will result in like-for-like habitat expected to have much greater productivity than that affected by the Project. As a result, it is expected that there will be no net loss and a net gain of fish habitat productive capacity.

Design elements that would be incorporated into the new channels to contribute to their success include:

- Specification of low average gradient to allow fish passage
- Specification of stable channel bank slopes (i.e., 2H:1V)
- Specification of bed material sizes that will be stable under higher flow conditions and provide spawning opportunities and cover for target fish species
- Provision of riffle, glide, and pool habitat types (similar to those instream areas immediately upstream and downstream of the new channels)
- Utilization of proven and appropriate habitat enhancement features, (e.g., gravel placement, boulder clusters, large woody debris, or lunker structures (to simulate undercut banks), which will be selected during the detailed design process) to increase the complexity of the habitat
- Maintenance of existing vegetation coupled with post-construction planting of disturbed areas to ensure a fully functional riparian buffer.

River gravel (mixed sizes with fines) will be placed in the new channels in shallower riffle areas to provide salmonid spawning opportunities. It is expected that this material will be comprised of 80 percent of 10–50 mm gravel with the remaining 20 percent made up of 100 mm gravel and a small portion of coarse sand (2–5 mm), consistent with the spawning requirements of most salmonids (Whyte *et a*l. 1997). The river gravel selected will be similar to that found upstream; the gradients through the new channels will be similar to those found upstream and downstream of the ponded areas (i.e., less than 5 percent, Figure C-01; Appendix B), therefore the suggested bedload is anticipated to be stable. The stability of this proposed bedload can be verified through hydrological analysis during the detailed design process.

Boulder clusters provide overhead cover to fish and can create areas of lower velocity (i.e., eddies). They can also result in localized scour thereby producing deeper areas within and around the cluster, improving habitat diversity for rearing fish, and providing improved gradation of substrate. Finally, boulder placement can enhance fish habitat by increasing water depth. Boulders would be placed by an excavator under the supervision of qualified environmental professionals.

Large woody debris installations are designed to increase rearing habitat quantity, habitat carrying capacity, and overall fish densities. It is also expected that they would assist in the recruitment and retention of woody debris from upstream areas thereby increasing their benefit over time.

The construction of artificial channel habitat is a well-established technique for increasing fish productivity of a creek or river system (Keeley et al. 1996; Roni et al. 2001; Morley et al. 2005). This is especially the case when the creation or re-establishment of side-channel or back-channel habitat is involved (Whyte et al. 1997). The creation of the new stream channel habitat replaces the low productivity instream habitat lost or altered with high quality habitat that provides like for like habitat but with much greater productivity. Improvements to backchannel habitat are considered to have high potential for fish production gains, especially for coho salmon in the Skeena catchment (Rabnett 2006). Based on typical values for juvenile density and marine survival, it has been estimated that created channel habitats can produce an average of 0.066 coho salmon adults and 1.58 chum salmon adults per square metre (Keeley et al. 1996). The compensatory habitat is also anticipated to benefit other salmonid species. As a result, it is expected that there will be a net gain of productive capacity.

Detailed design drawings will be provided to DFO prior to construction with a confirmation of habitat gain and an estimate of construction and monitoring costs to determine an appropriate letter of credit sum, if required. To facilitate detailed design, Stantec has conducted a topographical survey of the compensation area. Stantec will reengage local DFO staff during the detailed design process so their input can be incorporated.

In recognition of the likely negative influence beaver activity has had on the productive capacity of fish habitat in the compensation area, a beaver management plan will be considered as part of the final compensation plan and monitoring program. Stantec understands that DFO has ongoing beaver management programs taking place in other areas of the Exchamsiks backchannel. Stantec has been in communication with local DFO staff (Sandra Devcic) and it is anticipated that it will be possible to arrange to have this program extended to Sacred Tree Creek.

All compensation works will be conducted in accordance with the sediment control provisions of the *Land Development Guidelines for the Protection of Aquatic Habitat* (Chilibeck et al., 1993) and with attention paid to spill prevention and response.

The monitoring of the success of this compensation option is described in Section 10.

5.2 Alternate/Contingency Option: Khyex River Eulachon Spawning Bed Improvements

The eulachon is an anadromous smelt. Adults live in the marine environment but spawn in a number of British Columbia coastal rivers in the spring. Eulachon is a blue-listed species in British Columbia meaning its status is considered sensitive or vulnerable. Eulachon are considered an ecological cornerstone for regional coastal ecosystems (Marston et al. 2002) and are a culturally important source of food to many coastal First Nations communities in British Columbia.

Through discussions with Dave Rolston, Kitsumkalum Fisheries Manager, Stantec was made aware of a potential eulachon spawning bed restoration option in the Khyex River (Watershed Code 400-036100), a tributary of the Skeena River and historically one of the more dependable eulachon runs in the lower Skeena River watershed (Rolston 2010). According to Dave Rolston and Russel

Boulton, a member of the Kitsumkalum First Nation, collections of sand of the nature, and in the area, favoured by spawning eulachon are now limiting. Sand is critical to fertilized eulachon eggs. Once the egg is fertilized, the outer membrane of the egg ruptures and the surrounding sand is encapsulated within it. This prevents the egg from being washed quickly downstream (Rolston 2010) where it would likely die upon reaching saltwater influenced areas, eulachon egg survival and salinity being inversely related (Armstrong and Hermans 2007).

Typically, and as is the case for the Khyex River (David Rolston, personal communication), the main area used by spawning eulachon is bounded downstream by the upstream extent of saltwater influence (also known as the salt wedge) and upstream by the upstream extent of tidal influence. In the Khyex River this area is approximately 1.8 km long and located from approximately 5.5 to 7.3 km upstream of the Skeena River confluence (Figure 5). Within this area, the most common spawning zone is known to occur from approximately 5.9 to 7.1 km upstream of the Skeena River confluence. It is believed that a large proportion of the substrate suitable for eulachon spawning was flushed out of the most common spawning zone when a log jam, located approximately 7 km upstream of the Skeena River confluence, blew out in 2009 (Figure 5) (Rolston 2010). The bank erosion on the left bank just downstream of the log jam location (Figure 5), which was not present before the blow out (Russel Boulton, personal communication), supports this assertion. Furthermore, no eulachon eggs or larvae were captured during fish sampling efforts by the Kitsumkalum Fisheries Department in 2010 (Rolston 2010), one year after the blow out.

On May 11, 2012, Stantec visited the known eulachon spawning area in the Khyex River by jet boat with David Rolston and Russel Boulton of the Kitsumkalum First Nation. During this visit, the following sampling/data collection was conducted:

- In situ water quality data was recorded using a *YSI 85* metre
- Four sediment grab samples were taken using a Petite Ponar grab along with habitat and velocity information at areas containing suitable eulachon spawning substrate (i.e., course sand). These samples were checked for eulachon eggs both in the field and in the laboratory.
- Two plankton tow samples (18.06 and 54.27 m^3 of water sampled respectively) were collected at the downstream end of the known eulachon spawning area using a 0.5 m diameter conical plankton net (130 micron mesh) with a General Oceanics Inc. Model 2030R standard flowmeter to estimate volume of water filtered by the plankton net. These samples were checked for eulachon larvae in the field and in the laboratory.
- Velocity, depth and substrate composition information was collected at four transects—one at the upstream extent of the known eulachon spawning area, one at the downstream end of the known eulachon spawning area, and two within this area.
- All sampling locations and notable features were georeferenced using a *Garmin 60Cx* GPS unit and photographed

Water quality for fish in the Khyex River was good with a dissolved oxygen level of 14.1 mg/L and a pH of 6.6 being recorded within the known eulachon spawning area. Sediment suitable for eulachon spawning was considered to be limiting by all present but what spawning medium was available was typically found in areas of up to 2 m water depth and immediately downstream of large woody debris which provided a reduction in localized velocity to less than 0.3 m/s. Velocities elsewhere in the channel were closer to 1.0 m/s in general. No eggs or larvae were identified in any of the grab or tow samples despite both still being expected to be present based on the time of year when sampling took place.

Transect data was used in the hydrologic and geomorphic assessment conducted for this compensation option (Appendix A). This assessment provided estimates of annual streamflow statistics as well as information on the sediment transport thresholds and dynamics in this section of the Khyex River. The assessment determined an estimated mean annual flow in the Khyex River of 45.5 to 45.8 m^3/s (close to the 39.6 m^3/s flow experienced during the survey). The assessment also determined that sediment supply from upstream was ample and the sediment transport dynamics normal, indicating that sand recruitment into any new spawning beds is to be expected thereby replenishing substrate after periodic flood-related erosion. A sieve analysis of a sample of the optimal eulachon spawning substrate revealed a mean particle size of 0.8 mm. Given the flow conditions experienced in the Khyex River, this substrate is likely to only be deposited in naturally depositional areas of the river (i.e., in/around bars on the outside of bends) or on the leeward side of large boulders or pieces of large woody debris (e.g., rootwads) where hydraulic turbulence is reduced. A sand spawning bed arrangement involving three large upstream boulders to reduce hydraulic turbulence and downstream cobble and gravel material is suggested to provide the appropriate conditions for sand retention and recruitment (Figure 5). See Appendix A for more details.

Based on the field assessment described above and personal communication from David Rolston, Fisheries Manager, Kitsumkalum First Nation, it is considered that at least 6 suitable sites for new eulachon spawning beds with the arrangement shown in Figure 5 could be located within the known eulachon spawning area of the Khyex River. Considering the footprint of the spawning bed structures as habitat gain, it is estimated that each structure would provide 7.6 m^2 of habitat with six structures providing 45.6 m^2 of habitat (Figure 5). Although the areal habitat gain provided by this option is low, it should be considered that incubating eulachon egg density in the lower Skeena River watershed can be as high as 2,700,000 per m^2 (Rolston 2010) which could result in over 120 million eggs being produced in the new spawning beds. This productivity is amplified by the fact that larval, juvenile and adult eulachon can provide an important component of the diets of other culturally and commercially important fish species in both freshwater and marine environments. Therefore, it is considered that this compensation option would result in no net loss of habitat and a net gain of habitat in terms of productivity.

It is expected that the construction of these works would occur during the summer months to correspond with periods of low precipitation and the least risk timing window. Access to the site could be achieved by boat at high tide or via an existing ATV trail which follows the Khyex River to the west. It is anticipated that the larger material involved in construction (e.g., the boulders) could be transported to the site via helicopter. This habitat could be utilized by spawning eulachon within one year of construction (i.e., there will be minimal time lag until compensatory habitat becomes functional). Based on professional experience and previous successes with this type of work, the risk of failure of this compensation option is considered to be low.

As per previous discussions with DFO on March 28, 2012, it is considered that spawning bed construction would not constitute a HADD if clean materials are used and that the success of this compensation option would be contingent on the continued presence of the created spawning beds during a five year monitoring period.

5.3 Additional Habitat Enhancement/Creation

In addition to the compensation described above, an oversized countersunk box culvert arrangement is being proposed to replace the existing twin 1,000 mm circular concrete culvert at Casey Creek. This will create fish habitat and considerably improve fish access into W4 and W5 (Casey Creek). Quantification of restored habitat will be undertaken during the detailed design phase, in consultation with DFO.

5.4 Freshwater Habitat Balance

The combined freshwater aquatic (2,306 m^2) and riparian (15,527 m^2) habitat loss associated with the Project is 17,833 m^2. The new channel creation and riparian planting will replace low productivity instream habitat with high quality instream habitat (with fully functional riparian areas) that is optimal for salmonid spawning, overwintering, and rearing. The work will also enhance the productivity of existing instream and riparian habitat upstream of the works by improving fish access into these areas. In combination, this will ensure that there would be "no net loss" of fish habitat as a result of the Project.

5.5 Freshwater Habitat Protection Measures

The following measures will be implemented during compensation construction work:

- Isolation of instream work areas from flows
- Completing fish salvages prior to instream work
- Hazardous materials control and spill management
- Sediment and erosion control
- Restoration of disturbed work areas.

6 PROJECT COMPONENTS THAT AFFECT MARINE FISH HABITAT

The Project will affect marine fish habitats during both Stage 1 (Northern Expansion) and Stage 2 (Southern Expansion) of construction. Stage 1 will include the northern expansion of the Fairview Terminal, the construction of one rail siding along the west side of Kaien Island and the construction of a Port-dedicated access road between the Fairview Terminal and Ridley Island. Stage 2 will include the southern expansion of the Fairview Terminal and the construction of a second rail siding and maintenance road along the west side of Kaien Island. Stage 1 is expected to commence in Q3 or Q4 of 2012, following the completion of the environmental assessment and permitting processes. Construction of Stage 1 is anticipated to take between 30 and 36 months. The timing of Stage 2 will depend on the future need for increased cargo capacity at the Fairview Terminal. It is expected that Stage 2 will not be undertaken until sometime after 2015.

The northern and southern expansion of the Fairview Terminal will require the infilling of intertidal and subtidal habitats adjacent to the existing terminal, and the clearing of narrow bands of modified marine riparian vegetation. Dredging is required to remove soft seabed deposits prior to installation of the caisson wharf structure and the perimeter containment berm for the southern expansion. Dredging is also required at the northern expansion area to provide adequate depth for the proposed berth pocket. Construction of the rail sidings, Port-dedicated road and CN maintenance road will require the infilling of intertidal habitats along the west side of Kaien Island. Most of this infilling will be completed during Stage 1. Marine riparian vegetation adjacent to the existing rail line will also be cleared to accommodate the new roads and sidings. Marine fish habitats affected by the Project are described in Section 7 and quantified in Section 8.

7 EXISTING MARINE FISH HABITAT AND ECOLOGICAL VALUE OF HABITATS

Marine fish habitats within the Project footprint were characterized during six field surveys: a subtidal habitat survey conducted in January 2007; three intertidal habitat surveys conducted in September 2006, September 2007, and June 2011; a fish survey conducted in September 2006; and a benthic invertebrate survey conducted in June 2007. Detailed results of these field surveys are presented in the Marine Environment Technical Data Reports (Stantec 2009; Stantec 2011b). The following sections describe the marine habitat types within the Project footprint that will be affected during Project construction. This includes three types of biogenic habitat (eelgrass, kelp, and marine riparian vegetation), as well as two physical habitats (subtidal and intertidal).

7.1 Eelgrass Habitat

Eelgrass communities are essential habitats for a number of economically, culturally and ecologically important species including; juvenile salmon (*Onchorhynchus* spp.), Pacific herring (*Clupea harengus*), and Dungeness crab (*Cancer magister*) (Wilson and Atkinson 1995; Nelson and Waaland 1997).

The rooted, rhizomatous basal system and canopy of strap-like leaves of eelgrass add structure and habitat to an otherwise simple substratum, thus providing predictable habitat, nursery and refuge for infaunal and epifaunal organisms (Nelson and Waaland 1997; Heck et al. 1989). This also stabilizes the sediment, thus restricting erosion and supporting a higher biomass and greater diversity than would otherwise be present (Phillips 1984). The habitat complexity provided by eelgrass meadows is important for predator avoidance by juvenile fish in the nearshore environment; for instance, eelgrass forms a hiding place for herring eggs and young, which is a major food source for salmon, seabirds, seals and other marine mammals.

Seagrass meadows are among the most productive marine or terrestrial systems; carbon fixation can range as high as 8 g C m^2 day^{-1} in Alaska (McRoy 1970). This primary productivity forms the basis of important links in many marine food webs, and ultimately supports both local and regional fisheries (Valentine et al. 2002). There is clear evidence that direct herbivory on living leaves is an important source of energy in many coastal food webs (Valentine and Heck 1999). Additionally, because detached seagrass leaves are carried passively by currents and waves they may also represent an energy source for other less productive marine habitats, thus subsidizing regional food webs (Hemminga and Nieuwenhuize1990; Young et al. 1993; Ochieng and Erftemeijer 1999). Accumulations of detrital material can support consumers in areas such as deep sea canyons or coastal beaches where they also provide an important refuge from predation for macroinvertebrates (Lenanton et al. 1982). Additionally, decomposition of both above- and below-ground biomass releases inorganic nitrogen and phosphorus which can be captured again for plant and/or macroalgal production (Hemminga and Duarte 2000).

Eelgrass beds play an important role in climatic and oceanic cycles and also contribute to overall water quality (Duarte et al. 2004). Carbon and pollutants from the atmosphere and surrounding water can be absorbed through the blades and also the root-rhizome network (Thom et al. 2001). Eelgrass also aids in maintaining dissolved oxygen levels in the surrounding seawater through photosynthesis (Simenstad et al. 1994). The presence and condition of seagrass beds is a strong indicator of the environmental quality of coastal waters.

Eelgrass habitats within the Project footprint were mapped during field surveys conducted in 2006 and 2007. Several small patches of eelgrass were identified just south of the existing Fairview terminal ranging in size from 9 to 720 m^2 (Figure 6). Some larger continuous eelgrass beds were observed on the south-western shoreline of Kaien Island adjacent to Barret Rocks. These beds are mostly found within the lower intertidal to mid intertidal zone between the depths of 0 to +2 m chart datum (up to +4 m) where finer sediments have accumulated among the generally coarser mixed substrate. Based on field surveys of the eelgrass beds just south of the terminal, shoot densities ranged from 251 to 960 shoots per m^2.

The spatial distribution of eelgrass is influenced by a number of oceanographic and atmospheric processes, and may change from year to year depending on local environmental conditions. To ensure that the size and location of eelgrass beds within the Project footprint has not changed since the 2006 and 2007 surveys, eelgrass habitats near the Fairview Terminal and along the west side of Kaien Island will be mapped again during the first week of June 2012 and results will be included in the Final Habitat Compensation Plan.

7.2 Kelp Habitat

Kelps are large, brown macroalgae that are important for habitat formation and primary production in lower intertidal and subtidal zones. Kelp beds support commercial and sport fish such as salmon, rockfish and lingcod, invertebrates such as crabs, urchins and molluscs, and marine mammals and birds (Vadas et al. 2004; Berry et al. 2001). Subtidal kelp zones are areas of vigorous primary productivity and large quantities of biomass exist in the northern hemisphere, with some estimates ranking kelp among the most productive ecosystems known (Brady-Campbell et al. 1984; Mann 1973). Vadas et al. (2004) demonstrated 75 ha of kelp yielding 3.34×10^7 g C year^{-1} in Cobscook Bay, Maine.

Both canopy forming kelp and understory kelp exist within the Project footprint. Kelp canopies within Project footprint are composed of bull kelp (*Nereocystis luetkeana*). Reaching lengths of up to 15 m, large gas-filled bladders cause Bull kelp to extend from the substrate up to the water surface. Long blades originate from this bladder and hang into the water column. These kelp canopies add three-dimensional structure to an otherwise structurally featureless water column in the nearshore environment. This canopy can stabilize hydrodynamic conditions, slowing water movement and trapping plankton. Fish commonly colonize kelp canopies to feed on other fish and invertebrates, or to escape predation by other larger fish. Likewise, kelp holdfasts are complex structures that support a high diversity and abundance of small invertebrates that are food sources for fish.

Understory kelp within the Project footprint are restricted to the lower intertidal and the upper subtidal, and are mainly comprised of *Laminaria* spp. and *Alaria marginata*. Kelp understory species typically extend less than 1 m from the substrate, and thus act similarly to other understory seaweeds (e.g., *Ulva*, *Fucus*, discussed below) to provide habitat and contribute to primary production.

Kelp beds are important not only for fisheries, but for other commercially and culturally important activities as well. First Nations of the northwest coast of British Columbia have traditionally harvested kelp for medicines, cultural traditions and food while today, the most established and widespread use of kelp is as a fertilizer (Springer et al. 2007).

Canopy forming kelps exist within the Project footprint as a thin fringing reef in the shallow subtidal zone (Figure 6). To confirm the total areal extent of canopy forming kelps within the Project footprint (and adjacent waters), kelp habitats will be mapped again during the first week of June 2012.

7.3 Subtidal Substrate

The subtidal zone within the Project footprint is largely homogeneous, composed of unconsolidated bottom (mostly silt with cobble/boulder veneer). This environment comprises habitats for two types of biota; epibenthic (living on top of sea-floor) animals include sea cucumbers, anemones, seastars, sea pens, hydrocorals, red rock and Dungeness crabs, sea urchins, and sculpins, and infaunal (living in surface of sea-floor) animals, which include a diverse assemblage of polychaetes and bivalves. Small-scale physical features on soft benthic habitats, which include depressions, burrows, shells, boulders, cobbles and sand waves, may provide refuge from predation and feeding areas for juvenile fish (Thrush et al. 2002). Shallow sand and boulder nearshore habitat is abundant in the Prince Rupert Region.

7.4 Intertidal Substrate

Intertidal ecosystems exist at the interface between the land and ocean, and are subject to tidal flushing. Within the Project footprint, the intertidal substrate is dominated by boulder and bedrock, interspersed with cobble and gravel beaches. The shoreline profile is relatively uniform (i.e., fairly straight and not scalloped).

Biologically, the rocky intertidal zone supports seaweed growth that produces more organic material than almost any other type of intertidal habitat. There is also relatively high species diversity across a wide array of taxa: seaweed, barnacles, snails, nudibranchs, crabs, sea stars, etc. Rockweed (*Fucus* sp.) is the dominant seaweed in the mid and upper intertidal, and with gas filled bladders, it provides a floating 3-dimensional matrix for juvenile fish to hide in to avoid predation. The lower intertidal supports a more varied flora of seaweeds, and this vegetation provides habitat for juvenile fish by increasing complexity and supporting a diverse and abundant assemblage of microinvertebrates that fish prey upon. This shoreline represents important fish habitat, particularly for juvenile salmon while migrating.

7.5 Marine Riparian Vegetation

The level of importance of terrestrial vegetation to marine fish habitat is a topic of debate. Riparian habitats can provide a number of ecosystem services and functions in marine and estuarine systems. These functions include: maintaining water quality; soil stability and sediment control; wildlife habitat; microclimates; shade; nutrient inputs; fish prey production; and habitat structure (Brennan and Culverwell 2004). Many of the functions that relate to fisheries resources are site specific and may be provided through other means.

Terrestrial vegetation fringes the existing shoreline at the Fairview Terminal and along the west side of Kaien Island. Approximately 34 percent of the backshore vegetation that will be affected by the Project is currently maintained by CN Rail. This modified riparian vegetation is composed of a narrow band of small shrubs above the high water mark and does not likely provide any benefit to marine fish. The remaining 66% of the backshore vegetation in the Project footprint is unaltered functional riparian habitat composed of mostly secondary-growth forest, dominated by red alder (*Alnus rubra*) and salmonberry (*Rubus spectabilis*).

8 HADD QUANTIFICATION FOR MARINE FISH HABITAT

Project construction will result in the harmful alteration, disruption and destruction (HADD) of marine fish habitats. The types and amounts of marine HADD have been quantified based on the most recent engineering and design plans. Marine HADD associated with Stage 1 of Project construction is summarized in Table 3 and shown in Figures 7 to 10. Marine HADD associated with Stage 2 of Project construction is summarized in Table 4 and shown in Figures 11 to 14. The total marine HADD for the Project (at full build out) is summarized in Table 5.

The areas of marine HADD presented in this report should be considered approximate, as the Project footprint has not yet been finalized through detailed design. Detailed design of Project components continues, and should there be any modifications to the current Project footprint, the types and amounts of marine HADD will be re-calculated and these changes will be incorporated into the final habitat compensation plan.

Table 3: Marine HADD Quantification for Stage 1 of Project Construction

Habitat Type	Area (m^2)		
	Total	Northern Terminal Expansion	1st Rail Siding and Port Access Road
Eelgrass habitat (loss)	334	0	334
Kelp habitat (loss)	0	0	0
Intertidal substrate (loss)	128,011	11,709	116,302
Subtidal substrate (loss)	16,865	15,598	1,267
Subtidal substrate (disturbance)	28,212	28,212	0
Natural marine riparian vegetation (loss)	42,101	0	42,101
Modified marine riparian vegetation (loss)	25,705	6,125	19,580
Total Marine HADD	**241,228**	**61,644**	**179,584**

Table 4: Marine HADD Quantification for Stage 2 of Project Construction

Habitat Type	Area (m^2)		
	Total	Southern Terminal Expansion	2nd Rail Siding and Maintenance Road
Eelgrass habitat (loss)	1,391*	1,040	45
Kelp habitat (loss)	4,075*	2,494	0
Intertidal substrate (loss)	26,440	24,745	1,695
Subtidal substrate (loss)	50,264	48,416	1,848
Subtidal substrate (disturbance)	31,426	31,426	0
Natural marine riparian vegetation (loss)	64	0	64
Modified marine riparian vegetation (loss)	0	0	0
Total Marine HADD	**113,660**	**108,121**	**3,652**

NOTES:

* Construction of Stage 2 compensation habitat (intertidal fish nursery area) will result in the loss of 306 m^2 of eelgrass and 1,581 m^2 of bull kelp. These values have been included in the total HADD quantification.

Table 5: Marine HADD Quantification for the Project at Full Build Out

Habitat type	Area (m^2)		
	Total	Terminal Expansion	Rail Sidings and Roads
Eelgrass habitat (loss)	1,725*	1,040	379
Kelp habitat (loss)	4,075*	2,494	0
Intertidal substrate (loss)	154,451	36,454	117,997
Subtidal substrate (loss)	67,129	64,014	3,115
Subtidal substrate (disturbance)	59,638	59,638	0
Natural marine riparian vegetation (loss)	42,165	0	42,165
Modified marine riparian vegetation (loss)	25,705	6,125	19,580
Total Marine HADD	**354,888**	**169,765**	**183,236**

NOTES:

* Construction of Stage 2 compensation habitat (intertidal fish nursery area) will result in the loss of 306 m^2 of eelgrass and 1,581 m^2 of bull kelp. These values have been included in the total HADD quantification.

9 MARINE HABITAT COMPENSATION

The goal of the marine habitat compensation strategy is to maintain and conserve ecologically and culturally valuable habitat and to enhance the overall quality and productivity of marine habitat in the local area. The following sections describe the marine fish habitat compensation strategies identified for the Project. These strategies are presented according to DFO's goals of conservation, restoration and development of fish habitat in order to achieve "no net loss" of productive capacity.

9.1 Habitat Design and Creation

9.1.1 Eelgrass Transplants

Although the loss of eelgrass as a result of the Project is expected to be minimal, eelgrass is commonly featured in compensation strategies owing to its high productive capacity. In this case, compensation will take the form of eelgrass transplants as a component of a larger compensation feature proposed adjacent to terminal (see Intertidal Fish Nursery, below) (Figure 15). Transplanting eelgrass involves the relocation of viable seedlings grown in aquaria, or mature plants taken from healthy donor beds to the restoration site. Standard planting techniques offer low to moderate risk, though they tend to be extremely labour intensive, requiring divers to plant the individual units by hand. The newly transplanted eelgrass bed will likely be fully functioning habitat within one or two growing seasons, implying a short temporal loss in productivity.

9.1.2 Kelp Reefs

Kelp beds and subtidal habitat will be lost as a result of infilling for the Fairview Terminal expansion. To directly replace these lost kelp beds and to compensate for the infilled intertidal and subtidal habitats, it is proposed that artificial kelp reefs be established. This will entail the construction of subtidal rock reefs and the transplanting of kelp. This approach has been successful elsewhere on the Pacific coast; an artificial kelp reef was successfully established near San Clemente Pier in California as a compensation measure for the San Onofre Nuclear Generating System (SCE 2011, Internet site). This reef was subsequently colonized by large canopy-forming kelps and provides habitat for a diverse and abundant assemblage of fish species.

Compensation techniques will involve the collection and out-planting of juvenile bull kelp from natural populations near the Project footprint. Collections could take place in nearby sites from the lower intertidal in early spring, where the bull kelp juveniles often recruit to but are not likely to survive. Transplant of materials from sites of close proximity is preferable because genetic integrity of the local population will not be compromised, and these genotypes are likely adapted to conditions found in the local area. If planting is completed in the first growing season after disruption of habitat, there will be no temporal loss of habitat, because in natural populations, bull kelp regenerates from microscopic stages annually.

Habitat requirements for kelps include: hard substrate for recruitment, moderate levels of water motion, absence of excessive silt, and light for photosynthesis. The subtidal environment along the west side of Kaien Island appears suitable for kelp growth, as evidenced by the fringing beds of bull kelp located near the mouth of Casey Creek. The limiting factor in this area is hard substrate for attachment; most of the existing substrates are too fine to provide adequate anchoring points. Construction of the artificial rock reefs will provide a strong foundation for the establishment of bull kelp and understory kelps.

The proposed location of the kelp reefs is to the south of the Fairview Terminal, along the west side of Kaien Island (Figure 15). A sediment transport model conducted for the Project predicted that terminal expansion could result in the accumulation of fine sediments at two locations south of the existing Fairview Terminal (see Figure R in Worley Parsons 2010). Sedimentation of rocky reef habitats can have adverse effects on habitat-forming kelps, including reduced attachment success and increased mortality (Schiel et al. 2006). To ensure that the kelp reefs are not adversely affected by sedimentation, they will not be constructed in the two areas where sediment accumulation is predicted to occur.

The current approach is to construct a series of reefs adjacent to one another along the west side of Kaien Island. This approach is considered preferable to a single contiguous reef for several reasons. First, a series of reefs will have more edge habitat, which is commonly used as foraging habitat by fish. Second, separating the reefs will increase water flow and light penetration around the individual kelp beds, promoting kelp establishment and growth. Third, marine organisms that prefer soft sediment habitats will be able to persist between the reefs and will not be excluded from a single, large area. Several engineering and design variables for the kelp reefs are yet to be determined, including the size and type of rock used to build the reefs, the shape and height of the reefs above the seafloor, and the location and depth of kelp planting. These variables will be determined through the detailed design process, and will be presented in the final habitat compensation plan.

Successful establishment of the kelp reef is probable, as bull kelp is a native species already occurring in the area. As an annual species, it grows quickly and will be in place the first year. Although bull kelp has high reproductive rates, establishment of a functioning (i.e., self-regenerating and fully colonized) kelp reef will likely to take two to five years.

Benefits of using kelp reefs in habitat compensation plans are myriad. Increasing the biomass of kelp in the region will result in increases in primary productivity, regulation of nutrients by direct assimilation of nitrogen and phosphorus, and increased oxygen production in the marine system. Kelps provide important habitat for salmonids, herring, juvenile surf smelt, rockfish, lingcod, Dungeness crab and red rock crab. Replacing the existing subtidal habitat with kelp reefs will increase the structural complexity of marine fish habitats. While the existing subtidal habitat has only epibenthic and infaunal components, the proposed kelp reef ecosystem maintains these epibenthic and infaunal components, while introducing rock surfaces, interstitial spaces, fronds, and canopy. Furthermore, increased amounts of beach wrack will result on shores after storms. These additional habitat components mean that five habitat types will compensate for two extant types. The productive capacity of the kelp reefs is expected to be far greater than that of the existing habitat.

9.1.3 Intertidal Fish Nursery

To increase productive capacity of marine habitats for juvenile fish (e.g., salmon, herring, and rockfish), it is proposed that a shallow embayment be created adjacent to the southern terminal expansion (Figure 15). This approach follows on success with a similar project at the BC Ferry terminal in Tsawwassen. The embayment will be enclosed on three sides by the shore, the expanded terminal, and a constructed rock berm on the seaward side. The south end will be open to allow entry and exit of fish and for tidal flow.

To increase habitat complexity for use by juvenile fish, the embayment will be engineered to promote the growth of eelgrass. This will involve raising the seabed to a depth that is suitable for eelgrass growth through the addition of soft sediment material (e.g., sand, mud). As a result, the embayment will constitute an area characterized by lower current flows, shallower water, increased coverage and protection from predators. This embayment will provide a refuge for juvenile salmon migrating from Skeena outward (along the Kaien coastline). Eelgrass will be transplanted into the embayment and riparian or salt marsh vegetation will be planted along the east side, thus increasing primary productivity and habitat complexity. It is expected that the kelp reefs and the intertidal fish nursery will work synergistically to benefit juvenile salmon migrating along the Kaien Island shoreline.

Construction of the intertidal fish nursery will result in the loss of some existing eelgrass and bull kelp habitat. These losses have been quantified (see Section 8) and appropriate compensation will be provided. Despite these losses, the overall productive capacity of the fish nursery will be substantially greater than the existing habitat. By creating an environment suitable for eelgrass, the transplanted bed will expand over time, creating additional high-value habitat for juvenile fish. Following construction of the intertidal fish nursery, it is expected to take one to two years for the transplanted eelgrass and riparian vegetation to become fully established.

The intertidal fish nursery will be constructed within one of the areas predicted to accumulate sediments following the expansion of the Fairview Terminal (Worley Parsons 2010). Based on the sediment transport model, changes to seabed elevation should be evident within three months of the completion of Project construction (Stage 2). To ensure that the fish nursery habitat is not adversely affected by heavy sedimentation, its construction should be delayed until the true nature and extent of sediment accretion (or erosion) is known. A three month monitoring period should be sufficient to detect changes that could compromise the success of the compensation habitat. If only minor changes are observed after three months, construction of the intertidal fish nursery will proceed as planned. If dramatic changes are observed and/or there is evidence of ongoing sediment accumulation, it may be necessary to construct an alternate type of compensation habitat. This would likely take the form of additional kelp reefs, which would be located along the southwest side of Kaien Island, well away from the area of sediment accumulation.

9.1.4 Shallow Reefs

To compensate for the loss of intertidal habitat, it is proposed that a series of rock reefs be constructed along the west side of Kaien Island. These reefs differ from the proposed artificial kelp reefs in that rock material is piled together to provide a more three dimensional structure so that a portion of the reef is exposed at low tide. Construction of the shallow reefs will increase the structural complexity of the nearshore marine environment, providing habitat for both intertidal and subtidal organisms. Crevices of varying size in the interstitial spaces of rock reefs are well documented to provide excellent habitat for a wide variety of resident fish. The open matrix of a well-constructed reef also promotes exposure to tidal flushing that increases food and oxygen availability within the reef structure itself. Additionally, the presence of these reef segments provides anchoring sites that may promote the proliferation of invertebrate and seaweed communities, further contributing to habitat diversity and productivity.

The shallow reefs should be constructed in close proximity of the kelp reefs to allow fish and other mobile species to move between the compensation habitats (Figure 15). Constructing the reefs close together will also promote colonization by invertebrate larvae and seaweed propagules. It is likely that the shallow reefs will be naturally colonized by bull kelp originating from the artificial kelp reefs. The specific locations of the shallow reefs will be determined through the detailed design process.

Colonization of the subtidal reefs by marine organisms will begin immediately after construction; however, the establishment of a fully functioning rock reef community is expected to take two to three years.

9.1.5 Marine Riparian Compensation

As discussed in Section 7.5, the modified marine riparian vegetation that will be lost as a result of the Project is comprised of a narrow band of small shrubs and trees and likely has little or no value as fish habitat. It is expected that this type of vegetation will naturally regenerate along the Kaien Island shoreline adjacent to the rail sidings, but will continue to be maintained by CN. Therefore, no additional compensation is considered necessary.

To compensate for the loss of natural marine riparian vegetation, it is impractical to plant similar vegetation along the Kaien Island shoreline. To support the rooting of transplanted terrestrial vegetation, substantial amounts of soil would be required to cover the rocky substrate; this is economically prohibitive. Furthermore, habitat compensation would be required to account for the intertidal habitat infilled to create this habitat for trees, and the loss of this habitat to marine fish would not be worth the minimal benefits that riparian vegetation may provide.

Compensation for lost natural marine riparian vegetation will be provided, in part, through the creation of a saltwater wetland riparian area along the east side of the fish nursery habitat. A variety of native salt-tolerant species will be planted, including Lyngbye's sedge (*Carex lyngbyei*), seaside plantain (*Plantago maritima*), Arctic rush (*Juncus arcticus*), Alaska alkali grass (*Puccinellia nutkaensis*), sea arrow-grass (*Triglochin maritima*) and sea milkwort (*Glaux maritima)*. These wetland plants will contribute organic detritus to the fish nursery habitat, which will promote the growth of transplanted eelgrass. The wetland plants will also attract birds and insects, creating a more biologically diverse shoreline habitat.

Additional compensation for lost natural marine riparian vegetation will be provided through the creation of subtidal kelp reefs. This habitat type provides direct benefits to marine fish and is considered to have a much higher value than the lost riparian vegetation.

9.2 Timing and Access to Compensation Sites

All of the compensation features described in Sections 9.1 and 9.2 are proposed to be constructed on lands that are currently held by PRPA. The construction of these features will be staged to mirror the HADD incurred during Stage 1 and Stage 2 of Project construction. Stage 1 will involve the construction of kelp reefs and shallow reefs. Stage 2 will involve the construction of the fish nursery habitat (including eelgrass transplants and riparian planting), and the construction of additional kelp reefs and shallow reefs.

To minimize the temporal loss of productive capacity, the kelp reefs and shallow reefs should be established prior to Project construction. This will allow marine organisms to begin colonizing the reefs before marine habitats are lost within the Project footprint. If this is not feasible due to logistical constraints, the reefs should be constructed within six months of Project completion. Once the reefs have been established, they should be left to settle for at least one month before kelp transplants are undertaken.

The intertidal fish nursery will be constructed as part of the compensation for Stage 2. Because the nursery habitat will be enclosed on the northern end by the expanded terminal, it cannot be constructed until after the southern expansion is completed. Due to concerns regarding potential sediment accumulation south of the expanded terminal, construction should be delayed until the true nature and extent of sedimentation has been characterized. As discussed previously, the proposed monitoring period is three months.

9.3 Marine Habitat Balance

Compensation for lost or disturbed marine fish habitats will be provided through the creation of four marine habitat types: subtidal kelp reef habitat; shallow boulder reef habitat; intertidal fish nursery habitat; and saltwater wetland riparian habitat. The following sections describe the type and amount of compensation that will be provided for each type of habitat affected by the Project. Compensation ratios are presented as the amount of compensation habitat to the amount of affected habitat.

9.3.1 Eelgrass Habitat Loss

The eelgrass beds that are expected to be lost are small and patchily dispersed along the low intertidal zone of the affected shoreline. Eelgrass ecosystems hold relatively high productive capacity; however, they are not limited in the area as large continuous eelgrass beds are located south of the terminal outside the Project footprint. Eelgrass lost during Stage 1 will be compensated for with the creation of kelp reefs. Eelgrass lost during Stage 2 will be replaced with one continuous eelgrass bed within the fish nursery habitat. The productive capacity of the compensation habitats will be equivalent to or higher than the lost eelgrass habitat; however, to account for potential temporal loss of productive capacity, eelgrass will be compensated for at a ratio of 2:1.

9.3.2 Kelp Habitat Loss

Kelp beds provide high quality habitat for nearshore fish and are considered to have moderate to high productive capacity. Compensation for lost kelp beds will be incorporated into the larger artificial kelp reef system that is proposed as compensation for subtidal and intertidal substrate loss. Little to no temporal lag is anticipated, and productive capacity of the compensated habitat will be equivalent to or higher than the existing habitat; therefore, kelp will be compensated for at ratio of 1:1.

9.3.3 Subtidal Substrate Loss

The subtidal substrate within the Project footprint is composed of mixed mud, sand, cobble and boulder and is not limited in Prince Rupert harbor or the larger area. The loss of this type of habitat represents a small fraction of the subtidal substrate available in the region. To compensate for lost subtidal habitat, a series of artificial kelp reefs and shallow boulder reefs are proposed. These reefs will enhance productive capacity by increasing structural complexity and species diversity. In addition to maintaining habitat for benthic and infaunal species, increased vertical structure of the kelp forest and reef components will increase habitat complexity and will attract additional marine species to the area. This, in turn, increases food production and enhances local productivity. A temporal loss of productive capacity is not expected because the reefs will be established either before or during Project construction. Due to the substantial increase in productive capacity that is expected to result from the compensation habitat, subtidal substrate will be compensated for at a ratio of 2:5. It is expected that once the reefs are fully functional, they will provide a net increase in local productive capacity.

9.3.4 Subtidal Substrate Disturbance

Dredging at the northern and southern terminal expansion sites will temporarily disturb subtidal substrates. Although marine organisms occupying this habitat will be displaced or lost, the affected area will be immediately available for colonization following the completion of dredging activities. To account for the temporal loss of productive capacity, it is proposed that an additional area of 1,000 m^2 be added to the kelp reefs (500 m^2 for Stage 1 and 500 m^2 for Stage 2). The long-term productive capacity of this compensation habitat is expected to greatly exceed that of the disturbed substrates.

9.3.5 Intertidal Substrate Loss

Much of the shoreline affected by the Project has been previously modified by human development, including construction of the Fairview Terminal and the existing rail line. Compared to unaltered shoreline habitats in the Prince Rupert region, the shoreline along the west side of Kaien Island is generally lacking in structural complexity and biological diversity. Compensation for lost intertidal substrates will be provided through a combination of three fish habitat types: intertidal fish nursery habitat, kelp reef habitat, and shallow reef habitat. This suite of compensation features will increase the structural complexity of nearshore habitats, leading to increased species diversity and abundance. Together, the reefs and eelgrass bed will provide foraging, rearing and spawning habitat for a myriad of marine species, including salmon, herring, rockfish, lingcod, Dungeness crabs and red rock crabs.

Project construction will result in a temporary, localized reduction in the productive capacity of intertidal habitats, particularly along the west side of Kaien Island. However, within two to three years, the fully established compensation habitats will have much higher productive capacity than the existing intertidal habitat. The kelp reefs and eelgrass bed will contribute large amounts of organic carbon and other nutrients to the local environment, promoting the proliferation of prey communities. This large prey base, combined with an abundance of complex physical habitat (e.g., rock crevices, kelp canopies) will provide food and refuge for a number of harvested species. Given this expected increase in productive capacity, compensation for lost intertidal substrates will be provided at a ratio of 2:3.

9.3.6 Marine Riparian Vegetation Loss

As it is not practical to replace the marine riparian vegetation at the site and there are no locations in the region where this type of habitat restoration would be suitable, compensation for lost marine riparian vegetation will be provided primarily through the creation of subtidal kelp reefs. Given the substantially higher productive capacity of kelp reef habitat, compensation will be provided at a ratio of 1:4. Additional compensation for lost marine riparian vegetation will be provided through the establishment of a saltwater wetland riparian area adjacent to the intertidal fish nursery habitat. This wetland habitat will be constructed and planted following Stage 2 of Project construction.

9.3.7 Summary of Marine Habitat Compensation

The total area of marine HADD associated with the Project is 354,888 m^2, which includes 241,228 m^2 for Stage 1 and 113,660 m^2 for Stage 2. Tables 6, 7 and 8 outline the types and amounts of compensation habitat that will be developed to offset this marine HADD. Based on this Preliminary Habitat Compensation Plan, the 354,888 m^2 of fish habitat affected by the Project will be compensated for with the creation of 176,816 m^2 of high value fish habitat. The new habitat will be designed to provide substantially improved migration and rearing habitat for nearshore and juvenile fish, but is also expected to benefit benthic communities and enhance the overall aesthetic in the harbour.

Table 6: Type and Amount of Marine Fish Habitat Compensation Associated with the Stage 1 of Project Construction

Marine Habitat Type	Compensation Component	Proposed Ratio	Area (m^2)		
			Habitat Loss/ Disruption	Habitat Compensation	Net Difference
Eelgrass habitat (loss)	Kelp reefs	2:1	334	668	+334
Kelp habitat (loss)	–	–	0	0	0
Intertidal substrate (loss)	Kelp reefs, shallow reefs	2:3	128,011	65,000 (kelp reefs) 20,341 (shallow reefs)	-42,670
Subtidal substrate (loss)	Kelp reefs, shallow reefs	2:5	16,865	3,746 (kelp reefs) 3,000 (shallow reefs)	-10,119
Subtidal substrate (disturbance)	Kelp reefs	N/A*	28,212	500	-27,712
Natural marine riparian (loss)	Kelp reefs	1:4	42,101	10,526	-31,575
Modified marine riparian (loss)	Modified marine riparian	1:1†	25,705	25,705	0
Total Marine Habitat			**241,228**	**129,486**	**-111,742**

NOTES:
* Compensation provided for temporal loss of productive capacity
† Modified marine riparian vegetation is expected to naturally regenerate along the affected shoreline

Table 7: Type and Amount of Marine Fish Habitat Compensation Associated with the Stage 2 of Project Construction

Marine Habitat Type	Compensation Component	Proposed Ratio	Area (m^2)		
			Habitat Loss/ Disruption	Habitat Compensation	Net Difference
Eelgrass habitat (loss)	Eelgrass transplants	2:1	1,391	2,782	+1,391
Kelp habitat (loss)	Kelp reefs	1:1	4,075	4,075	0
Intertidal substrate (loss)	Intertidal fish nursery	2:3	26,440	17,627	-8,813

Marine Habitat Type	Compensation Component	Proposed Ratio	Area (m^2)		
			Habitat Loss/ Disruption	Habitat Compensation	Net Difference
Subtidal substrate (loss)	Kelp reefs, shallow reefs	2:5	50,264	10,106 (kelp reefs) 10,000 (shallow reefs)	-30,158
Subtidal substrate (disturbance)	Kelp reefs	N/A*	31,426	500	-30,926
Natural marine riparian (loss)	Saltwater wetland	1:1	64	2,240	+2,176
Modified marine riparian (loss)	–	–	0	0	0
Total Marine Habitat			**113,660**	**47,330**	**-66,330**

NOTES:
* Compensation provided for temporal loss of productive capacity
† Modified marine riparian vegetation is expected to naturally regenerate along the affected shoreline

Table 8: Type and Amount of Marine Fish Habitat Compensation Associated with the Project at Full Build Out

Marine Habitat Type	Compensation Component	Proposed Ratio	Area (m^2)		
			Habitat Loss/ Disruption	Habitat Compensation	Net Difference
Eelgrass habitat (loss)	Eelgrass transplants, Kelp reefs	2:1	1,725	2,782 (eelgrass) 668 (kelp reefs)	+1,725
Kelp habitat (loss)	Kelp reefs	1:1	4,075	4,075	0
Intertidal substrate (loss)	Kelp reefs, shallow reefs, Intertidal fish nursery	2:3	154,451	65,000 (kelp reefs) 20,341 (shallow reefs) 17,627 (fish nursery)	-51,483
Subtidal substrate (loss)	Kelp reefs, shallow reefs	2:5	67,129	13,852 (kelp reefs) 13,000 (shallow reefs)	-40,277
Subtidal substrate (disturbance)	Kelp reefs	N/A*	59,638	1,000 (kelp reefs)	-58,638
Natural marine riparian (loss)	Kelp reefs	1:4	42,101	10,526	-31,575
	Saltwater wetland	1:1	64	2,240	+2,176
Modified marine riparian (loss)	Modified marine riparian	1:1†	25,705	25,705	0
Total Marine Habitat			**354,888**	**176,816**	**-178,072**

NOTES:
* Compensation provided for temporal loss of productive capacity
† Modified marine riparian vegetation is expected to naturally regenerate along the affected shoreline

At full build out of the Project, the following total areas of marine fish habitats will be created:

- 2,782 m^2 of eelgrass habitat
- 17,627 m^2 of intertidal fish nursery habitat
- 94,453 m^2 of kelp reef habitat
- 33,341 m^2 of shallow reef habitat
- 2,240 m^2 of saltwater wetland habitat

Together, these marine compensation features will provide habitat for a myriad of fish, invertebrate and algal species. Their development will increase the structural complexity of the nearshore marine environment, enhance local primary production, and increase the productive capacity of marine fish habitats.

10 MONITORING PROGRAM

PRPA and CN will implement a monitoring program for each of their associated portions to ensure that the habitat compensation works are successful and meet the objectives of the plan. The monitoring program will consist of compliance monitoring, to ensure that compensatory habitats are constructed in accordance with the plan, and effectiveness monitoring, to ensure that the compensatory habitats are functioning as intended after construction.

10.1 Compliance Monitoring

Compliance monitoring for the compensation works will be integrated into the supervision of compensation habitat construction. A biologist will be on-site during start-up, at critical periods of the construction, and when sections of new stream channel are tied-in. Information to be documented during construction will include:

- Written and photo-documented sequence of events during construction
- Any changes in the design that are necessary to adapt to unanticipated conditions
- Technical issues that arise during construction and how they were addressed
- Confirm that all habitat compensation components meet design requirements
- Confirm that all terms and conditions of the DFO Authorization are met

An as-built report will be submitted to DFO within 90 days of compensation habitat construction

10.2 Freshwater Habitat Effectiveness Monitoring

Effectiveness monitoring will be facilitated by the previous fish sampling exercises conducted in the compensation area on behalf of DFO North Coast. Starting one year after completion of the Sacred Tree Creek and Hayes Pit Road habitat improvement works, CN and/or PRPA would commence a five year monitoring program conducted by qualified professionals to demonstrate the success of the compensatory habitat works, as required by the DFO Authorization for the Project. In years one, three and five, this monitoring program would include:

- Water quality assessment (e.g., dissolved oxygen, temperature, pH and turbidity)
- Assessment of physical stability of the bed and banks of the new channel
- Physical habitat assessment including determination of substrate composition
- Determination of the survival and growth of shrubs and trees planted to revegetate riparian habitats along the new channel
- Aerial photography
- Topographic surveys
- Establishment of photo points for ground-based site photos
- Fish utilization monitoring will be conducted using minnow trapping or electrofishing, and visual observation (for spawners) to confirm the use of the new and enhanced instream habitat by salmonids for a) rearing during the moderate flow periods of early spring and late summer/fall and b) spawning during the late summer/fall

In addition, flow and water temperature would be monitored in the new channel habitat over all five years.

Flow monitoring will be conducted using a data logging pressure sensor. Flow will be calculated based on water depth and channel characteristics in the channel. The flow data will be calibrated with in situ flow measurements taken twice a year for the same period, concurrent with the fish sampling described below. Temperature data will be collected using a data logger. This data will be complemented by *in situ* measurement of temperature, pH, and dissolved oxygen conducted twice annually concurrent with the fish sampling described below do determine if water quality is suitable for salmonids.

Stability monitoring will involve the use of visual observations against standard benchmarks (i.e. mature trees or large boulders outside of the channel) to document erosion, bank stability, bed load movement and integrity of constructed features (e.g., large woody debris structures) relative to as-build conditions. The new channel habitat will be considered stable if the channel bed, banks, pools, and habitat enhancement features (e.g., boulder clusters and large woody debris) maintain their function through the five year monitoring program.

Physical habitat assessments will be conducted in years one, two, three and five to document channel development and changes in substrate and riparian habitat. The objective of this assessment is to confirm the type and quantity of fish habitat present.

Monitoring of planted shrubs will be conducted to determine the survivorship and health of any trees or shrubs planted. The planting work will be considered successful if there is an 80 percent survival rate of the planted trees and shrubs or if natural recruitment provides an equivalent plant density (based on the 80 percent survivorship criterion). If this target is not realized in year three additional planting will take place to meet it.

Fish sampling (via minnow trapping and/or electrofishing for juveniles and visual observation for spawners) will be conducted in early spring and late summer/fall of years one, three, and five to document fish use in each habitat type (pool, riffle, run), relative use of the habitat features (based on catch per unit effort and density) and the size and species of fish present in each habitat type. Fish collected will be identified to the most refined taxonomic level possible (i.e., species or genus) and length and weight will be recorded along with an estimation of their age class. Productive capacity of the new habitat will be established by these data. However, the success of the new channel should not be based on fish presence and abundance but rather on whether usable fish habitat has been provided, as the spatial and temporal distribution of fish can be highly variable.

A georeferenced digital aerial image of the compensation site will be taken, specifically for the project, in years one and five to support an accurate quantification of habitat gained and any morphological changes that have occurred during the monitoring period.

As-built topographic surveys will be conducted upon completion of construction and by the end of the fifth year of monitoring. If the compensatory freshwater habitat is not considered to be functioning as intended by year 5 of the monitoring program, a work plan will be developed to meet the success criteria or additional compensation options will be considered.

10.3 Marine Habitat Effectiveness Monitoring

Starting one year after completion of each component of the final suite of marine habitat compensation measures, CN and PRPA will commence a five-year monitoring program to demonstrate the success of the compensatory habitat works as required by the DFO Authorization(s) for the Project. Many of the components of this monitoring program will require surveys by vessel, SCUBA, or remote-operated vehicle (ROV) with video capabilities. This monitoring program will examine:

- Yearly survival of eelgrass transplants
- Yearly recruitment of kelp sporophytes
- Physical stability of artificial reef components
- Yearly rates of sediment deposition over hard reef and soft substrate components
- Colonization of artificial reef components by invertebrate epifauna and macroalgae
- Fish utilization of the constructed habitat in years one, three and five

Monitoring of eelgrass will be conducted to determine the survivorship and health of transplants. The planting work will be considered successful if there is an 85 percent survival rate of the eelgrass transplants or if natural recruitment provides an equivalent plant density (based on the 85 percent survivorship criterion).

Yearly monitoring of kelp reefs will be undertaken to determine the ability of the kelp reef to self-replenish. The transplants will be considered successful if the kelp forest returns each year at a density of 50 percent or greater of the original transplanted density. Monitoring should take place in early summer. This ability to maintain population structure within the kelp reef area is a key requirement of success of this approach because bull kelp dies off each year; therefore, annual regeneration of the kelp forest is a requirement for long-term persistence of this habitat. If the density criteria are not met each year, additional transplants should be in place before midsummer each year.

Stability monitoring will involve the use of visual observations against standard benchmarks (i.e., pilings or large boulders in close proximity) to document integrity of constructed features (e.g., hard substrate for kelp reefs, sides of the intertidal fish nursery, and shallow reefs). In addition, distortion of reef arrangements can be assessed by boat using GPS and depth soundings where appropriate. If, by the end of the five-year monitoring program, the reef components are within a 10% tolerance of original design specifications, then these measures will be considered successful.

Sediment deposition rates will be assessed yearly to ensure that: a) at least 70 percent of the exposed horizontal surfaces of the hard substrate components of the kelp reef do not become obscured in sediment; and b) eelgrass within the intertidal fish nursery should have greater than 70 percent of the bottom covered in sediment exceeding 3 inches in depth to promote and sustain rooting. However, these success criteria may be waived providing the criterion for eelgrass and kelp densities are consistently met over the period of monitoring.

Invertebrate utilization monitoring will be conducted to confirm the use of the kelp reefs, intertidal fish nursery, and shallow reefs by sessile and mobile invertebrate epifauna, (including sea cucumbers, anemones, seastars, sea pens, hydrocorals, red rock and Dungeness crabs, and sea urchins), and by macroalgae.

Fish utilization monitoring will be conducted to confirm the use of the kelp reefs, intertidal fish nursery, and shallow reefs by salmonids, rockfish, lingcod and other nearshore fish species. The monitoring program will document fish use in each habitat type, relative use of the habitat features (based on catch per unit effort and density) and the size and species of fish present in each habitat type.

If success criteria are not achieved by year five, a work plan will be developed to meet the success criteria. The work plan may include such measures as: planting additional eelgrass shoots or kelp sporophytes within the compensation areas, amending the sediments within the compensation area(s) to improve the conditions for eelgrass colonization via rhizomal growth and/or establishment of eelgrass seeds; building up the reef components to promote sediment flushing by currents; and replanting of other areas that have conditions suitable for eelgrass or kelp colonization.

10.4 Reporting

Results of compliance and effectiveness monitoring programs will be compiled annually and sent to DFO for review. After the fifth year of the effectiveness monitoring program, a summary report will be issued with recommendations based on the success of the compensation habitats. If the works have not met the objectives after five years, contingencies will be required under the Authorization.

11 SUMMARY HABITAT BALANCE

The compensatory work described in this PHCP has been prepared to support issuance of an Authorization, under Section 35(2) of the *Fisheries Act*, for the harmful alteration, disruption and destruction of fish habitat and demonstrate the Project's ability to meet DFO's *Policy for the Management of Fish Habitat*. Based on the compensation works described in this Plan, and environmental mitigation commitments made in the EA process, the Fairview Terminal Phase II Expansion Project meets DFO's guiding principle of "no net loss" of fish habitat and policy of "net gain" of habitat productive capacity.

11.1 Freshwater Habitat Balance Summary

The Project will impact freshwater fish habitats in streams flowing into Prince Rupert Harbour and a coastal pond. Specifically, HADD is associated with:

- Elimination of the lower portions of W2 due to terminal expansion, resulting in 649 m^2 of habitat loss
- The loss of 254 m^2 of fish habitat at W22 due to rail line siding work and wye construction
- The loss of 1,403 m^2 of fish habitat in freshwater/brackish pond habitat (Pond 4) due to siding works and construction of the wye

Areas of HADD requiring habitat compensation therefore include:

- 2,306 m^2 of aquatic fish habitat loss
- 15,527 m^2 of riparian habitat loss

To offset these impacts to fish habitat, PRPA and/or CN have proposed creating new channel habitat and riparian planting in the Sacred Tree Creek and Hayes Pit Road area of the Exchamsiks backchannel system, near Km 50 on Highway 16 W from Terrace. The creation of the new stream channel replaces the low productivity instream habitat lost or altered with high quality habitat that provides like for like habitat but with much greater productivity.

Should the compensatory habitat fail to function as intended, a contingency option has been identified involving eulachon spawning bed creation in the Khyex River. It is considered that this contingency option can meet the compensation requirements for the Project on productivity grounds.

11.2 Marine Habitat Balance Summary

The Project will impact nearshore marine fish habitats that fall within the Project footprint. Specifically, the loss and disturbance of fish habitat is associated with:

- The loss of subtidal and intertidal habitat from infilling required for the northern and southern expansion of the Fairview Terminal
- The disturbance of subtidal substrates from dredging required to provide under-keel clearance for cargo vessels calling on the Fairview Terminal

- The infilling of shoreline habitat associated with the construction of two additional rail sidings, a port access road and a maintenance road between the Fairview Terminal and the southwest tip of Kaien Island

Areas of habitat loss and disturbance considered to be a HADD and therefore requiring habitat compensation include:

- 1,725 m^2 of eelgrass habitat loss
- 4,075 m^2 of kelp habitat loss
- 154,451 m^2 of intertidal substrate loss
- 67,129 m^2 of subtidal substrate loss
- 59,638 m^2 of subtidal substrate disturbance
- 42,165 m^2 of natural marine riparian vegetation loss
- 25,705 m^2 of modified marine riparian vegetation loss

To offset these impacts to marine fish habitat, PRPA and CN are proposing a comprehensive habitat compensation program that includes the following components:

- 17,627 m^2 of intertidal fish nursery habitat creation adjacent to the southern terminal expansion
- 2,782 m^2 of eelgrass habitat creation (transplants) within the intertidal fish nursery
- 94,453 m^2 of artificial kelp reef habitat creation along the west side of Kaien Island
- 33,341 m^2 of shallow reef habitat creation along the west side of Kaien Island
- 2,240 m^2 of saltwater wetland habitat creation adjacent to the intertidal fish nursery
- 25,705 m^2 of natural revegetation of modified marine riparian vegetation along the affected shoreline

Within the marine environment, this compensation plan replaces large areas of relatively homogeneous subtidal and shoreline habitat with more structurally diverse and higher quality fish habitat. The linkages between the intertidal fish nursery, the artificial kelp reefs and the shallow reefs will provide a highly functional marine ecosystem and will increase the quality and productivity of habitats available for marine fish. Implementation of the proposed compensation features is expected to result in a substantial increase in the productive capacity of marine fish habitats in the Prince Rupert region.

12 CLOSURE

This Preliminary Habitat Compensation Plan has been prepared by Stantec, on behalf of PRPA and CN to support issuance of a Section 35(2) *Fisheries Act* Authorization(s) for the Fairview Terminal Phase II Expansion Project (including Kaien siding). The information presented in this report is based on the best available engineering design and construction information. If you should have any questions or comments regarding the content of the plan, please contact the undersigned at 604-436-3014.

All compensation designs are preliminary and will require refinement of design components and suitable location for engineered structures.

Respectfully submitted,

Stantec Consulting Ltd.

Original signed by:

Ravi Chatterji, Ph.D.
Fisheries Scientist, Environmental Services
Email: ravi.chatterji@stantec.com

Original signed by:

Janine Beckett, M.Sc., R.P.Bio.
Marine Ecologist, Environmental Services
Email: janine.beckett@stantec.com

Reviewed by:

Original signed by:

Kara Hewgill, B.Sc.
Project Manager, Environmental Services
kara.hewgill@stantec.com

RC/JB/KH/mp/pf

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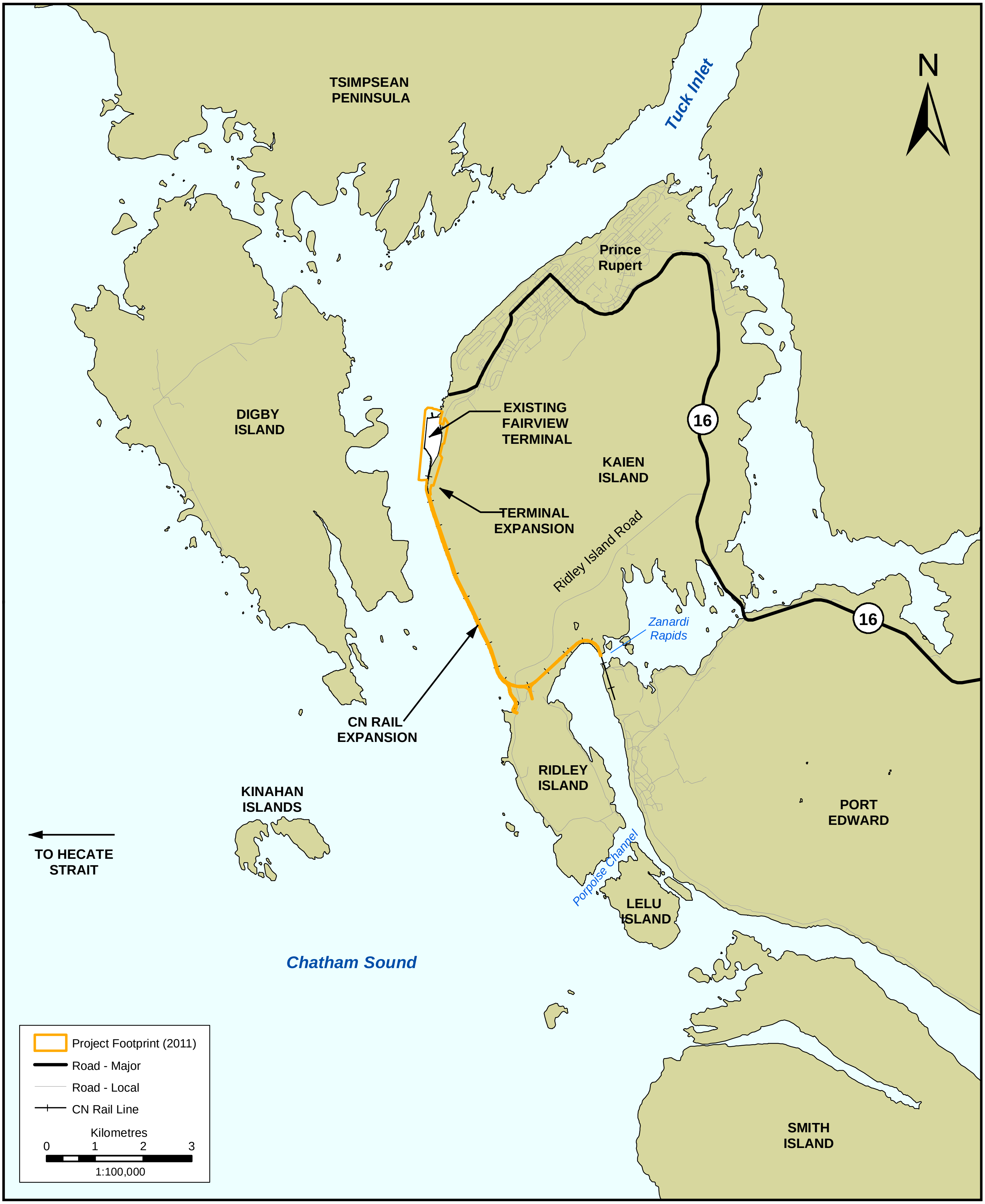
14 FIGURES

Please see the following pages.



PROJECT LOCATION HABITAT COMPENSATION	DRAWN BY NP	CHECKED BY GV	
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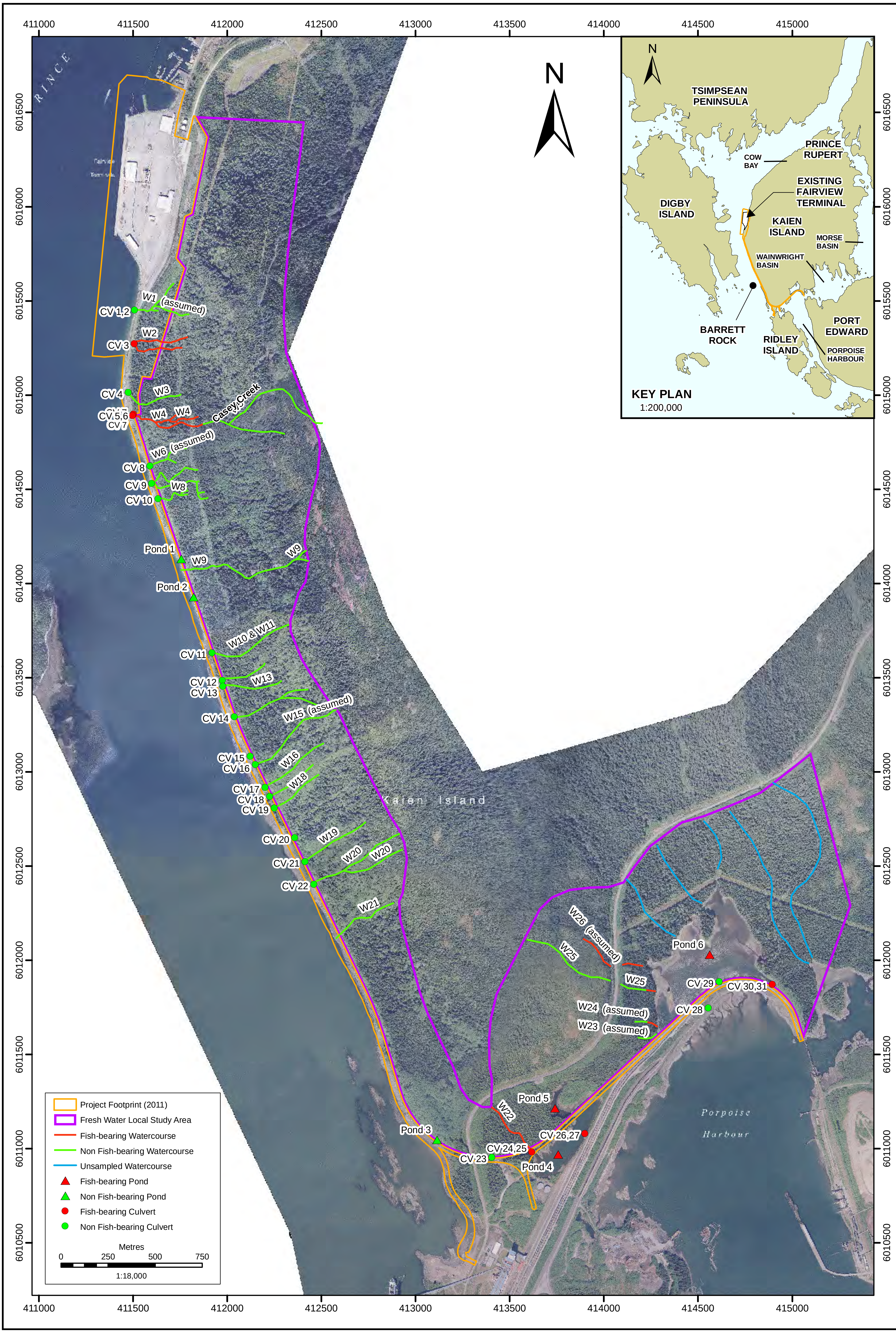

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PRINCE RUPERT PORT AUTHORITY

FRESHWATER LOCAL STUDY AREA SITE LOCATIONS AND CLASSIFICATIONS

HABITAT COMPENSATION

PROJECTION: UTM - Zone 9	DRAWN BY: NP
DATUM: NAD 83	CHECKED BY: GV
DATE: 02-FEB-12	FIGURE NO. 2

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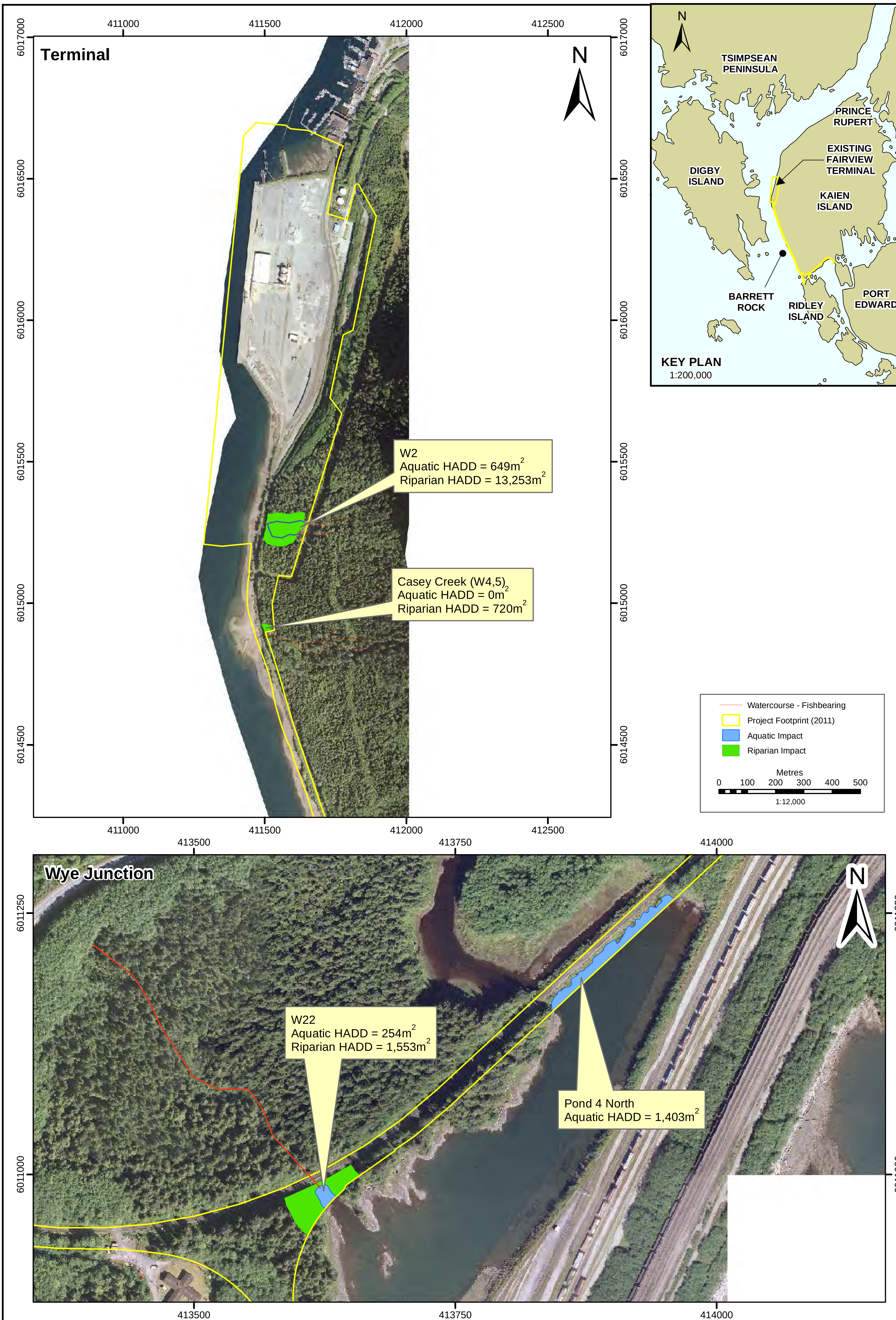

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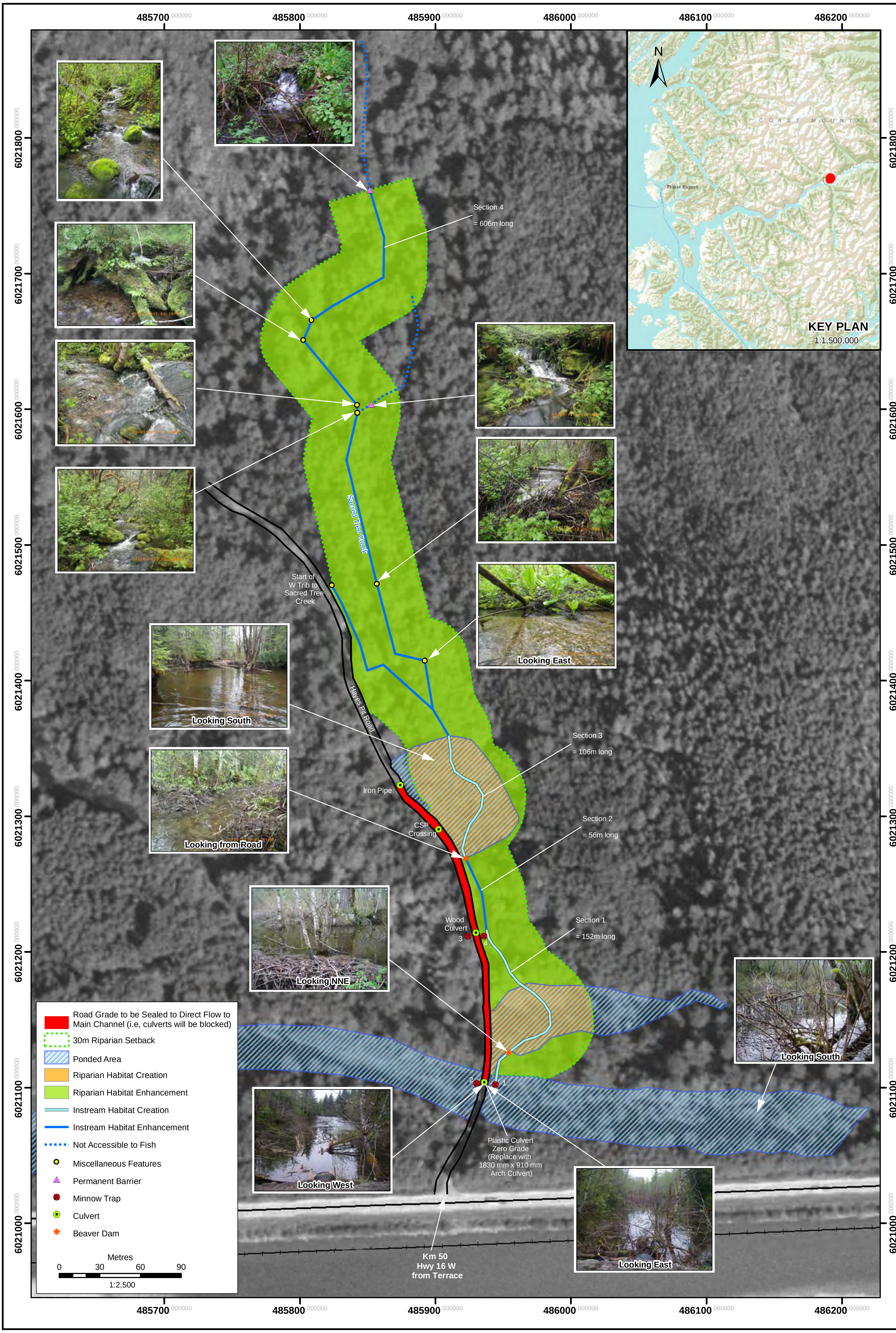

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PRINCE RUPERT PORT AUTHORITY

SACRED TREE CREEK AND HAYES PIT ROAD IMPROVEMENTS

HABITAT COMPENSATION PLAN

PROJECTION	UTM - Zone 9	DRAWN BY	SS
DATUM	NAD 83	CHECKED BY	GV
DATE	7/6/2012	FIGURE NO.	4

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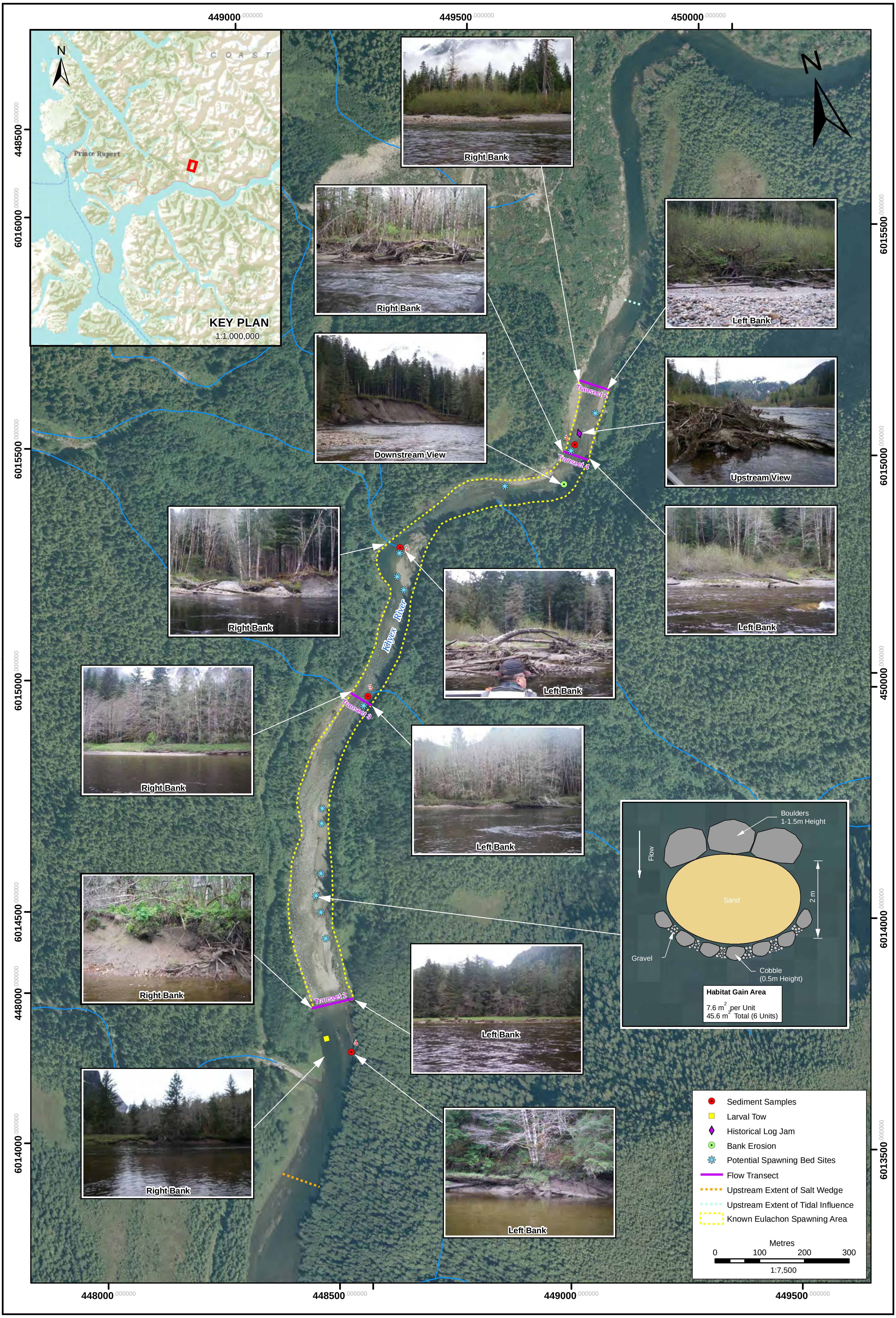

Stantec	CN PRINCE RUPERT PORT AUTHORITY	KHYEX RIVER EULACHON SPAWNING BED IMPROVEMENTS HABITAT COMPENSATION PLAN	PROJECTION UTM - Zone 9	DRAWN BY SS
			DATUM NAD 83	CHECKED BY GV
			DATE 16-May-12	FIGURE NO. 5

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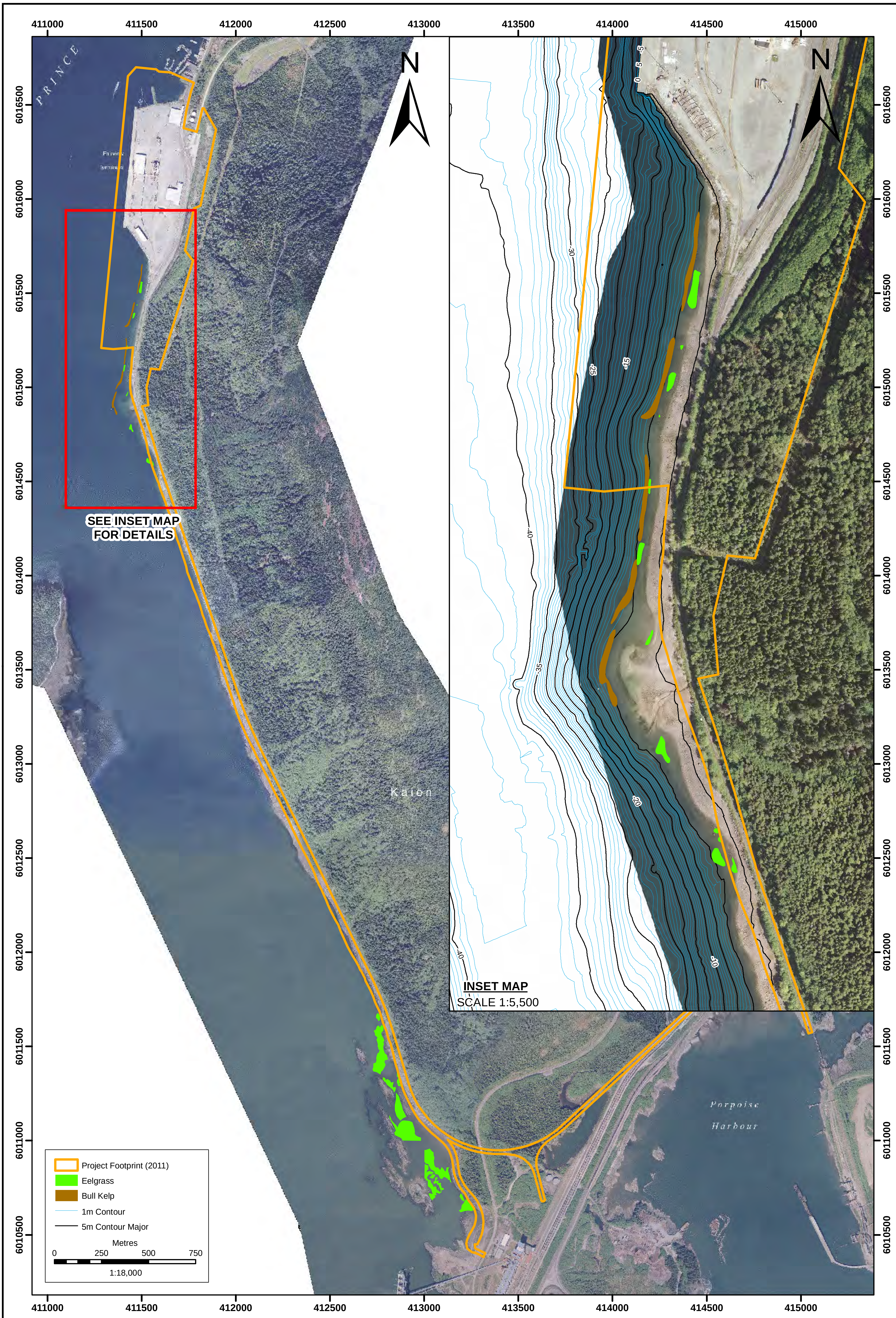

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CN

PRINCE RUPERT PORT AUTHORITY

LOCATION OF EELGRASS BEDS AND BULL KELP

MARINE ENVIRONMENT
PRELIMINARY HABITAT COMPENSATION PLAN

PROJECTION: UTM - Zone 9	DRAWN BY: NP
DATUM: NAD 83	CHECKED BY: SD
DATE: 09-FEB-12	FIGURE NO. 6

2/9/2012 - 8:54:13 AM R:\2010Stantec\123110003_Fairview_MarinePrelimHabitatCompPlan_2012\gis\Figures\123110003 Fig 6_LocationOfEelgrassBeds&BullKelp.mxd

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PRINCE RUPERT PORT AUTHORITY

STAGE 1 - MARINE HADD TERMINAL AREA

MARINE ENVIRONMENT
PRELIMINARY HABITAT COMPENSATION PLAN

PROJECTION	UTM - Zone 9	DRAWN BY	NP
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DATE	13-FEB-12	FIGURE NO.	7

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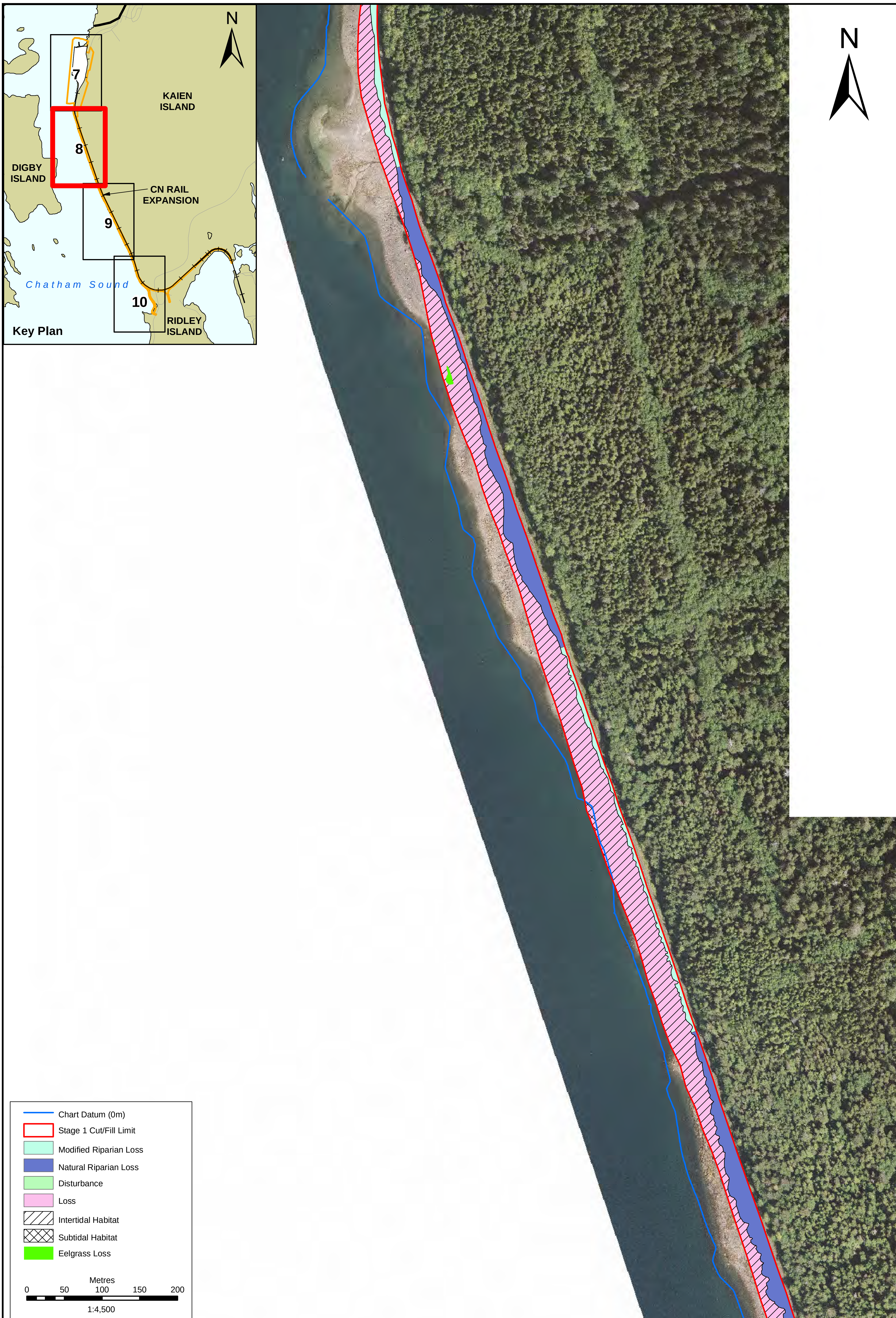

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PRINCE RUPERT PORT AUTHORITY

STAGE 1 - MARINE HADD
RAIL AND ROAD CORRIDOR (1/3)
MARINE ENVIRONMENT
PRELIMINARY HABITAT COMPENSATION PLAN

PROJECTION	UTM - Zone 9	DRAWN BY	NP
DATUM	NAD 83	CHECKED BY	SD
DATE	13-FEB-12	FIGURE NO.	8

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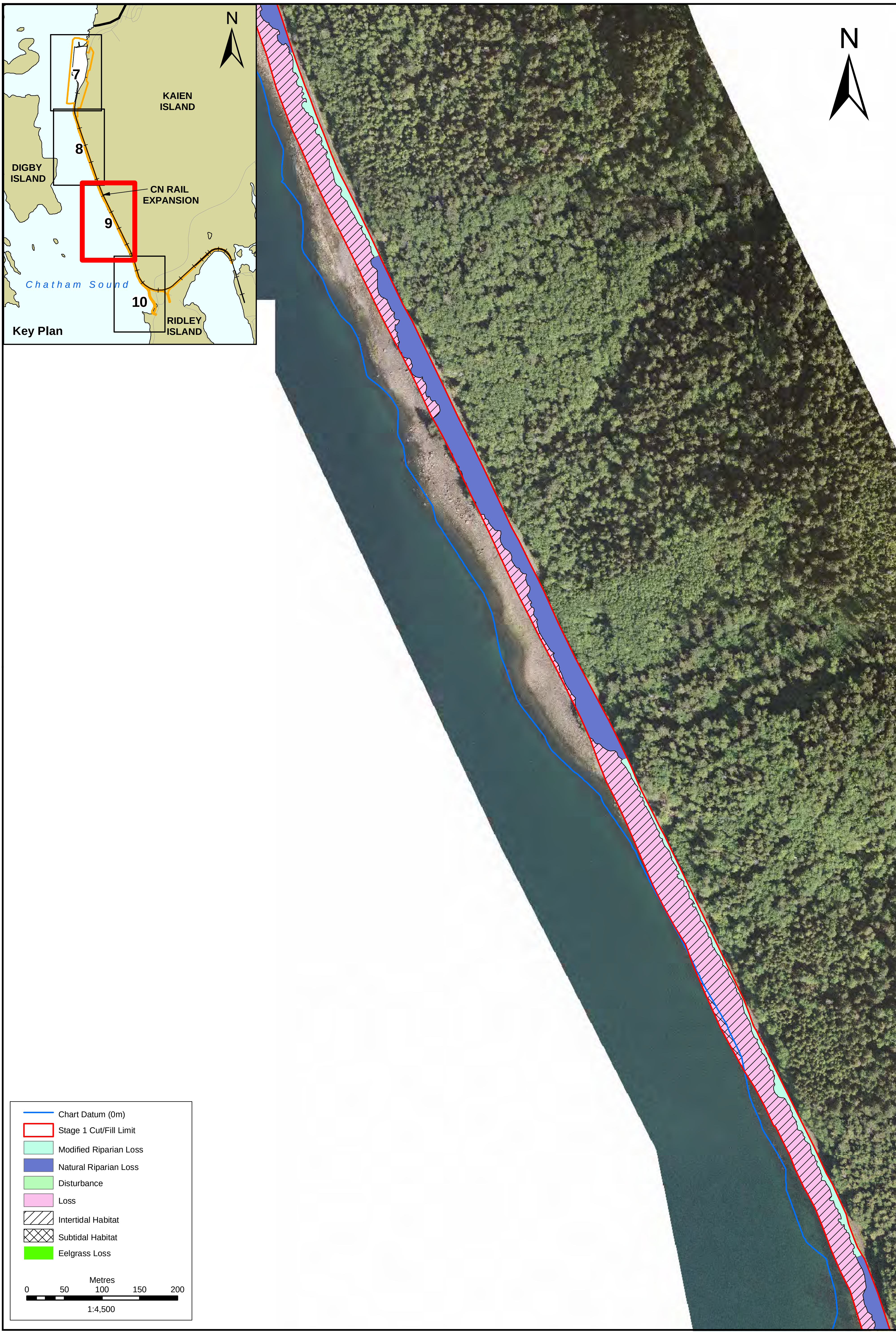

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PRINCE RUPERT PORT AUTHORITY

STAGE 1 - MARINE HADD
RAIL AND ROAD CORRIDOR (2/3)
MARINE ENVIRONMENT
PRELIMINARY HABITAT COMPENSATION PLAN

PROJECTION	UTM - Zone 9	DRAWN BY	NP
DATUM	NAD 83	CHECKED BY	SD
DATE	13-FEB-12	FIGURE NO.	9

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STAGE 1 - MARINE HADD
RAIL AND ROAD CORRIDOR (3/3)
MARINE ENVIRONMENT
PRELIMINARY HABITAT COMPENSATION PLAN

PROJECTION	UTM - Zone 9	DRAWN BY	NP
DATUM	NAD 83	CHECKED BY	SD
DATE	13-FEB-12	FIGURE NO.	10

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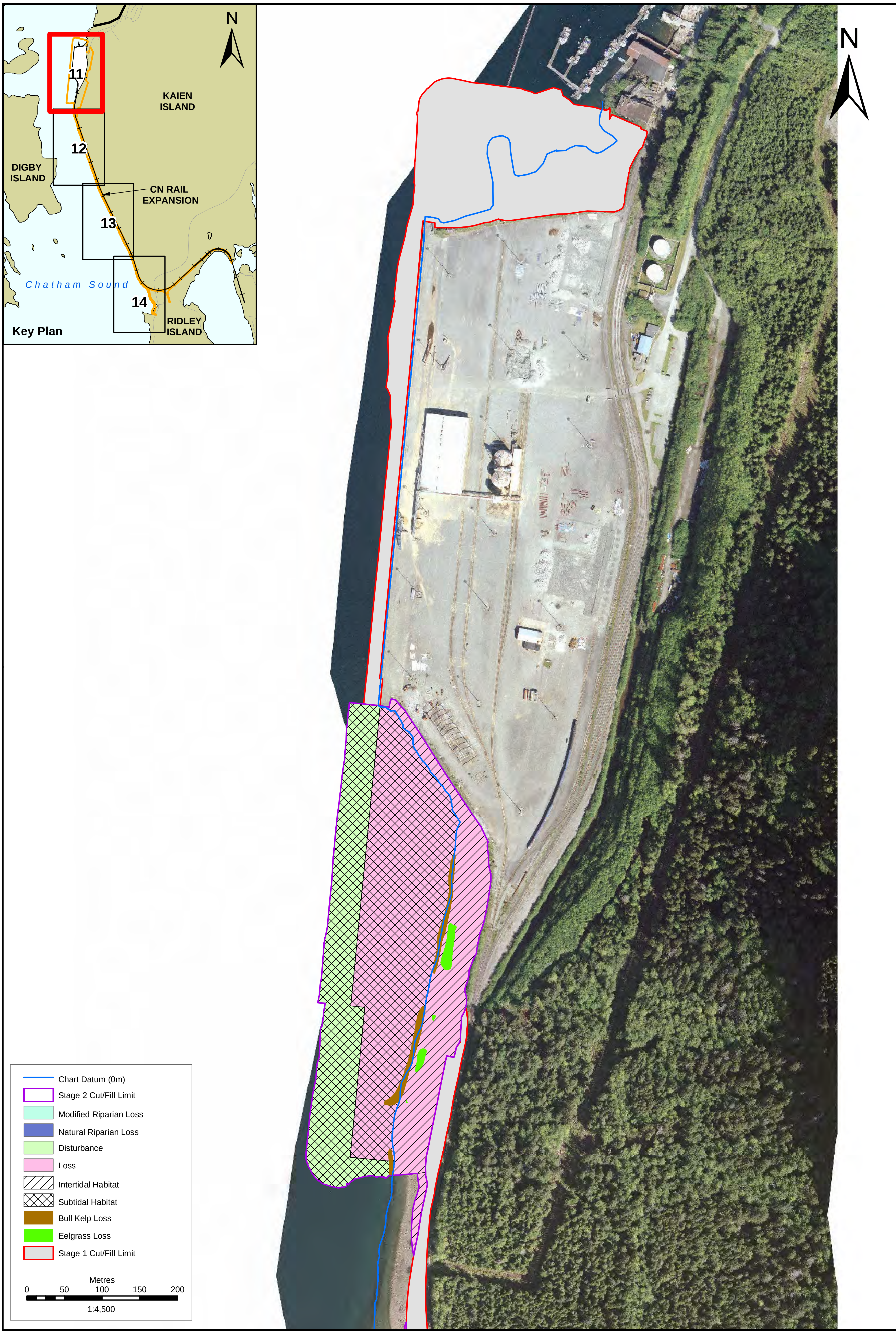

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PRINCE RUPERT PORT AUTHORITY

STAGE 2 - MARINE HADD TERMINAL AREA

MARINE ENVIRONMENT
PRELIMINARY HABITAT COMPENSATION PLAN

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DATUM	NAD 83	CHECKED BY	SD
DATE	13-FEB-12	FIGURE NO.	11

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STAGE 2 - MARINE HADD
RAIL AND ROAD CORRIDOR (1/3)
MARINE ENVIRONMENT
PRELIMINARY HABITAT COMPENSATION PLAN

PROJECTION: UTM - Zone 9	DRAWN BY: NP
DATUM: NAD 83	CHECKED BY: SD
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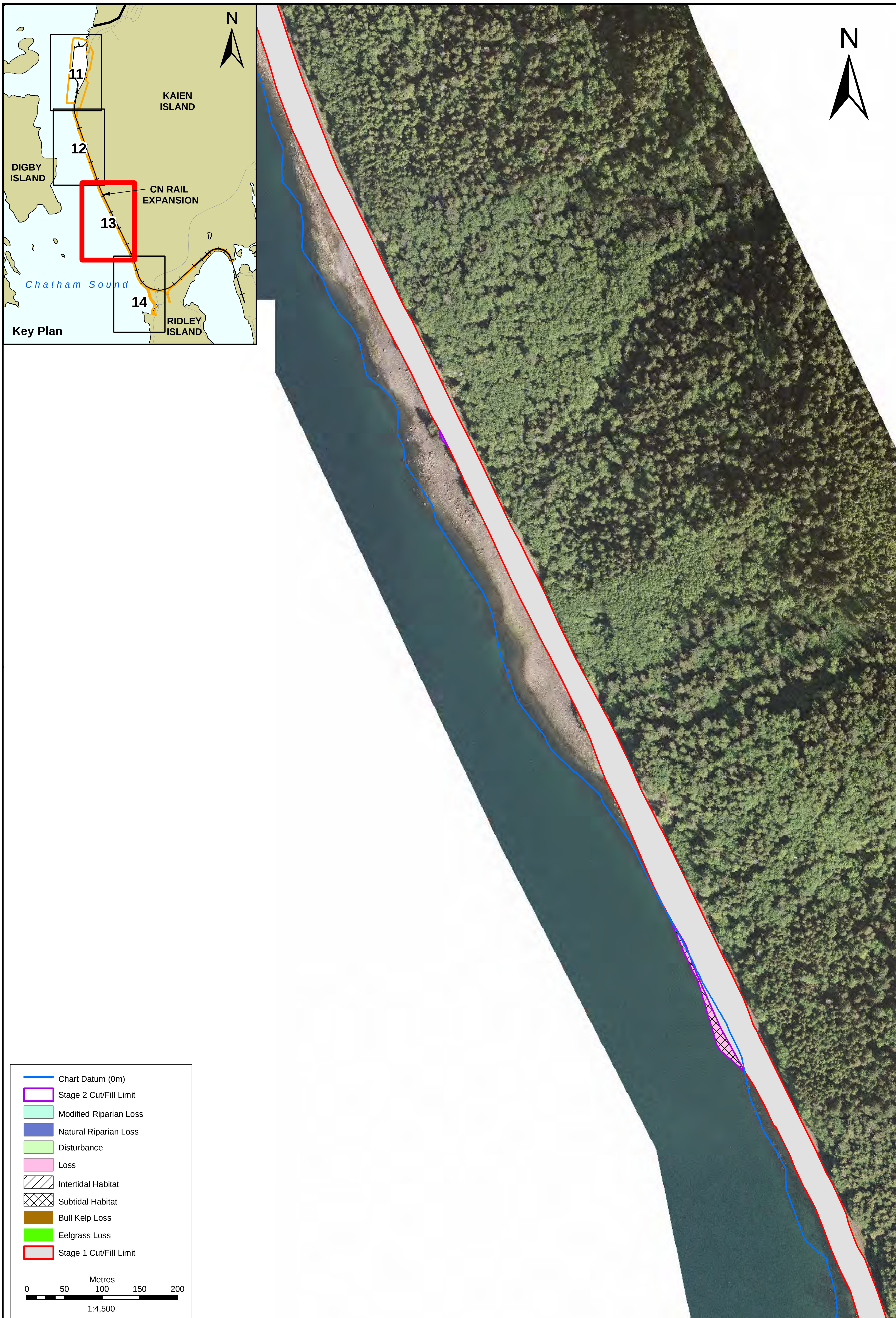

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STAGE 2 - MARINE HADD
RAIL AND ROAD CORRIDOR (2/3)
MARINE ENVIRONMENT
PRELIMINARY HABITAT COMPENSATION PLAN

PROJECTION: UTM - Zone 9	DRAWN BY: NP
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DATE: 13-FEB-12	FIGURE NO. 13

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STAGE 2 - MARINE HADD
RAIL AND ROAD CORRIDOR (3/3)
MARINE ENVIRONMENT
PRELIMINARY HABITAT COMPENSATION PLAN

PROJECTION: UTM - Zone 9	DRAWN BY: NP
DATUM: NAD 83	CHECKED BY: SD
DATE: 13-FEB-12	FIGURE NO. **14**

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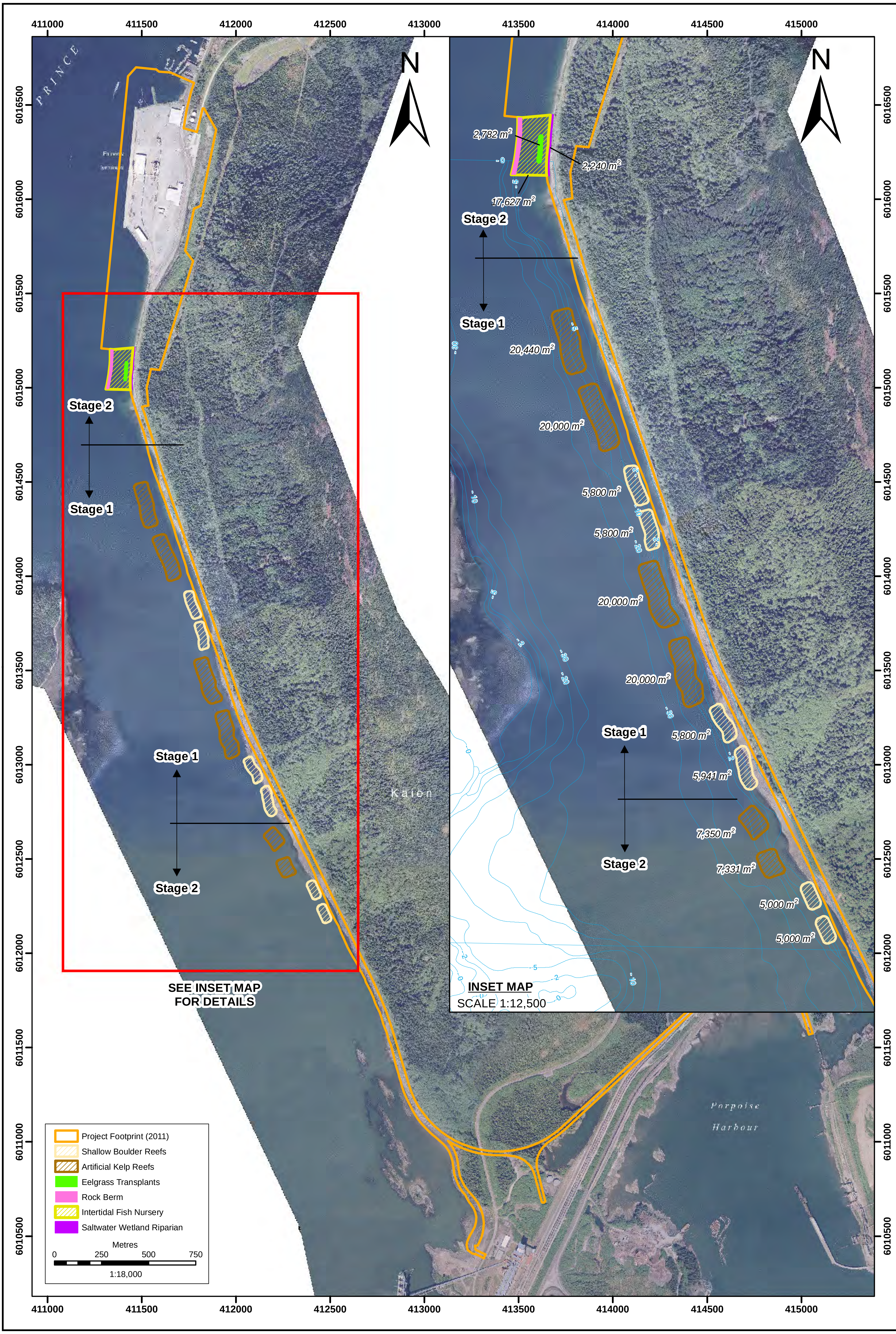

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MARINE COMPENSATION FEATURES

MARINE ENVIRONMENT
PRELIMINARY HABITAT COMPENSATION PLAN

PROJECTION: UTM - Zone 9	DRAWN BY: NP
DATUM: NAD 83	CHECKED BY: SD
DATE: 29-MAY-12	FIGURE NO. 15

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APPENDIX A

Khyex River Hydrologic and Geomorphic Assessment

KHYEX RIVER HYDROLOGIC AND GEOMORPHIC ASSESSMENT

Fairview Terminal Phase II Expansion Project Including Kaien Siding

Prepared for:

Prince Rupert Port Authority
200, 215 Cow Bay Road
Prince Rupert, BC V8J 1A2

and

Canadian National Railway Company
13477 – 116th Avenue
Surrey, BC V3R 6W4

Prepared by:

Stantec Consulting Ltd.
4370 Dominion Street, Suite 500
Burnaby, BC V5G 4L7
Tel: (604) 436-3014 Fax: (604) 436-3752

Project No.:

1231-10003 | 1231-10100

Date:

May 2012

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List of Tables

List of Figures

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1 INTRODUCTION

To assess the viability of the proposed habitat compensation plans for the lower reach of Khyex River, a hydrologic and geomorphic assessment of the Khyex River was completed. The objective of the hydrological analysis and geomorphic assessment was to develop estimates of annual streamflow statistics, assess the long-term sediment bar dynamics of the lower reach, and to assess potential sediment transport thresholds in the lower reach, to provide information needed to assess the feasibility of the habitat compensation plan.

2 HYDROLOGICAL ASSESSMENT

The Khyex River is a fourth-order tributary to the Skeena River and joins the Skeena approximately 40 km upstream of the mouth of the Skeena River. The Khyex River lies within the Coastal Western Hemlock biogeoclimatic zone, though portions of the drainage basin are considered Alpine and include glaciated areas. The total elevation range of the basin is 1,933 m above sea level (asl) to 4 m asl and total relief is 1,929 m. These basin characteristics, the proximity to the coast and nature of synoptic weather patterns result in high annual precipitation totals in the region. There are numerous Water Survey of Canada (WSC) stations in the region though no WSC stations exist on the Khyex River.

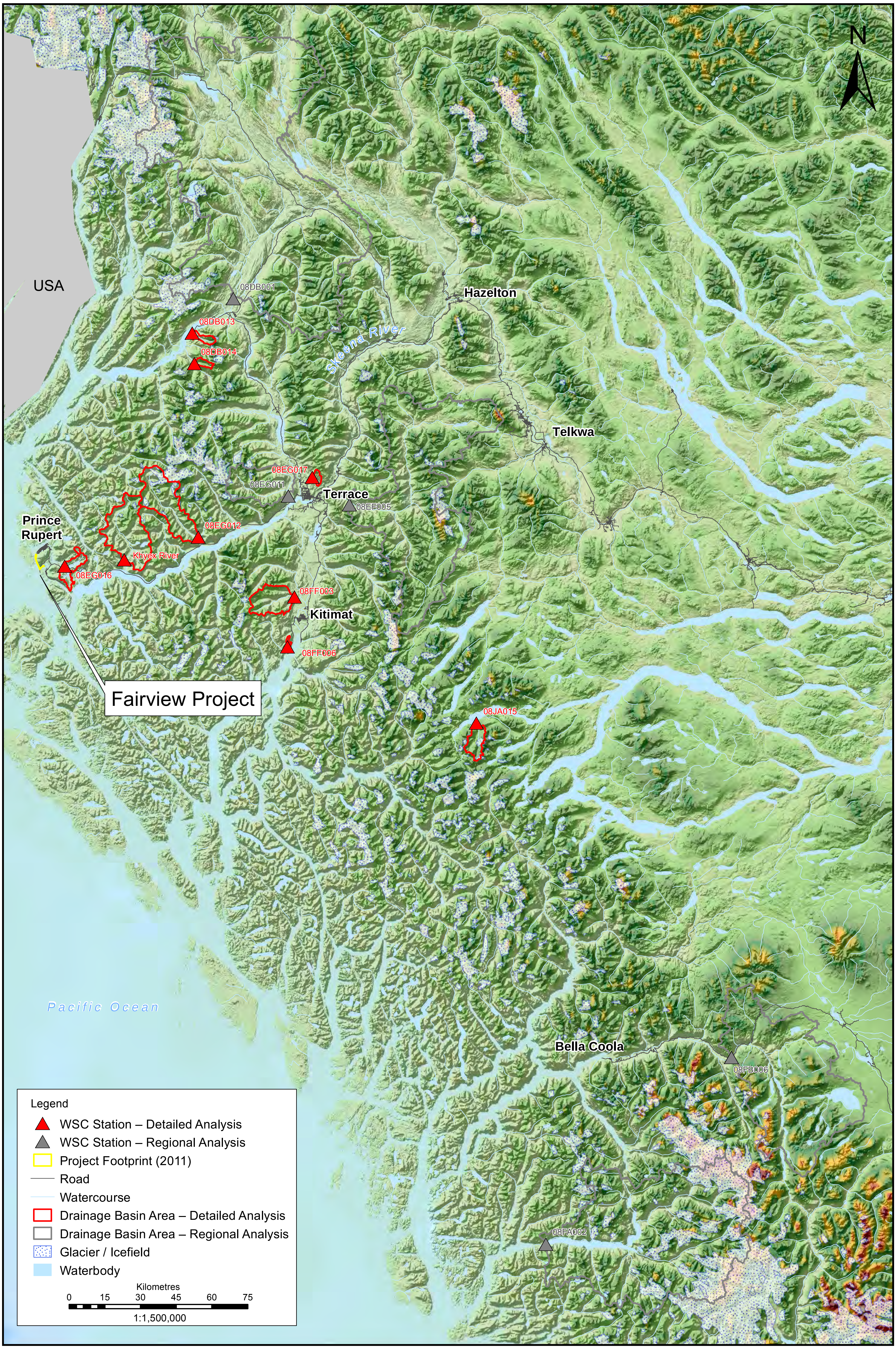
The long-term hydrological conditions of the Khyex River were estimated using a regional scaling approach. The historical records of thirteen WSC stations were assessed to determine the mean annual flow statistics and annual distribution of flows in the region (Table 1-1). The regional station records ranged from 14 to 54 years. The WSC stations were located in the same approximate biogeoclimatic zone as the Khyex River. However, due to the variable terrain and climatic influences in the region, the assessment focused on eight WSC stations that had similar basin areas and climatic conditions (Figure 1-1). The mean annual flow statistics were derived for those stations and a correlation was developed between basin area and mean annual flow rate (Figure 1-2). The linear function of that relationship was used to estimate the mean annual flow rate of the Khyex River to be approximately 46 m^3/s.

Table 1-1: Regional WSC Stations and Drainage Basin Information

Station Name	WSC #	Basin Area	Elevation (m asl)				Mean Annual Flow (cms)
			Maximum	Minimum	Relief	Mean	
Nass River above Shumal Creek	08DB001	7169	2,708	35	2,673	862	815.8
Ansedagan Creek near New Aiyansh	08DB013	26	2,119	32	2,087	872	1.01
Ksedin Tributary No. 2 Creek near New Aiyansh	08DB014	18	1,895	169	1,726	1,137	0.583
Zymoetz River	08EF005	2830	2,751	125	2,626	1,169	104.9

Station Name	WSC #	Basin Area	Elevation (m asl)				Mean Annual Flow (cms)
			Maximum	Minimum	Relief	Mean	
Zymagotitz River near Terrace	08EG011	364	2,091	52	2,039	923	23.7
Exchamsiks River near Terrace	08EG012	363	1,982	7	1,975	885	43.7
Kloiya River near Prince Rupert	08EG016	73	1,016	21	995	293	7.1
Deep Creek above reservoir	08EG017	16	1,483	265	1,218	654	0.572
Wannock River at outlet of Owinkeno Lake	08FA002	3884	3,103	5	3,098	1,214	328
Atnarko River near the mouth	08FB006	2506	2,926	189	2,737	1,449	29.3
Little Wedeene River below Bowbyes Creek	08FF003	177	2,088	61	2,027	763	756
Renegade Creek near Kitimat	08FF006	6	727	102	625	398	0.396
Laventie Creek near the mouth	08JA015	80	2,145	865	1,280	1,408	5.3
Khyex River		392	1,933	4	1,929	705	49.19

As a check on the method above, the basin ratio scaling approach was used to estimate the mean annual flow of the Khyex River. This method is described in Gordon et al. (2004) and in Watt (1989), which is directly applicable to Canadian settings. Briefly, the method relies on the general principle of hydrological similarities among basins in a region, assuming land use and climate conditions are similar. The flow characteristics of the unknown basin are scaled to the known basin and adjusted using a coefficient that reflects the basin water storage and flood characteristics of the basins. In the absence of information on the drainage basins that specifically speaks to changes in runoff conditions (i.e., large-scale land disturbance), the coefficient should be in the range of 0.7 to 0.8 (Gordon et al. 2004; Watt, 1989).



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WATER SURVEY OF CANADA STATIONS AND DRAINAGE BASIN AREAS

PROJECTION: UTM - Zone 9	DRAWN BY: R Stohmann
DATUM: NAD 83	CHECKED BY: T Gardner
DATE: 05/17/2012	FIGURE NO. 1-1

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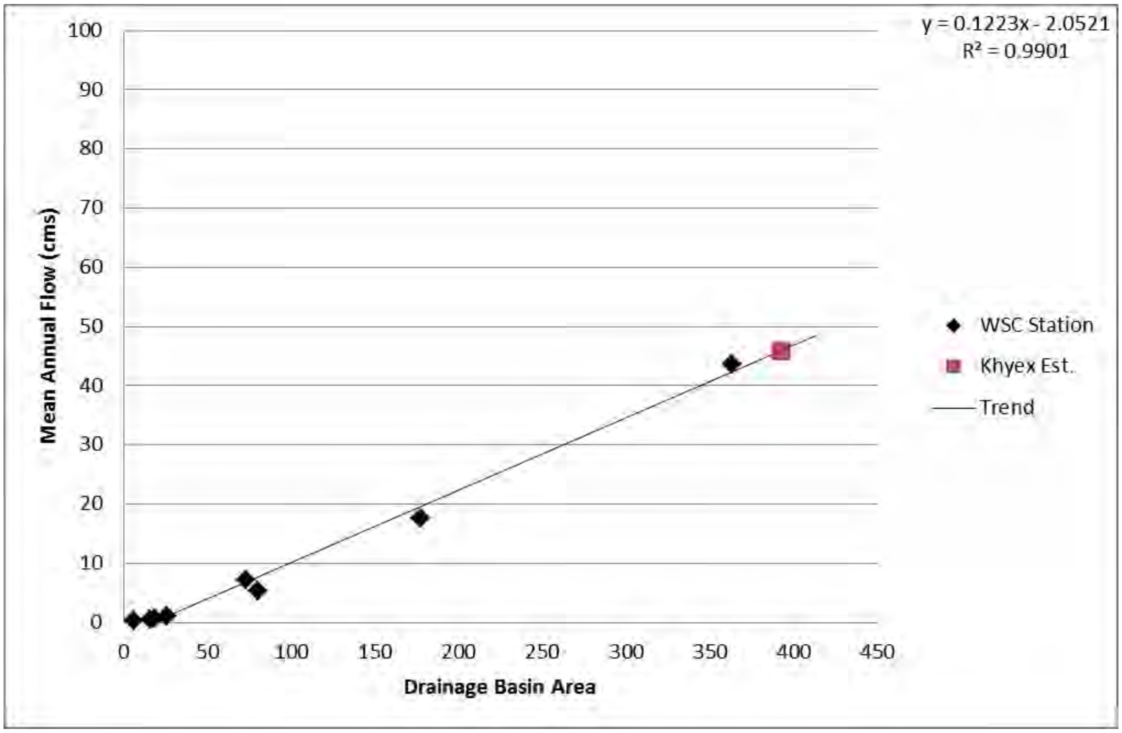


Figure 1-2: Empirical Relationship between Basin Area and Mean Annual Flow

Intuitively, it is best to scale from a basin that is in close proximity to the unknown (Khyex River) basin. In this case, the closest basin with a WSC gauge that had similar physiographic and climatic conditions as the Khyex River basin was the Exchamsiks River (WSC 08EG012). The Exchamsiks River is the next major sub-basin to the Khyex River heading upstream in the Skeena River watershed. The two basins are of similar size (basin ratio is 1.08), have similar mean basin elevations and relief, and share a drainage divide in the headwaters (Table 1-1 and Figure 1-1). Based on the similarities in physical characteristics, the Exchamsiks River provided an excellent basin to estimate the Khyex River conditions from using the basin ratio scaling approach. The estimated mean annual runoff for the Khyex River using this approach ranged from 45.5 to 45.8 m^3/s (range is due to coefficient). Confirmation of the estimates using the regional approach above suggests the method is satisfactory for the purposes of this assessment.

The annual distribution of flows for the WSC stations were also assessed (Figure 1-3). The annual distribution of the Khyex River was derived based on the mean values of the WSC stations. The outcome of this was an annual hydrograph that is somewhat distinct in shape from the Exchamsiks River, for example. However, the differences in the annual distribution of flows between these two rivers are due to the proximity of the Khyex River to the maritime influences of the coast, while the Exchamsiks River is located further from the coast. In this way, the proximity to the coast tends to moderate annual flow peaks and rivers tend to have relatively higher winter season flow rates due to shorter periods of below freezing temperatures near the coast.

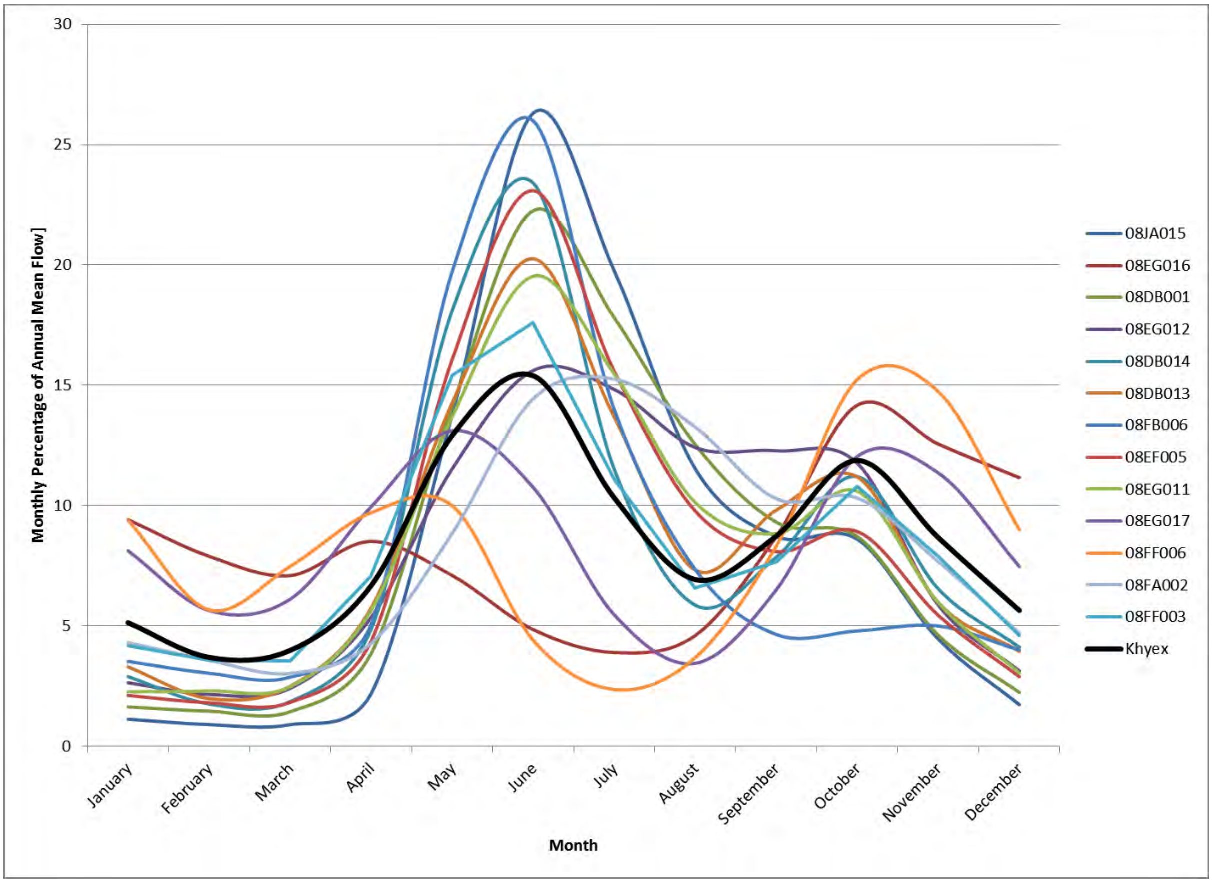


Figure 1-3: Annual Distribution of Flows, WSC Stations and Khyex River

Based on the annual distribution of flows and the mean annual flow rate, the mean monthly flow rates were derived for the Khyex River (Table 1-2). This information was needed to understand the magnitude of flow variations during the year.

Table 1-2: Estimated Monthly Flow Rates for Lower Reach of the Khyex River

Estimated Monthly Flow Rate	
Month	**Flow (cms)**
January	27.7
February	22.1
March	21.5
April	37.2
May	69.6
June	85.8
July	55.7

Estimated Monthly Flow Rate	
Month	**Flow (cms)**
August	37.4
September	48.7
October	64.1
November	48.3
December	30.5

3 GEOMORPHIC ASSESSMENT

Air photos of the lower reaches of the Khyex River from 1961, 1969, 1988, and 2008 were reviewed to assess the dominant channel features as well as the long-term bar dynamics in the river. The analysis did not include measurements of bar dimensions or channel dimensions due to the lack of ortho-rectified imagery. All imagery except for 2008 were black and white images scanned and reproduced, the 2008 imagery was digital color. The scale of the imagery ranged from 1:15000 to 1:60000.

The lower reach of the Khyex River is characterized as a single-channel, low sinuosity, relatively stable reach. Portions of the lower reach are slightly incised with an approximate entrenchment ratio between 1.4 to 2.2 and a width to depth ratio > 20 (based on initial field measurements). Historically, the Khyex River has migrated relatively small distances at the lower reach (i.e., less than one-half channel width).

The Khyex River features prominent, bank-attached gravelly bars and in some instances, small, incipient bars within the channel may be exposed at lower flow conditions. Based on the air photo record, bar migration is a common process in this section of the Khyex River. Bar migration may be expected due to particularly high flood events which may result in rapid bar movement downstream and the addition of new material from upstream, as well as the gradual migration of bars downstream with the annual fluctuations in streamflow. The large bank-attached bars are generally stable and tend to migrate incrementally downstream as material is deposited in areas of reduced hydraulic turbulence.

Sediment supply appears to be ample from the upstream sections of the drainage basin as expected in areas of high relief. This material is likely to be in the range of fine sand to cobble-sized material. None of these processes are exceptional to the Khyex River and in general tend to typify glacier-fed coastal rivers. There is no reason to anticipate that the bar dynamics of the lower reach of the Khyex River will be altered in the short- to medium-term (1 to 25 years) assuming the existing hydrologic conditions continue.

Large woody debris is prominent both at the channel banks and as displaced root wads in the channel. The estimated tidal extent in this section of the river is approximately 7 km upstream of the

Skeena River confluence. Small tributaries enter the Khyex River within the study area. Given the steep terrain, it is likely that these smaller tributaries contribute relative high bedload content to the Khyex River. However, these contributions are not greater than the expected grain size or volume of bedload that typifies the Khyex River. Sediment sources are available along the main channel in the form of many cut-bank exposures, gravel bars, and the tributaries. The grain size distribution of the Khyex River has not been calculated. However, field-based visual assessment of grain sizes in the lower reach suggests the median grain size (D50) is in the range of 50 – 80 mm (large gravel or cobbles) (Figure 1-4).

Figure 1-4: Example of Channel Bed Particles, Lower Reach, Khyex River, May 2012

4 SEDIMENT TRANSPORT CONDITIONS

The estimation of the bedload sediment transport conditions at the lower reach of the Khyex River was conducted to provide context for the compensation strategy. The estimation of bedload sediment transport conditions in the lower reach of the Khyex River relied on theoretical methods to estimate shear stress using the known morphological and hydrological conditions sampled at the site.

Bedload transport is difficult to estimate in general due to the mixed particle sizes of channel beds, the shielding and exposure of different sized particles, and the variable nature of turbulence near the channel bed. Intuitively, sediment mobility may be thought to be a function of particle size. Thus, finer particles should be easier to entrain than coarser particles at a given flow velocity (assuming no cohesive forces and uniform bed material), and this theory is demonstrated by the Hjulstrom curve. However, the Hjulstrom curve does not fully capture the nature of the forces that act on a particle (Knighton, 1998). The initiation of sediment mobility is dependent on the boundary shear stress exerted on a particle on the channel bed relative to the forces that inhibit mobility (e.g., gravity, particle density, shielding by other particles). The combination of those forces that define the initiation of bed sediment transport is conceptualized as the critical shear stress for particle mobility. Thus if the boundary shear stress exceeds the critical shear stress, particle mobility may be initiated.

Boundary shear stress is defined as:

$$\tau = g*\rho*(R*S)$$

Where:

τ = shear stress
g = acceleration due to gravity
ρ = water density
R = hydraulic radius
S = slope.

The units for boundary shear stress are N/m^2.

Critical shear stress is defined by:

$$\tau cr = \theta c*g(\rho s-\rho)D50$$

Where:

τcr = critical shear stress
θc = Shields parameter
ρs = particle density
$D50$ = median grain size.

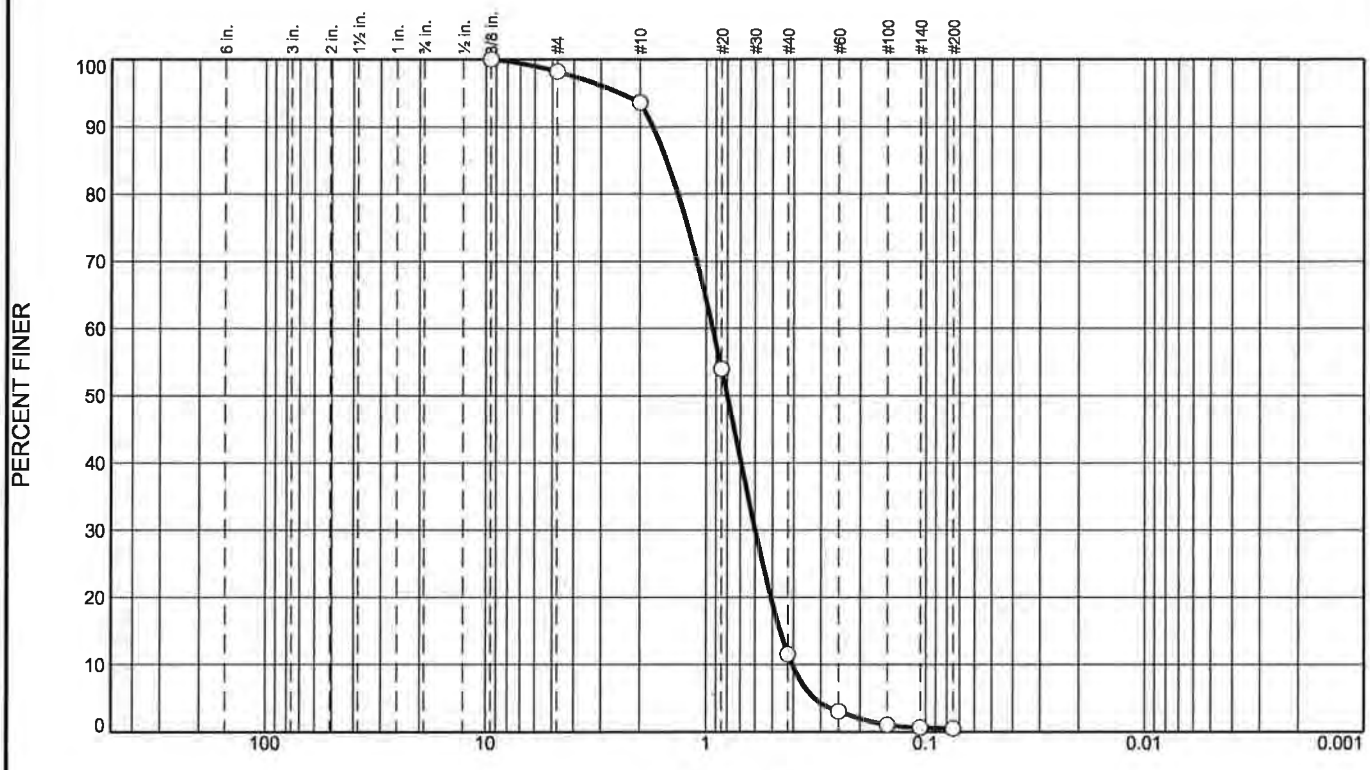
The Shields parameter is dimensionless and accounts for particle size, density, and relative bed roughness.

Estimation of boundary shear stress and critical shear stress was completed for the lower reach of Khyex River to provide a basis to assess which particle sizes would be expected to be mobile during the existing flow regime. Field measurements at four transects in May 2012 provided estimates of mean channel dimensions, stream velocity, and criteria for Manning's roughness coefficient. Using the Manning equation, the unknown variables required for the shear stress estimates were verified. The mean flow volume through the lower reach (i.e., based on the four transects) was calculated to be 39.6 m^3/s. Thus flow conditions were near the mean annual flow rate (as discussed above). Given that flow conditions were close to average conditions, the field data provided rationale to estimate the typical boundary shear stress conditions in the lower reach of the Khyex River. Based on the equations above, the boundary shear stress ranges from approximately 11 to 35 (N/m^2) (range is based on variable slope estimates). Assuming a D50 of 50 to 80 mm, the critical shear stress is 40 to 64, thus for the average condition, the median channel bed particles are not likely to be in transport.

5 EULACHON SPAWNING HABITAT CONDITIONS

The median particle size of sediment grab samples from expected eulachon spawning areas in the lower reach of the Khyex River was 0.8 mm based on sieve analysis (Figure 1-5). The critical shear stress for these size particles is < 1, indicating that under most flow conditions and assuming a relatively uniform channel boundary, sand-sized particles are likely to be transported as bedload. However, it is apparent that these particle sizes are not always in transport since, although this substrate was considered to be limiting, numerous deposits were found during the field visit.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.8	4.6	82.0	11.1	0.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8	100.0		
#4	98.2		
#10	93.6		
#20	54.0		
#40	11.6		
#60	3.1		
#100	1.0		
#140	0.7		
#200	0.5		

* (no specification provided)

Soil Description

Grey medium SAND, trace fine gravel, trace silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 1.7463 D_{85}= 1.5141 D_{60}= 0.9327
D_{50}= 0.8011 D_{30}= 0.5985 D_{15}= 0.4611
D_{10}= 0.4065 C_u= 2.29 C_c= 0.94

Classification

USCS= SP AASHTO=

Remarks

Sampled by Ravi Chatterji
Tested by Hector Ipinza

Source of Sample: Sediment Sieve Analysis

Date: May 17, 2012

Stantec Consulting, Ltd.

Burnaby, British Columbia

Client: CN / PRPA
Project: Fairview Phase II Terminal Expansion
Project No: 123110100-123110003 **Figure** 1-5

Tested By: HI **Checked By:** RC

The samples were located in areas with reduced hydraulic turbulence, on the leeward side of large boulders or accumulations of woody debris. Due to the shielding effects of these large features, the bed roughness is much higher and hydraulic turbulence is reduced, which allows for sand-sized particles to be deposited as the shear stress acting at those areas is diminished. In time, with large flood events, it is likely that these locations will migrate as is the nature of the bar dynamics in the Khyex River. However, the recruitment of similar large boulders or woody debris and the deposition of sand-sized particles in the lee of those features are expected to continue.

The conceptual design of the compensation features in the lower Khyex River was based on the assumption that the existing bar dynamics in the Khyex River will continue. That is, it is anticipated that the supply of sediment from the headwaters of the basin, the movement of bars, and the occurrence of the typical range in flow conditions will continue. The proposed locations of the habitat features in the Khyex River were determined by the existing channel bar morphology, to key-in to areas where boundary shear stresses are likely already low (depositional areas at bar margins), and to the existing large woody debris structures or large boulders. Given the size of many of the exposed bars, it is anticipated that the habitat features will be stable in position.

The habitat features were designed to replicate existing features in the Khyex River where eulachon spawning is expected to occur and where sand-sized particle deposition is prevalent. In this way, the habitat features were designed to increase relative bed roughness, to improve shielding of smaller-sized particles, to reduce hydraulic turbulence, and reduce boundary shear stresses at the lee of the boulder-sized material, in order to facilitate and maintain the ideal hydraulic conditions for sand-sized particle deposition. At high flows, the sand-sized material may be eroded from the lee of the boulders which is to be expected. However, given the continued presence of the large boulder-sized particles, it is anticipated these areas will promote continued sand-sized particle deposition in the future.

Respectfully submitted,

Stantec Consulting Ltd.

Original signed by:

Tobi Gardner, Ph.D.
Water Resources Scientist

Reviewed by:

Original signed by:

Ravi Chatterji, Ph.D.
Fisheries Scientist

TG/RC/mp

6 REFERENCES

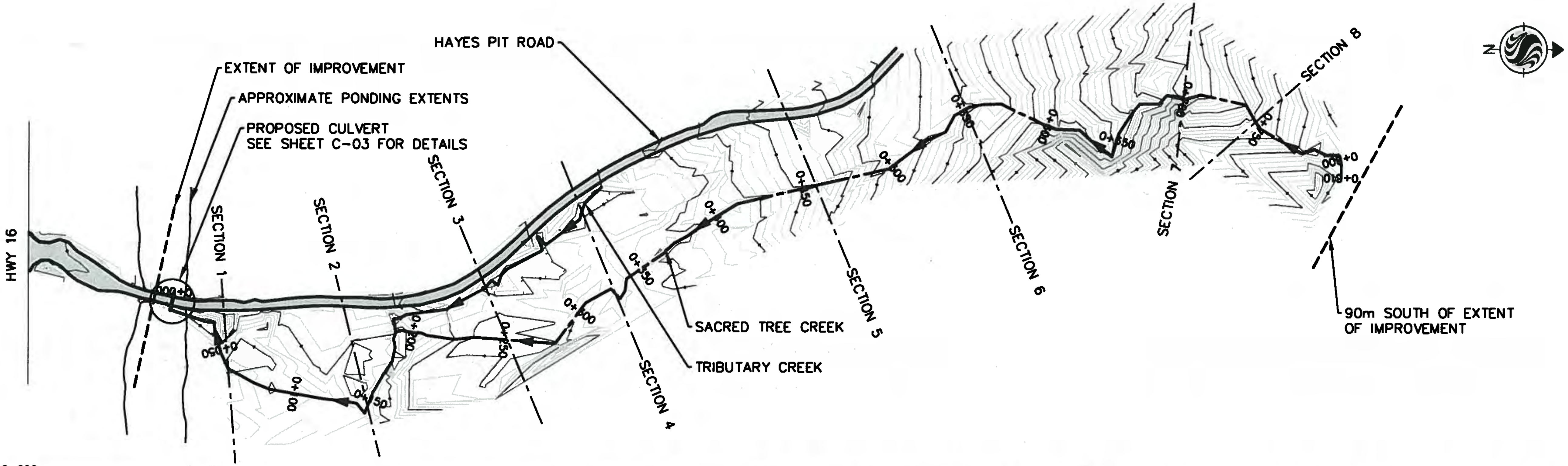
Gordon, N., McMahon, T., Finalyson, B., Grippel, C., & Nathan, R. 2008. Stream Hydrology 2nd Ed. UK: John Wiley and Sons Ltd.

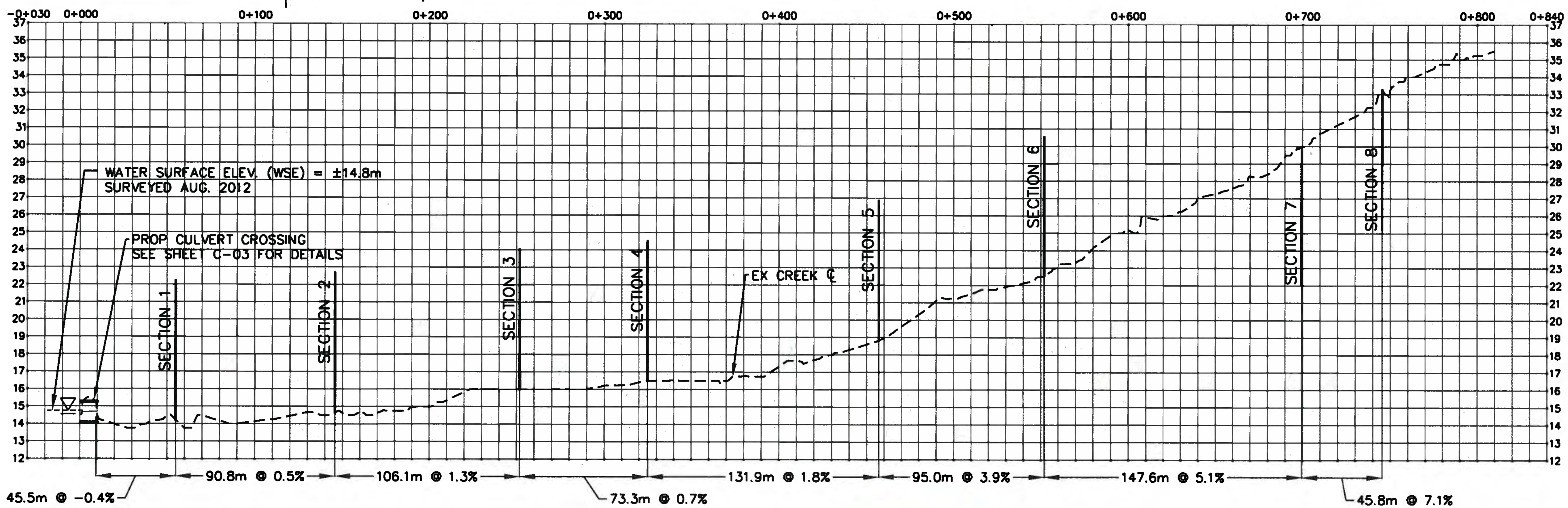
Knighton, D., 1998, Fluvial Forms and Processes, Arnold, New York, 383 pp.

Watt, E.W. (editor). 1989. Hydrology of Floods in Canada: A Guide to Planning and Design. National Research Council Canada. p.245.

APPENDIX B

Hydrological Assessment and Culvert/Channel Design Drawings





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PRINCE RUPERT
PORT AUTHORITY

CN

LEGEND

MAJOR CONTOUR
MINOR CONTOUR
ROAD
WATERCOURSE
EXTENT OF IMPROVEMENT

SCALE:
HORI 1:2500
VERT 1:250

PROFESSIONAL PROVINCE OF B. W. LIVELY # 33817 BRITISH COLUMBIA ENGINEER

2012-09-12

AFFIX SEAL

PRELIMINARY
NOT FOR CONSTRUCTION
2012-09-12

Client/Project
PRINCE RUPERT PORT AUTHORITY &
CANADIAN NATIONAL RAILWAY COMPANY
SACRED TREE CREEK & HAYES
PIT ROAD IMPROVEMENTS

Figure No.
C-01

Title
SACRED TREE CREEK
PLAN & PROFILE

SEPT. 2012
123110003

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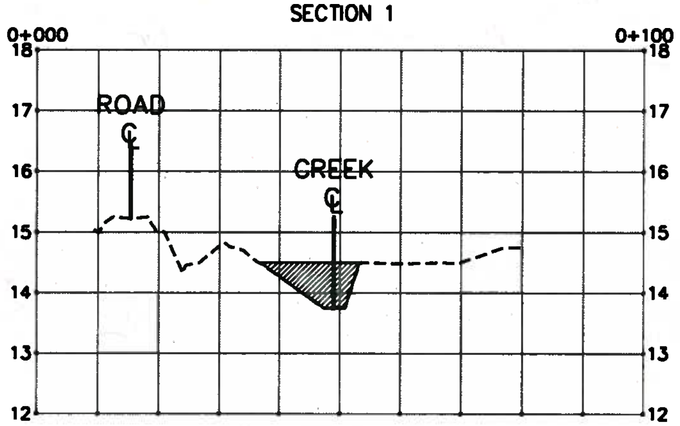
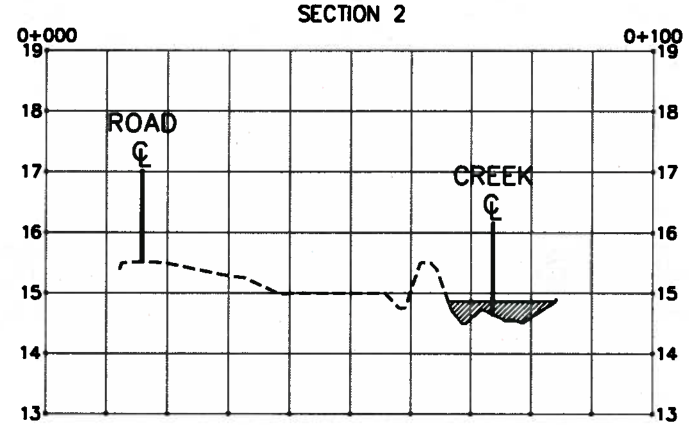


ESTIMATED EXISTING MAIN CHANNEL
CROSS-SECTIONAL AREA = 7.52m²
FLOW CAPACITY = 6.13m³/s

SECTION 2



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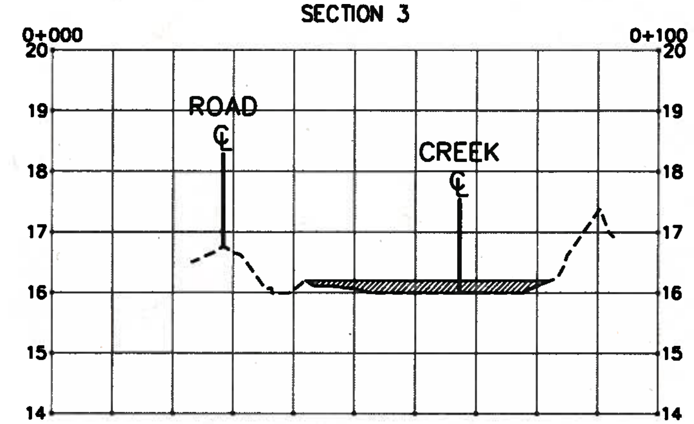
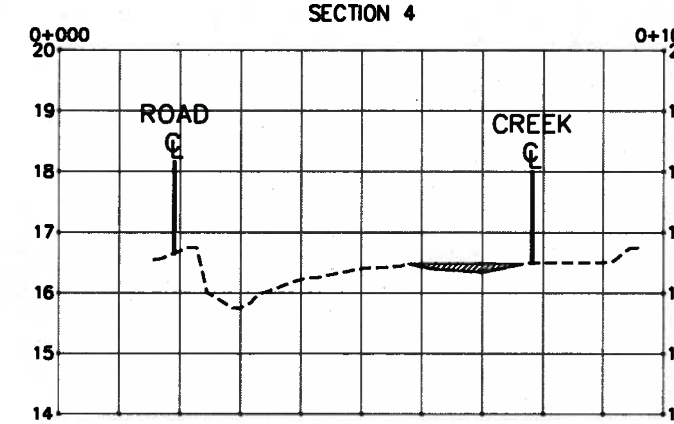
FLOW CAPACITY = 2.46m³/s

SECTION 3



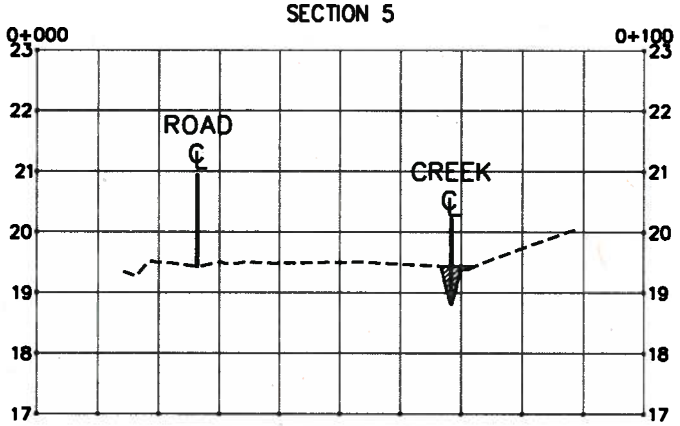
ESTIMATED EXISTING MAIN CHANNEL
CROSS-SECTIONAL AREA = 6.58m²
FLOW CAPACITY = 4.99m³/s

SECTION 4



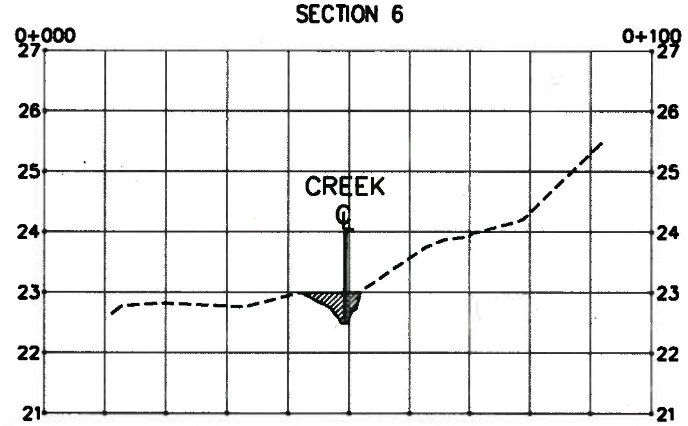
ESTIMATED EXISTING MAIN CHANNEL
CROSS-SECTIONAL AREA = 1.56m²
FLOW CAPACITY = 0.55m³/s

SECTION 5



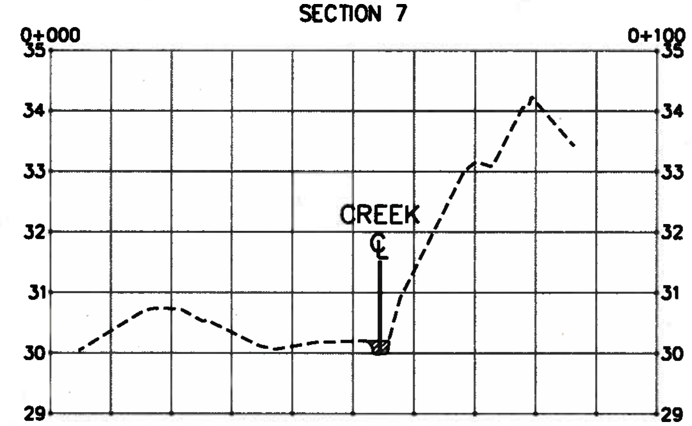
ESTIMATED EXISTING MAIN CHANNEL
CROSS-SECTIONAL AREA = 1.26m²
FLOW CAPACITY = 0.92m³/s

SECTION 6



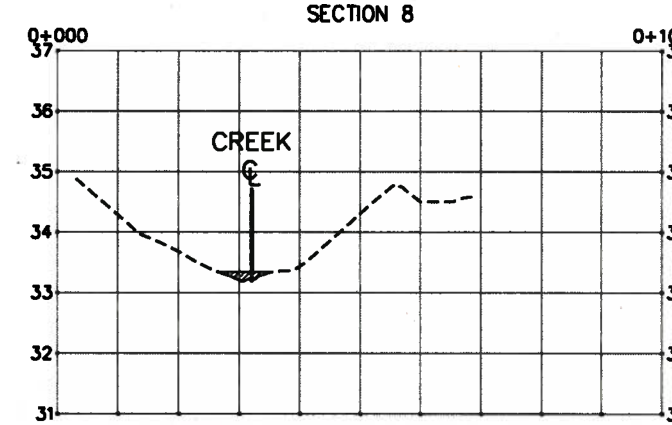
ESTIMATED EXISTING MAIN CHANNEL
CROSS-SECTIONAL AREA = 2.36m²
FLOW CAPACITY = 4.02m³/s

SECTION 7



ESTIMATED EXISTING MAIN CHANNEL
CROSS-SECTIONAL AREA = 0.53m²
FLOW CAPACITY = 0.76m³/s

SECTION 8



ESTIMATED EXISTING MAIN CHANNEL
CROSS-SECTIONAL AREA = 0.49m²
FLOW CAPACITY = 0.48m³/s

Stantec

PRINCE RUPERT
PORT AUTHORITY

CN

LEGEND

MAJOR CONTOUR
MINOR CONTOUR
ROAD
WATERCOURSE
EXTENT OF IMPROVEMENT

SCALE:
HORI 1:1250
VERT 1:125

PROFESSIONAL
PROVINCE OF
B. W. LIVELY
33817
BRITISH COLUMBIA
ENGINEER
2012-09-12
AFFIX SEAL

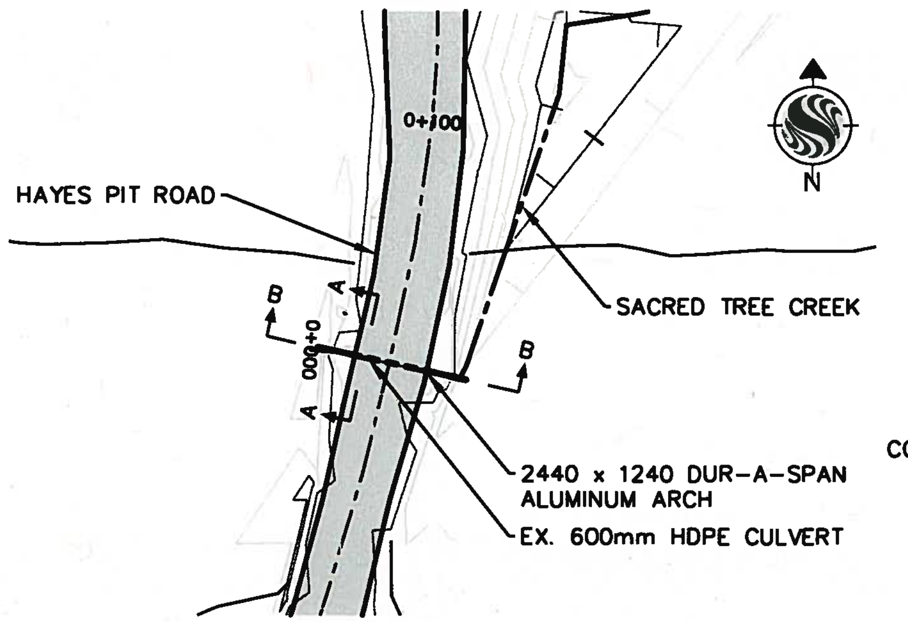
PRELIMINARY
NOT FOR CONSTRUCTION
2012-09-12

Client/Project
PRINCE RUPERT PORT AUTHORITY &
CANADIAN NATIONAL RAILWAY COMPANY
SACRED TREE CREEK & HAYES
PIT ROAD IMPROVEMENTS

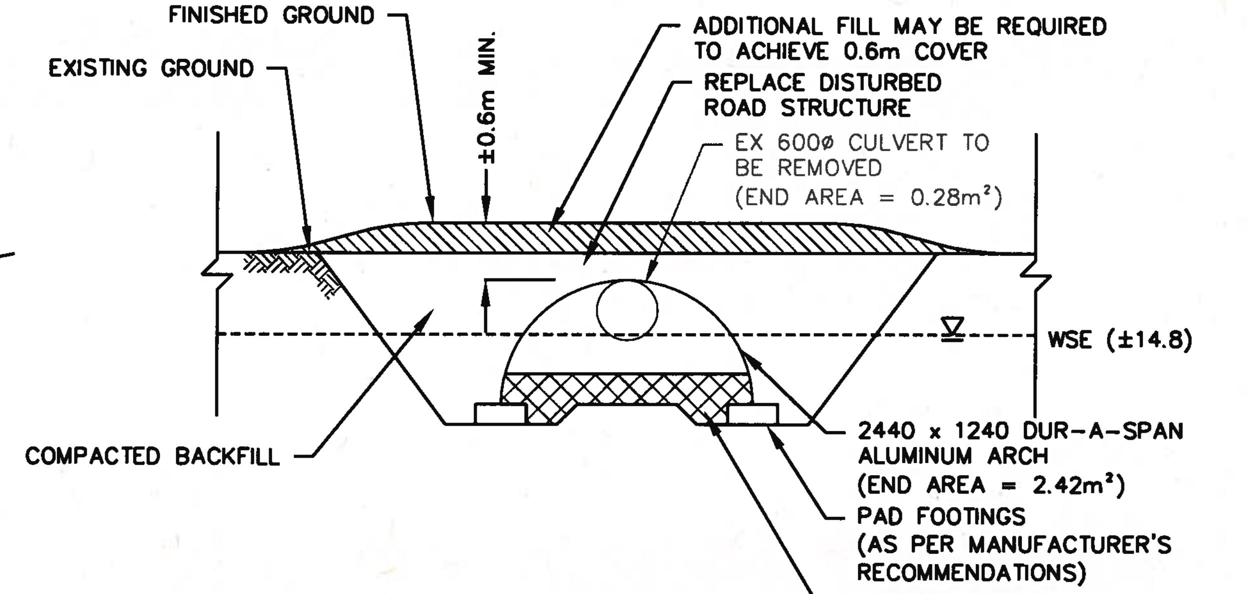
Figure No.
C-02

Title
SACRED TREE CREEK
SECTIONS

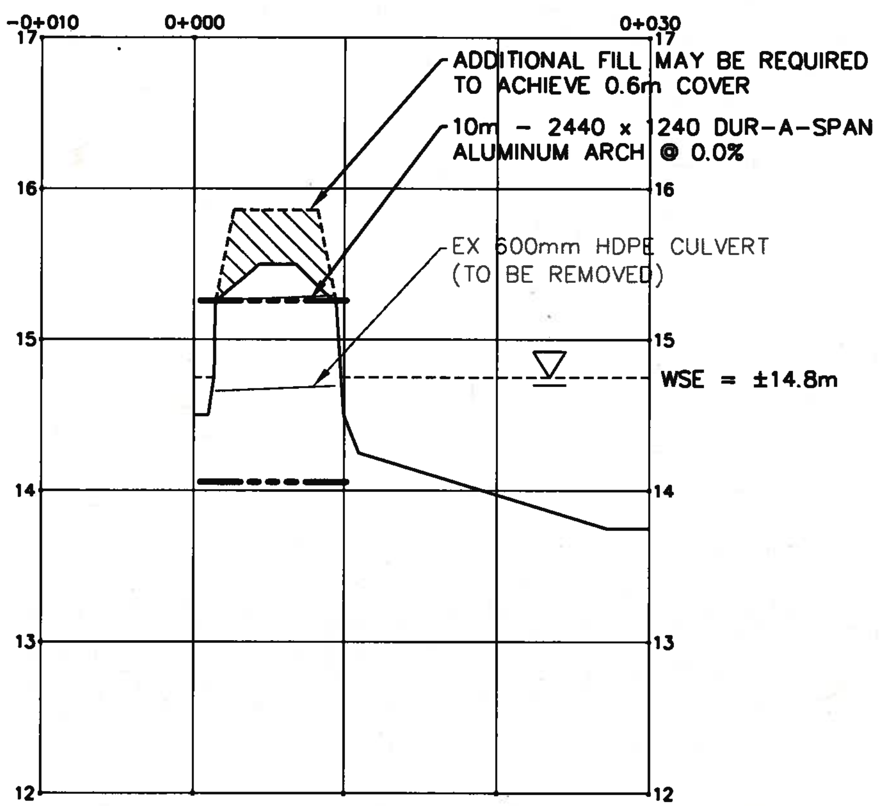
SEPT. 2012
123110003



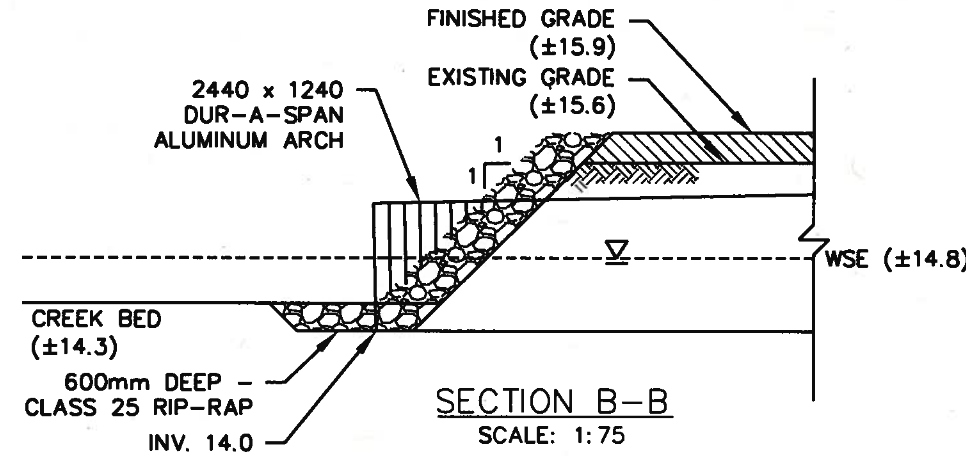
PLAN VIEW
SCALE: 1:500



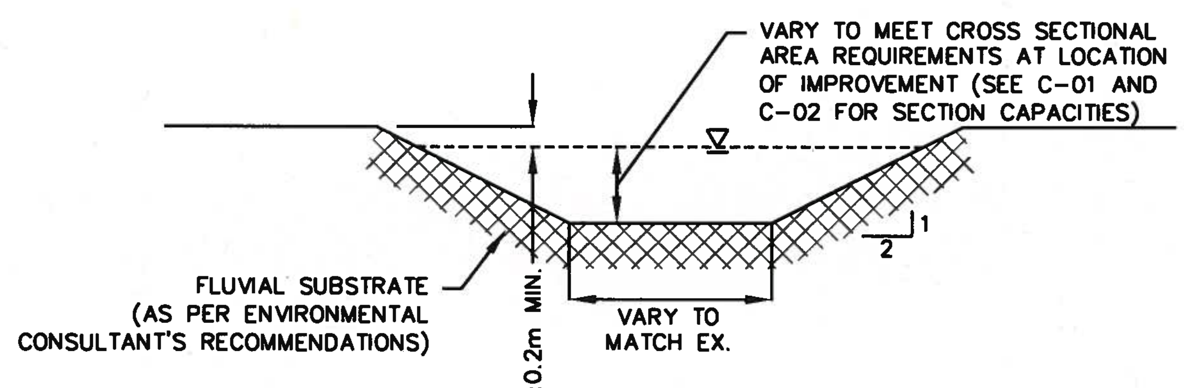
SECTION A–A
SCALE: 1:75



PROFILE VIEW
SCALE: H: 1:500
V: 1:50



SECTION B–B
SCALE: 1:75



PROPOSED MAIN CHANNEL SECTION (TYPICAL)
SCALE: 1:75

GENERAL NOTES

1. SURVEY INFORMATION PROVIDED BY ALLNORTH CONSULTANTS LIMITED ON 2012.08.30. STANTEC DOES NOT GUARANTEE THE ACCURACY OF THIS INFORMATION.
2. DRAWINGS C-01, C-02 AND C-03 ARE TO BE READ IN CONJUNCTION WITH THE FAIRVIEW PHASE II PRELIMINARY HABITAT COMPENSATION PLAN.
3. ESTIMATED FLOW CAPACITIES ARE BASED ON TOPOGRAPHICAL INFORMATION PROVIDED. ACTUAL MAIN CHANNEL CAPACITIES MAY VARY. ESTIMATED CAPACITIES DO NOT REPRESENT THE EXTENT OF THE FLOOD PLAIN OR LOCALIZED PONDING AREAS ALONG THE REACH OF SACRED TREE CREEK.

DESIGN CONSIDERATIONS

ANALYSIS

TO UNDERSTAND THE CHARACTERISTICS AND CONSTRAINTS OF SACRED TREE CREEK, THE FOLLOWING WAS COMPLETED:

- A TOPOGRAPHIC SURVEY TO PROVIDE REPRESENTATIVE SECTIONS OF SACRED TREE CREEK.
- AN AREA BASED HYDROLOGIC ASSESSMENT (BASED ON METHODOLOGY DESCRIBED IN THE KHYEX RIVER HYDROLOGICAL AND GEOMORPHIC ASSESSMENT REPORT, STANTEC 2012) TO DETERMINE MEAN ANNUAL FLOW (MAF).
- CROSS SECTIONS WERE DEVELOPED TO DETERMINE APPROXIMATE CREEK CAPACITIES USING THE MANNINGS FORMULA.
- THE CAPACITY OF THE EXISTING CULVERT CROSSING HAYES PIT ROAD WAS ESTIMATED USING THE MANNINGS FORMULA.
- SITE OBSERVATION AND AVAILABLE DATA REVIEW.

KEY OUTCOMES

AREA BASED MAF: DRAINAGE BASIN AREA = 265ha
LAND TYPE = STEEP, WELL VEGETATED
CLOSEST WATER SURVEY OF CANADA STATION = EXCHAMSIKS RIVER (NEAR TERRACE, BC)
MAF = 31.9m³/s
*INCLUDES RUNOFF, SNOW MELT, BASEFLOW, ETC.

EXISTING CREEK CAPACITY: ESTIMATED MAIN CHANNEL CAPACITIES RANGE FROM 0.46m³/s TO 6.13m³/s.
EXISTING CULVERT CAPACITY: CULVERT SIZE = 600mm
CULVERT MATERIAL = HDPE
END AREA = 0.28m²
ESTIMATED HYDRAULIC CAPACITY = 0.48m³/s

CONCLUSIONS

- THE EXISTING CULVERT IS UTILIZED AS A OVERFLOW PIPE, TO BALANCE THE TWO PONDING AREAS ADJACENT TO HAYES PIT ROAD, RATHER THAN A PRIMARY CONVEYANCE FOR CREEK FLOW. DESIGN OF THIS CULVERT WAS NOT GOVERNED BY ANTICIPATED CREEK FLOW.
- BACK FLOW FROM THE SKEENA RIVER DOES NOT SIGNIFICANTLY INFLUENCE THE PERFORMANCE OF THE EXISTING CULVERT.
- THE PROPOSED CULVERT HAS BEEN SIZED/LOCATED BASED ON THE CAPACITY OF THE EXISTING CULVERT AND THE ESTIMATED FLOW CHARACTERISTICS UPSTREAM OF THE CROSSING LOCATION. THE MAF WAS REVIEWED, BUT NOT CONSIDERED AS THE BASIS FOR DESIGN. THE INTENT IS TO PROVIDE ADEQUATE PASSAGE FOR THE FISH HABITAT PRESENT AND MAINTAIN OR IMPROVE THE FLOW CHARACTERISTICS OF SACRED TREE CREEK. A DETAILED DRAINAGE BASIN ANALYSIS WILL BE REQUIRED TO CONFIRM SUITABILITY OF THE PROPOSED CULVERT.
- ANY PROPOSED IMPROVEMENTS (I.E. CHANGES TO CREEK ALIGNMENT) WITHIN SACRED TREE CREEK ARE TO MAINTAIN OR IMPROVE THE CREEK'S ABILITY TO MANAGE FLOW, AS COMPARED TO THE SECTIONS SHOWN ON C-02.

ORIGINAL SHEET – ANSI B U:\123110003\drawing\sheet\C-03.dwg Plotted: 9/12/2012 10:28 AM

Stantec

PRINCE RUPERT PORT AUTHORITY

CN

LEGEND

	MAJOR CONTOUR
	MINOR CONTOUR
	ROAD
	WATERCOURSE
	EXTENT OF IMPROVEMENT

SCALE: AS NOTED

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2012-09-12
AFFIX SEAL

PRELIMINARY NOT FOR CONSTRUCTION 2012-09-12

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PRINCE RUPERT PORT AUTHORITY &
CANADIAN NATIONAL RAILWAY COMPANY
SACRED TREE CREEK & HAYES
PIT ROAD IMPROVEMENTS

Figure No.
C-03

Title
DETAILS

SEPT. 2012
123110003