

PART B – ASSESSMENT OF POTENTIAL EFFECTS, INCLUDING CUMULATIVE EFFECTS, PROPOSED MITIGATION MEASURES, AND THE SIGNIFICANCE OF ANY RESIDUAL EFFECTS

4.0 ASSESSMENT METHODS

4.1 General

Environmental assessment in BC provides an integrated process for identifying and evaluating potential adverse environmental, economic, social, heritage and health effects that may occur during the life of a reviewable project. The purpose of the EA is to predict the significance of potential project-related effects and to identify measures to avoid or reduce these potential effects through redesign and operational improvements. The assessment process ultimately results in a decision by the responsible ministers regarding whether to issue an EA Certificate, subject to legally binding conditions, which is required before a reviewable project can proceed.

The Assessment Methodology described below reflects accepted EA practice in BC and Canada in accordance with the BCEAO Guideline for the Selection of Valued Components and Assessment of Potential Effects (Figure 4-1, BCEAO 2013), Operational Policy Statement: Addressing Cumulative Environmental Effects under the *Canadian Environmental Assessment Act* (CEA Agency 2007), Addressing Cumulative Environmental Effects. A Reference Guide for the *Canadian Environmental Assessment Act* (CEA Agency 1994), Cumulative Effects Practitioners Guide (CEA Agency 1999); and CEAA (1992) “A Reference Guide for the *Canadian Environmental Assessment Act*: Determining Whether a project is Likely to Cause Significant Environmental Effects” (FEARO 1994a).

The methods used to conduct the assessment include the following information:

- Scope of the environmental, economic, social, heritage, and health effects assessments;
- A description of the agencies, Aboriginal groups, and stakeholders that reviewed and commented on the draft AIR/EIS Guidelines;
- A description of how consultations with the public, stakeholders, Aboriginal groups, and government agencies on the scoping and identification of issues to be addressed in the assessment;
- A list of the guidance documents provided by agencies used to develop the assessment methodology;
- Methods used for assessing potential effects of the Proposed Project, including identification of the criteria used to characterise effects in support of the evaluation of the significance of effects (i.e., magnitude, geographic extent, duration and frequency, reversibility, context and probability) for construction, operation, and reclamation and closure phases of the Proposed Project;
- A description of how model predictions were used to assess potential effects and how monitoring data was used to inform predictive modelling;
- Description/reference for each standard used in baseline studies and assessment analyses; and
- List of applicable best management practices, and guidance documents that will be implemented.

Although the methods described in this section have, in general, been applied in the assessment of the effects of the Proposed Project on human and terrestrial wildlife health, some modification and refinements were made to accommodate the specific nature of the risk assessment, and include the following elements:

- Unlike other components, field data is not used to directly measure existing risks to human and terrestrial wildlife health. Instead, existing risks must be estimated using the same risk assessment approach and methods used to evaluate how the Proposed Project may affect human and terrestrial wildlife health. As such, there is no baseline report for human and terrestrial wildlife health. Baseline data and information from the other disciplines are used in the assessment of human and terrestrial wildlife health. Data collected specifically in support of the health assessment (e.g., drinking water data) are provided in Volume 4, Part G - Section 22.0; and
- The identification of direct linkages between the Proposed Project and the changes in environmental quality which could potentially impact human and terrestrial wildlife health is not explicitly identified. Rather, the pathway analysis focuses on assessing whether the potential exists for the Proposed Project to affect human or terrestrial wildlife health through predicted changes to air quality, water quality or other components of the physical environment.

The human and terrestrial wildlife health risk assessment utilizes a slightly modified approach to the classification of residual effects and evaluation of significance, because several of the criteria (e.g., geographical extent, duration, frequency and reversibility) are already incorporated into the risk estimates and, therefore, are not independent variables. Additional details on the methods used for the assessment of human and terrestrial wildlife health are provided in Volume 2, Part B - Section 9.1, Human Health Chapter.

4.2 Select Valued Components

Valued Components (VCs) are components of the natural and human environment that are considered by the proponent, public, Aboriginal groups, scientists and other technical specialists and government agencies involved in the assessment process to have scientific, ecological, economic, social, cultural, archaeological, historical or other importance (BCEAO 2013). VCs may be measured directly or indirectly using indicators. Indicators are metrics used to measure and report on the condition and trend of a VC.

The general methodology and rationale for the selection of VCs and associated indicators used in the assessment is described in this section; additional details are provided in each discipline chapter in Volume 2, Part B - Section 5.1 through 9.2.

VCs were selected through issues scoping based on the following general criteria and the steps presented in Table 4-1:

- Focus and identification of the issues of greatest concern and relevance to the Proposed Project associated with the biophysical conditions and cultural/socioeconomic (human) resources of the Proposed Project assessment areas;

- Identification of measurable parameters to assess Proposed Project-specific effects and cumulative effects for each VC;
- Regulatory requirements and issues raised by Aboriginal groups, the public and interested stakeholders;
- Evaluation of assessment boundaries; and
- Integration of the cumulative effects assessment into the overall assessment of Proposed Project-related residual environmental effects.

VCs for the biophysical environment are typically major components, such as wildlife or vegetation, or are aspects of the physical and biological environment that are widely recognized as important for ecological resources. Representative VCs for the socio-cultural and economic environment are aspects of the human environment that include such components as economy, employment and business, land use, communities or community life, and traditional land and resource access and use.

Table 4-1: General VC Selection Methodology

Step	Approach
Identify Key Issues (Issue Scoping)	<ul style="list-style-type: none"> ■ Review available Proposed Project information; ■ Review available information on the type of project being proposed (aggregate mine) including past EAs, research and publications, etc.; ■ Review available information for the local area and region within which the Proposed Project is located; ■ Consult provincial and federal agencies (if there are matters of federal jurisdiction); ■ Consult local government and regional community service organizations; ■ Engage and or consult potentially affected Aboriginal groups; and ■ Draw on professional judgment and expertise.
Identify Candidate VCs	<ul style="list-style-type: none"> ■ Candidate VCs should be identified based on whether: <ul style="list-style-type: none"> - The component is present already; - The Proposed Project has the potential to interact with the component; - There are legislative or regulatory requirements protecting the component; - The component pertain to aboriginal interests; - There is potential for significant adverse cumulative effects; and - The component is particularly sensitive or vulnerable to disturbance.
Evaluate Candidate VCs	<ul style="list-style-type: none"> ■ Evaluate candidate VCs based on the following to develop a list of Selected VCs. ■ Is the VC relevant to at least one of the five pillars and clearly linked to the values reflected in the issues raised in respect of the Proposed Project? ■ Is the VC responsive to the potential effects of the Proposed Project? ■ Is the potential Proposed Project related effect on the candidate VC measurable and able to be monitored? ■ Is the candidate VC better represented by another VC? ■ Can the potential VC be effectively considered within the assessment of another VC? (e.g., is it already duplicated by another species, economic activity); ■ Is it the ultimate receptor or VC that is of concern and not an intermediate VC? (e.g., fish being affected by sediment laden discharge)?

Step	Approach
	<ul style="list-style-type: none"> ■ How appropriate is the VC and can it be clearly articulated and understood? (i.e., VCs with no desired attributes should not be selected); and ■ How concise is the VC to the nature of the Proposed Project? (i.e., VC interaction and the resulting effect pathway are articulated).

VCs may be measured directly or indirectly using indicators. Indicators are metrics used to measure and report on the condition and trend of a VC. They frequently comprise of an aspect(s) that is important to the integrity of the VC and can be used to understand and evaluate potential effect on the VC. Key indicators were selected for each VC that had the following attributes:

- **Relevant** – indicators must relate directly or indirectly to the selected VC;
- **Practical** – there must be a practical way to evaluate the indicator, using existing or achievable data, predictive models, or other means;
- **Measureable** – the measurement of the selected indicator must include general useful data that informs our understanding of the potential effect on the VC;
- **Responsive** to potential effects of the Proposed Project;
- **Accurate** in reflecting changes to the VC; and
- **Predictable** in terms of their response to the Proposed Project.

4.2.1 Identifying Key Issues

Issues are revealed through a scoping exercise which involves a literature review and consultation with local stakeholder groups. Issues reflect the interests of government agencies, First Nations, conservation initiatives and stakeholders.

The flowing information was reviewed by each technical discipline in order to frame their key issues:

- Proposed Project information;
- Information on the type of project being proposed (aggregate mine) including past EAs, research and publications;
- Information for the local area and region within which the Proposed Project is located;
- Information attained through the consultation with provincial and federal agencies;
- Information attained through the consultation with local government and regional community service organizations; and
- Information attained through the consultation of potentially affected First Nations.

Issues were grouped by BC EAO pillar (i.e., environmental, economic, social, heritage and health).

4.2.2 Candidate VCs and Selected VCs

The BC EAO describes VCs in their guidance document as “components of the natural and human environment that are considered by the proponent, public, Aboriginal groups, scientists and other technical specialists, and government agencies involved in the assessment process to have scientific, ecological, economic, social, cultural, archaeological, historical, or other importance”

Similarly, the Canadian Environmental Assessment Agency defines Valued Ecosystem Component as “the environmental element of an ecosystem that is identified as having scientific, social, cultural, economic, historical, archaeological or aesthetic importance” (CEAA 2006).

Candidate VCs were selected to that relate to one of the five ‘pillars’ of assessment defined above, and clearly linked to the issues identified through scoping. Through the evaluation of candidate VCs, selected VCs are identified to be carried through the environmental assessment process.

4.2.2.1 Identify Candidate VCs

Through the identification of key issues, candidate VCs (e.g., marine mammals, anadromous coho salmon and their habitats, archaeological sites etc.) were selected through professional judgment and expertise by technical disciplines based on those that best represented the key issues when considering the potential for them to interact with the Proposed Project. Candidate VCs were identified based on whether:

- The component is present already;
- The Proposed Project has the potential to interact with the component;
- There are legislative or regulatory requirements protecting the component;
- The component pertain to First Nations interests;
- There is potential for significant adverse cumulative effects; and
- The component is particularly sensitive or vulnerable to disturbance.

Each candidate VC was then screened based on three categories (Table 4-2) to determine whether the candidate VC was relevant to the stakeholder environment:

- Is the candidate VC of regulatory or conservation concern (e.g., listed federally (*Species at Risk Act* and COSEWIC) or provincially);
- Is the candidate VC of importance to First Nations (e.g., aboriginal fishery, harvested, cultural importance); and

- Is the candidate VC of importance to other stakeholder groups (e.g., tourism, commercial or recreational fishery, local cultural importance)

If the answer was “Yes” for any of the filter questions, the component was carried forward to the next screening.

4.2.2.2 Evaluate Candidate VCs

In order to identify Selected VCs, Candidate VCs were evaluated based on three parameters (Table 4-3):

- Is the candidate VC known to be present (based on information review) or has been observed (based on field work) in the study areas?
- Does the Project and the potential to interact with the candidate VC?
- Is the candidate VC better represented by another VC or can the potential VC be effectively considered within the assessment of another VC? (e.g., is it already duplicated by another species, economic activity)?

If the answer was “Yes” for the first two parameters and no to the third, the candidate VC was carried forward and selected as a final VC. If the answer was no to the first two parameters or if the answer was yes to the third, then the VC was excluded and further explanation was provided.

Table 4-2: Evaluating Regulatory and Stakeholder Importance of Identified Candidate Valued Components

Issue	Candidate VCs Identified through Issues Scoping	Regulatory Importance or Conservation Considerations ¹	Importance to First Nations Groups? ^{2, 3}	Importance to other Stakeholders?	Carried Forward as a Candidate VC
EA Pillar: Environmental					
Fisheries and Freshwater Habitat	Anadromous chinook salmon and their habitats	<ul style="list-style-type: none"> T (COSEWIC) 	Component known to be of interest to First Nations. Details will be sought through consultation with potentially affected groups.	Yes. Fish are part of recreational fishery.	Yes
	Steelhead (rainbow trout) and their habitats	<ul style="list-style-type: none"> Yellow-listed (BC CDC) 	Component known to be of interest to First Nations. Details will be sought through consultation with potentially affected groups.	Yes. Fish are part of recreational fishery.	Yes
	Anadromous chum salmon and their habitats	<ul style="list-style-type: none"> Yellow-listed (BC CDC) 	Component known to be of interest to First Nations. Details will be sought through consultation with potentially affected groups.	Yes. Fish are part of recreational fishery.	Yes
	Anadromous coho salmon and their habitats	<ul style="list-style-type: none"> Yellow-listed (BC CDC) E (COSEWIC) 	Component known to be of interest to First Nations. Details will be sought through consultation with potentially affected groups.	Yes. Fish are part of recreational fishery.	Yes
	Anadromous and freshwater cutthroat trout (<i>clarkii</i> spp) and their habitats	<ul style="list-style-type: none"> Blue-listed (BC CDC) 	Component known to be of interest to First Nations. Details will be sought through consultation with potentially affected groups.	Yes. Fish are part of recreational fishery.	Yes
	Anadromous pink salmon and their habitats	<ul style="list-style-type: none"> Yellow-listed (BC CDC) 	Component known to be of interest to First Nations. Details will be sought through consultation with potentially affected groups.	Yes. Fish are part of recreational and commercial fishery (firs time opened in Howe Sound in 2013 since 1962).	Yes
Marine Resources	Marine Water Quality	<ul style="list-style-type: none"> Pollution that may result in changes to marine water quality which is regulated under the BC <i>Environmental Management Act</i>. 	-	-	Yes
	Marine sediment	<ul style="list-style-type: none"> Pollution that may result in changes to marine sediments or re-suspension of sediments is regulated under the BC <i>Environmental Management Act</i>. 	-	-	Yes
	Marine benthic communities (fauna and flora)	<ul style="list-style-type: none"> Eelgrass and bull kelp serves as breeding habitat for CRA fish and is present in Howe Sound. Several marine invertebrates play important roles in the marine ecosystem. Glass sponge present in Howe Sound. Rockfish conservation areas present near to Project area. Marine conservation areas present in Howe Sound. 	Component known to be of interest to First Nations. Details will be sought through consultation with potentially affected groups.	Crustaceans and bivalves are fished recreationally.	Yes
	Northern Abalone	<ul style="list-style-type: none"> EN-1(SARA) Red-listed (BC CDC) 	Component known to be of interest to First Nations. Details will be sought through consultation with potentially affected groups.	-	Yes
	Forage fish and their habitats (including herring, surf smelt and Pacific sand lance)	<ul style="list-style-type: none"> VC includes fish that have been identified by COSEWIC as Endangered and Threatened. VC includes species that are protected under the <i>Fisheries Act</i>. 	Component known to be of interest to First Nations. Details will be sought through consultation with potentially affected groups.	Yes. The VC includes fish that are commercially and recreationally fished.	Yes

¹ **Identified Wildlife** in the Identified Wildlife Management Strategy (IWMS) under the *Forest and Range Practices Act*, COSEWIC: Committee on the Status of Endangered Wildlife in Canada.; **1**: Schedule 1 of *Species at Risk Act* (SARA); **EN**: Endangered; **T**: Threatened; **SC**: Special Concern; **CDC**: BC Conservation Data Center; **No Status**: Not assessed; **Red**: Extirpated, Endangered or Threatened; **Blue**: Vulnerable; **Yellow**: Not at Risk.

² A Cultural Study is being prepared by the Squamish Nation. BURNCO will incorporate information from this study into the EA when it is available.

³ - : issue has not been specifically identified; **Yes**: stakeholder has brought this up as a VC of concern through the AIR/EIS Guidelines review process of the discipline leads have determined that it will likely be of concern to stakeholders through professional judgement.

Issue	Candidate VCs Identified through Issues Scoping	Regulatory Importance or Conservation Considerations ¹	Importance to First Nations Groups? ^{2, 3}	Importance to other Stakeholders?	Carried Forward as a Candidate VC
	Marine birds	<ul style="list-style-type: none"> VC includes birds that are listed as Endangered, Threatened or Special Concern under Schedule 1 of the federal <i>Species at Risk Act</i>. Protected under the <i>Migratory Birds Convention Act</i>. Protected under the <i>Wildlife Act</i>. 	-	Yes. Public comment that area provides habitats for migrating land and marine birds.	Yes
	Marine mammals	<ul style="list-style-type: none"> VC includes species that are listed as Blue or Red Provincially. VC includes amphibian species that are listed as Endangered, Threatened or Special Concern under Schedule 1 of the federal <i>Species at Risk Act</i>. VC includes species that have been identified by COSEWIC as Endangered and Threatened. VC includes species that are protected under the <i>Fisheries Act</i> and Marine Mammal Regulations. 	Component known to be of interest to First Nations. Details will be sought through consultation with potentially affected groups.	Yes	Yes
Terrestrial Wildlife and Vegetation	Listed Amphibian Species, including Coastal tailed frog	<ul style="list-style-type: none"> VC includes species that are listed as Blue or Red Provincially. VC includes amphibian species that are listed as Endangered, Threatened or Special Concern under Schedule 1 of the federal <i>Species at Risk Act</i>. VC includes species that have been identified by COSEWIC as Endangered, Threatened or Special Concern. VC includes species listed as Identified Wildlife (IWMS) Aquatic habitat indicator species 	Component known to be of interest to First Nations. Details will be sought through consultation with potentially affected groups.	-	Yes
	Western screech owl	<ul style="list-style-type: none"> Blue-listed (BC CDC) Threatened (COSEWIC) SC-1 (SARA) Nocturnal raptor indicator of mature forest 	-	-	Yes
	Common nighthawk	<ul style="list-style-type: none"> Yellow-listed (BC CDC) Threatened (COSEWIC) T-1 (SARA) Avian indicator of open habitat and insectivorous species 	-	-	Yes
	Northern goshawk	<ul style="list-style-type: none"> Red-listed (BC CDC) Threatened (COSEWIC) T-1 (SARA) Identified Wildlife – IWMS Diurnal raptor indicator of mature forest 	-	-	Yes
	Band-tailed pigeon	<ul style="list-style-type: none"> Blue-listed (BC CDC) Special Concern (COSEWIC) SC-1 (SARA) Avian indicator of shrub and forest habitat 	-	-	Yes
	Marbled murrelet	<ul style="list-style-type: none"> Blue-listed (BC CDC) Threatened (COSEWIC) T-1 (SARA) Identified Wildlife - IWMS 	-	-	Yes

Issue	Candidate VCs Identified through Issues Scoping	Regulatory Importance or Conservation Considerations ¹	Importance to First Nations Groups? ^{2, 3}	Importance to other Stakeholders?	Carried Forward as a Candidate VC
		<ul style="list-style-type: none"> Avian indicator of mature coastal forest Recovery Strategy developed in 2014 (Environment Canada 2014a) 			
Barn swallow		<ul style="list-style-type: none"> blue-listed (BC CDC) T (COSEWIC) 	Component known to be of interest to First Nations. Details will be sought through consultation with potentially affected groups.	-	Yes
Great blue heron		<ul style="list-style-type: none"> Blue-listed (BC CDC) Special Concern (COSEWIC) SC-1 (SARA) Identified Wildlife - IWMS 	Component known to be of interest to First Nations. Details will be sought through consultation with potentially affected groups.	-	Yes
Bald Eagle		<ul style="list-style-type: none"> Yellow-listed (BC CDC) Not at Risk (COSEWIC) 	Component known to be of interest to First Nations. Details will be sought through consultation with potentially affected groups.	-	Yes
Osprey		<ul style="list-style-type: none"> Yellow-listed (BC CDC) 	Component known to be of interest to First Nations. Details will be sought through consultation with potentially affected groups.	-	Yes
Sooty grouse		<ul style="list-style-type: none"> Blue-listed (BC CDC) 	-	-	Yes
Green heron		<ul style="list-style-type: none"> Blue-listed (BC CDC) 	-	-	Yes
Roosevelt elk		<ul style="list-style-type: none"> Blue-listed (BC CDC) Identified Wildlife - IWMS Ungulate indicator of coastal forest and early seral vegetation 	Component known to be of interest to First Nations. Details will be sought through consultation with potentially affected groups	VC is hunted and provides wildlife viewing opportunities.	Yes
Double-crested cormorant		<ul style="list-style-type: none"> Blue-listed (BC CDC) 	-	-	Yes
Olive-sided flycatcher		<ul style="list-style-type: none"> Blue-listed (BC CDC) T (COSEWIC) T-1 (SARA) 	-	-	Yes
Purple martin		<ul style="list-style-type: none"> Blue-listed (BC CDC) 	-	-	Yes
Moose		<ul style="list-style-type: none"> Yellow-listed (BC CDC) 	Component known to be of interest to First Nations. Details will be sought through consultation with potentially affected groups.	-	Yes
Columbia black-tailed deer		<ul style="list-style-type: none"> Yellow-listed (BC CDC) 	Component known to be of interest to First Nations. Details will be sought through consultation with potentially affected groups.	Yes. VC is hunted and provides wildlife viewing opportunities.	Yes
Townsend's big-eared bat		<ul style="list-style-type: none"> Blue-listed (BC CDC) 	-	-	Yes
Keen's myotis		<ul style="list-style-type: none"> Red-listed (BC CDC) Identified Wildlife - IWMS 	-	-	Yes
Wolverine		<ul style="list-style-type: none"> Blue-listed (BC CDC) SC (COSEWIC) Identified Wildlife - IWMS 	-	-	Yes
Fisher		<ul style="list-style-type: none"> Blue-listed (BC CDC) Identified Wildlife - IWMS 	-	-	Yes
Grizzly bear		<ul style="list-style-type: none"> Blue-listed (BC CDC) Special Concern (COSEWIC) Identified Wildlife - IWMS Carnivore indicator of sea level to high elevation habitat (omnivorous species) 	Component known to be of interest to First Nations. Details will be sought through consultation with potentially affected groups.	Yes. VC is hunted and provides wildlife viewing opportunities.	Yes
Black bear		<ul style="list-style-type: none"> Yellow-listed (BC CDC) 	Component known to be of interest to First Nations. Details will be sought through consultation with potentially affected groups.	Yes. VC is hunted and provides wildlife viewing opportunities. Public comment that bears have been observed feeding in the upland cover.	Yes
Terrestrial invertebrates		<ul style="list-style-type: none"> Limited provincial extent and distribution for these species make them important contributors to biodiversity and sensitive to ecological change 	-	-	Yes

Issue	Candidate VCs Identified through Issues Scoping	Regulatory Importance or Conservation Considerations ¹	Importance to First Nations Groups? ^{2, 3}	Importance to other Stakeholders?	Carried Forward as a Candidate VC
		<ul style="list-style-type: none"> • Sensitive to disturbance • Conservation status 			
	Environmentally sensitive ecosystems (wetlands, riparian ecosystems, old growth forest)	<p>Wetlands: Sensitive to disturbance, potential for rare plant occurrence, important contributor to community- and landscape-level biodiversity, influence stream flow, water quality and water temperature and provide important habitat for a wide variety of wildlife.</p> <p>Riparian ecosystems: Sensitive to disturbance, potential for rare plant occurrence, important contributor to community- and landscape-level biodiversity, provide important wildlife habitat, and important inputs to stream productivity, moderate water temperature, stabilize soil on wetland edges.</p> <p>Old growth forest: Important role in conserving species- and ecosystem-level biodiversity, wildlife habitat value, slow recovery time post-disturbance.</p>	-	-	Yes
	Ecosystems at-risk	Ecosystems listed with a provincial red or blue status. Limited provincial extent and distribution for these species make them important contributors to biodiversity. High sensitivity to disturbance. Conservation status.	-	-	Yes
	Plant species at-risk	Limited provincial extent and distribution for these species make them important contributors to biodiversity. Sensitive to disturbance. Conservation status.	-	-	Yes
	Traditional and medicinal plants	-	Yes	-	Yes
Geotechnical and Natural Hazards	Terrain stability	The criteria and guidelines or regulated methods for conduct of VC assessments are governed by and under the authority of the National and BC Building Codes and the <i>Engineers and Geoscientists Act</i>	-	Yes	Yes
	Earthquakes and tsunamis	The criteria and guidelines or regulated methods for conduct of VC assessments are governed by and under the authority of the National and BC Building Codes and the <i>Engineers and Geoscientists Act</i> .	-	Yes	Yes
	Climate	<ul style="list-style-type: none"> • Required by the Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment. <p>Guided by the:</p> <ul style="list-style-type: none"> • Global Reporting Initiative (GRI); • Greenhouse Gas Reporting Program (GHGRP); and • British Columbia Reporting Regulation – Guidance Document. 	-	Yes	Yes

Issue	Candidate VCs Identified through Issues Scoping	Regulatory Importance or Conservation Considerations ¹	Importance to First Nations Groups? ^{2, 3}	Importance to other Stakeholders?	Carried Forward as a Candidate VC
Surface Water Resources	Water quantity: • base flow • high flow	VC is protected under the: • <i>Water Sustainability Act Regulation</i> • <i>Fisheries Act</i> • <i>BC Water Sustainability Act</i> • <i>Navigable Waters Protection Act</i>	-	-	Yes
	Water quality: • suspended sediments • chemical quality	VC is protected under the: • <i>Water Sustainability Act Regulation</i> • <i>Fisheries Act</i> • <i>BC Water Sustainability Act</i>	-	-	Yes
	Aquatic health • Surface water quality • Periphyton • Benthic invertebrates • Freshwater fish	• Pollution that may result in changes to water quality or re-suspension of sediments is regulated under the <i>BC Environmental Management Act</i> . • Indicators for freshwater aquatic health. • VC includes fish that have been identified by COSEWIC as Endangered and Threatened. • VC includes species that are protected under the <i>Fisheries Act</i> .	Component known to be of interest to First Nations. Details will be sought through consultation with potentially affected groups.	Yes. VC includes fish that are part of commercial and recreational fisheries.	Yes
Groundwater Resources	Groundwater quantity (flow)	VC is protected under the: • <i>Water Sustainability Act Regulation</i> • <i>Fisheries Act</i> • <i>BC Water Sustainability Act</i> • <i>Navigable Waters Protection Act</i>	-	-	Yes
	Groundwater quality	VC is protected under the: • <i>Water Sustainability Act Regulation</i> • <i>Fisheries Act</i> • <i>BC Water Sustainability Act</i>	-	-	Yes
Air Quality	Air Quality Indicators	• Regulated by the BC Ambient Air Quality Objectives (AAQO) and National Ambient Air Quality Objectives (NAAQO) for TSP, PM10 and PM2.5 where applicable • Sea-to-Sky Air Quality Management Plan (SSAQMP) specified air quality indicators and targets	-	-	Yes
Climate Change	Air Quality Indicators Greenhouse gases (GHGs)	• Required by the Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment. • Guided by the: • Global Reporting Initiative (GRI); • Greenhouse Gas Reporting Program (GHGRP); and • British Columbia Reporting Regulation – Guidance Document.	-	-	Yes

Issue	Candidate VCs Identified through Issues Scoping	Regulatory Importance or Conservation Considerations ¹	Importance to First Nations Groups? ^{2, 3}	Importance to other Stakeholders?	Carried Forward as a Candidate VC
EA Pillar: Economic					
Sustainable Economy	Regional Economic Development	Regulated by the: <ul style="list-style-type: none"> New West Partnership Trade Agreement (NWPTA) and Agreement in Internal Trade (AIT); and Industry Training Authority Act. 	-	Yes	Yes
	Labour Market	Regulated by the: <ul style="list-style-type: none"> Employment Standards Act; Labour Relations Code; Workers Compensation Act; Industry Training Authority Act; Labour Mobility Act; and Trade, Investment and Labour Mobility Agreement Implementation Act. 	Component known to be of interest to First Nations. Details will be sought through consultation with potentially affected groups	Yes	Yes
	Local Government Revenue	Regulated by the: <ul style="list-style-type: none"> Provincial Community Charter Local Government Grants Act Local Government Act 	-	Yes	Yes
	Real Estate	No specific regulations	-	Yes	Yes
EA Pillar: Social					
Social Conditions	Housing and Accommodation	Regulated under the <i>Local Government Act</i>	-	Yes	Yes
	Emergency Services	Several sub-components were identified for this VC and are regulated under the following acts: <ul style="list-style-type: none"> Police - <i>Royal Canadian Mounted Police Act</i> Ambulance Services - <i>Canada Health Act</i> and <i>Emergency and Health Services Act</i> Fire and Wildfire Management Services - <i>Fire Services Act</i> and the <i>Wildfire Act</i> Oil Spill Services - <i>Canada Shipping Act</i> Mining Emergency Plans - <i>Mines Act</i> and the Health, Safety and Reclamation Code for Mines in BC 	-	-	Yes
Marine Transportation	Marine Navigation	Regulated under the: <ul style="list-style-type: none"> <i>Navigation Protection Act;</i> <i>Canada Shipping Act;</i> and <i>Marine Liability Act.</i> 	-	-	Yes
	Vessel Wake	Vessel wake has the potential to affect sensitive habitats and public docks.	Component known to be of interest to First Nations. Details will be sought through consultation with potentially affected groups.	Yes	Yes
Non-Traditional Land and Resource Use	Forestry	Regulated under the: <ul style="list-style-type: none"> <i>Forest Act;</i> and <i>Forest and Range Practices Act.</i> 	-	Yes	Yes
	Harvesting fish and wildlife	Regulated under the: <ul style="list-style-type: none"> <i>Wildlife Act;</i> and <i>Fisheries Act.</i> 	Component known to be of interest to First Nations. Details will be sought through consultation with potentially affected groups.	Yes	Yes
	Recreation and tourism	Regulated under the: <ul style="list-style-type: none"> <i>Tourism Act;</i> <i>Land Act;</i> <i>Ministry of Lands;</i> and <i>Parks and Housing Act.</i> 	Component known to be of interest to First Nations. Details will be sought through consultation with potentially affected groups.	Yes	Yes

Issue	Candidate VCs Identified through Issues Scoping	Regulatory Importance or Conservation Considerations ¹	Importance to First Nations Groups? ^{2, 3}	Importance to other Stakeholders?	Carried Forward as a Candidate VC
	Minerals and aggregates	Regulated under the: <ul style="list-style-type: none"> • <i>Mineral Tenure Act</i> 	-	-	Yes
Visual Resources	Visual Quality	Management of visual resources: <ul style="list-style-type: none"> • Sunshine Coast District Sustainable Resource Management Plan Related to forestry: <ul style="list-style-type: none"> • None specifically, managed under the <i>Forest and Range Practices Act</i> • BC Visual Resource Management Related to mining: <ul style="list-style-type: none"> • Guidelines for Mine Permit Applications for Aggregate Pits and Quarries in British Columbia (MEMPR 2010) under the <i>Mines Act</i> Related to lighting: <ul style="list-style-type: none"> • Sunshine Coast Regional District Outdoor Lighting Guidelines • Guide on the Limitation of the Effects of Obtrusive Light from Outdoor Lighting Installations 	Component known to be of interest to First Nations. Details will be sought through consultation with potentially affected groups	Yes. The visual aesthetics of this area are valued by local residents, recreational users and tourists and there is concern related to maintaining the quality of visual resources of the Proposed Project Area as it's visible from Gambier Island, the Sea to Sky Highway corridor (Highway 99) and McNab Creek strata properties.	Yes
EA Pillar: Heritage					
	Paleontological Resources	<ul style="list-style-type: none"> • Required to be assessed under the Former CEAA. 	-	-	Yes
Heritage Resources	Archaeological Resources	<ul style="list-style-type: none"> • VC protected under the <i>Heritage Conservation Act</i>. • Significant historical sites that are not protected by the <i>HCA</i> may be protected by municipal by-law, per the <i>Local Government Act</i>, and/or included on municipally-administered Community Heritage Registers (CHRs). • Specific First Nations heritage policies (the Squamish First Nation and Tsleil-Waututh Nation) 	Component known to be of interest to First Nations. Details will be sought through consultation with potentially affected groups.	-	Yes
EA Pillar: Health					
Public Health	People (includes public health effects related to water quality, air quality and the consumption of country foods)	Risk assessment guidance provided by Health Canada, the British Columbia (BC) Ministry of the Environment the United States Environmental Protection Agency and other applicable risk assessment and health assessment guidance documents and manuals.	Component known to be of interest to First Nations. Details will be sought through consultation with potentially affected groups.	Yes	Yes
Noise	Noise levels	Regulatory requirement based on Commission Guideline and HC Guidance	Component known to be of interest to First Nations. Details will be sought through consultation with potentially affected groups.	Yes	Yes

Table 4-3: Evaluating Candidate Valued Components to Identify Selected Valued Components

Issue	Candidate VCs Carried Forward	Known or Potential to be Present in the Local or Regional Study Areas ⁴	Potential to Interact with the Proposed Project	Can effects be covered within the assessment of another VC. Which one(s)?	Carried Forward as a Selected VC in the EA
EA Pillar: Environmental					
Fisheries and Freshwater Habitat	Anadromous chinook salmon and their habitats	Yes	Observations of chinook salmon within the study area were infrequent.	Yes. The general habitat requirements of chinook salmon are similar to that of other salmonids that are being considered in the assessment.	No
	Steelhead (rainbow trout) and their habitats	Yes	Observations of steelhead within the study area were infrequent.	Yes. The general habitat requirements of steelhead are similar to that of other salmonids that are being considered in the assessment.	No
	Anadromous chum salmon and their habitats	Yes	Yes	No	Yes
	Anadromous coho salmon and their habitats	Yes	Yes	No	Yes
	Anadromous cutthroat trout and their habitats	Yes	Yes	No	Yes
	Freshwater resident trout and their habitats (cutthroat trout)	Yes	Yes	No	Yes
	Pink salmon and their habitats	Yes	Yes	No	Yes
Marine Resources	Marine Water Quality	Yes	Yes	Yes. Potential effects to water quality were assessed under potential effect to marine sediments and the assessment of accidents and malfunctions (spills). Indirect effects due to changes in water quality will be captured in the assessment of the VC carried through the assessment.	No
	Marine sediment	Yes	Yes	No	Yes
	Marine benthic communities (fauna and flora)	Yes	Yes	No	Yes
	Northern Abalone	No known occurrences of Northern abalone within the Proposed Project area. This is based on a desktop review (SARA Registry, BC Conservation Data Centre) and a review of habitat suitability. Results were confirmed by dive and underwater video survey observations.	No as they are not present in the study areas.	Yes. Abalone are considered a part of the marine benthic community, therefore potential effects assessed on this more general umbrella will cover potential effects on this specific species.	No, not specifically. See previous column.
	Forage fish and their habitats (including herring, surf smelt and Pacific sand lance)	Yes	Yes	No	Yes
	Marine birds	Yes	Yes	No	Yes
	Marine mammals	Yes	Yes	No	Yes

⁴ References cited within Table A-2:

Cousens, B., and J. C. Lee. 2012. Status Report on the Western Purple Martin (*Progne subis arboricola*) in British Columbia. Published by the Ministry of Environment.

Available at <http://a100.gov.bc.ca/pub/eirs/finishDownloadDocument.do?subdocumentId=91>.

Fraser and Ramsey. 1996. Status of the Green Heron in British Columbia: Wildlife Working Report No. WR-78. Published by the Ministry of Environment, Lands and Park. Available at <http://www.env.gov.bc.ca/wld/documents/statusrpts/wr78.pdf>.

Robertson, B. A. and R. L. Hutto. 2007. Is selectively harvested forest an ecological trap for Olive-sided Flycatchers? *The Condor* 109: 109-121

Blood, D.A. 2000. Moose in British Columbia, Ecology, Conservation and Management. B.C. Minist. Environ, Lands and Parks, Wildl. Branch. 6pp

COSEWIC. 2003. COSEWIC assessment and update status report on the wolverine *Gulo gulo* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 41 pp.

Weir, R.D. 2003. Status of the Fisher in British Columbia. B.C. Minist. Water, Land and Air Prot., Biodiversity Branch, and B.C. Minist. Sustainable Resour. Manage, Conservation Data Centre Victoria, BC. Wildl. Bull. B-105. 47pp.

Issue	Candidate VCs Carried Forward	Known or Potential to be Present in the Local or Regional Study Areas ⁴	Potential to Interact with the Proposed Project	Can effects be covered within the assessment of another VC. Which one(s)?	Carried Forward as a Selected VC in the EA
Terrestrial Wildlife and Vegetation	Listed Amphibian Species, including Coastal tailed frog	Yes	Yes	No	Yes
	Western screech owl	Yes	Yes	No	Yes
	Common nighthawk	Yes	Yes	No	Yes
	Northern goshawk	Yes	Yes	No	Yes
	Band-tailed pigeon	Yes	Yes	No	Yes
	Marbled murrelet	Yes	Yes	No	Yes
	Barn swallow	Yes	Yes	Common nighthawk is assessed as a surrogate species representative of aerial feeding insectivorous avian species; therefore, barn swallow was not specifically included as representative insectivorous avian VC species. Common nighthawk assessed as a surrogate. Notwithstanding, all species at-risk identified for the Proposed Project area will be discussed in the EAC Application/EIS, with a more detailed level of analysis being provided for selected VCs which may be representative of other species.	No
	Great blue heron <i>fannini</i>	Nesting is colonial typically in Sitka spruce (<i>Picea sitchensis</i>), western redcedar (<i>Thuja plicata</i>), western hemlock (<i>Tsuga heterophylla</i>), red alder (<i>Alnus rubra</i>), and black cottonwood (<i>Populus trichocarpa</i>) (COSEWIC 2008). No nesting has been recorded within the Project area. Great blue heron have occasionally been observed foraging near the mouth of McNab Creek	Yes	The <i>fannini</i> subspecies of the great blue heron was excluded as a VC as nesting is not known to occur within the Project area. Potential interaction with great blue heron food source (i.e., fish) will be assessed as part of the freshwater and marine VCs.	No
	Bald Eagle	Yes	Yes	Northern goshawk and western screech-owl were selected as surrogate raptor species occurring in mature and old-growth forest habitat based on their conservation status. In general, raptors and their nests will be considered in the assessment. Bald eagles will not be considered a stand-alone VC.	No
	Osprey	Yes	Yes	Osprey nesting has not been documented in the Project area. Potential interaction with osprey food source (i.e., fish) will be assessed as part of the freshwater and marine components. In general, raptors and their nests will be considered in the assessment. Osprey will not be considered a stand-alone VC.	No
Sooty grouse	Yes	Yes	Northern goshawk, western screech-owl and marbled murrelet were selected as surrogate species for forest dwelling avian species. Band-tailed pigeon have been selected as a surrogate avian species that occurs in open/cleared habitat.	No	

Issue	Candidate VCs Carried Forward	Known or Potential to be Present in the Local or Regional Study Areas ⁴	Potential to Interact with the Proposed Project	Can effects be covered within the assessment of another VC. Which one(s)?	Carried Forward as a Selected VC in the EA
	Green heron	No. Green heron occur within a variety of aquatic habitats including wetlands, riparian areas of sloughs, rivers, ponds and lakes, estuaries and beaches. Habitat use is generally dependent on the availability of slow moving or shallow water for foraging and dense trees or tall shrubs for nesting. In BC, green heron typically nests in deciduous trees and shrubs, although they have been recorded nesting in Douglas-fir (<i>Pseudotsuga menziesii</i> ; Fraser and Ramsey 1996). Highly suitable green heron nesting and foraging habitat does not occur within the Project area.	No as they are not present in the study areas.	N/A	No
	Roosevelt elk	Yes	Yes	No	Yes
	Double-crested cormorant	Yes	Yes	Has been assessed as a marine bird VC.	No
	Olive-sided flycatcher	Yes	Yes	Olive-sided flycatchers are associated with forest openings in montane coniferous forests including natural openings (i.e., meadows, burns, rivers) or anthropogenic opens (cut blocks). Nesting occurs in natural and anthropogenic forest openings with survivalship rates in natural openings approximately double that of nests in harvested forest (Robertson and Hutto 2007). The Proposed Project Area mostly consists of pole sapling forests in the early stages of re-generation post logging. As such, is not considered highly suitable olive-sided flycatcher habitat based on research reported in Robertson and Hutto (2007). Band-tailed pigeon has been selected as a surrogate species representing an avian species that occurs in open habitat and forest edges.	No
	Purple martin	No. In BC, purple martins are only currently known to breed at marine sites. No active breeding areas are known to occur at or adjacent to the Project area and the Project area does not occur within the active range extent or historical range extent identified by Cousens and Lee (2012)	No as they are not present in the study areas.	Common nighthawk is assessed as a surrogate species representative of aerial feeding insectivorous avian species.	No
	Moose	Moose range in British Columbia does not include the South Coast environment (Blood 2000).	No as they are not present in the study areas.	Roosevelt Elk have been included as a VC and are considered to represent other ungulate species.	No
	Columbia black-tailed deer	Yes	Yes	Roosevelt Elk have been included as a VC and are considered to represent other ungulate species.	No
	Townsend's big-eared bat	Possible Townsend's big-eared bat occurs in the region; however, its presence is typically associated with drier habitats and/or	The Project is not expected to interact with important or unique habitat such as maternity colonies or hibernacula. Townsends' big-eared bat could forage in the riparian habitat	Effects to riparian habitat will be assessed as a component of the sensitive ecosystem VC.	No

Issue	Candidate VCs Carried Forward	Known or Potential to be Present in the Local or Regional Study Areas ⁴	Potential to Interact with the Proposed Project	Can effects be covered within the assessment of another VC. Which one(s)?	Carried Forward as a Selected VC in the EA
		significant freshwater riparian areas. No day-roosting habitat was observed in the LSA (e.g. caves or mines), and foraging habitat typically associated with the species is limited in the LSA (e.g. open forest types or riparian areas).	associated with McNab Creek; however, this is outside of the Project area.		
	Keen's myotis	Possible. The distribution of Keen's myotis appears to be limited to dense mature forest in temperate coastal areas. Low elevation ponds and riparian areas provide the most important foraging habitat for this species due to high insect productivity in these areas. Keen's long-eared myotis are not known to roost or forage in clear-cut areas or second growth forests.	Yes. The Project is not expected to interact with important or unique habitat such as maternity colonies or hibernacula. Keen's myotis may forage and roost in mature and old growth forest within the Project area	Effects to mature and old growth forest will be assessed as a component of the sensitive ecosystem VC. Western screech-owl, marbled murrelet and northern goshawk have been selected as a surrogate species representing forest dwelling species.	No
	Wolverine	Yes. Wolverines generally occur at higher elevations and are mobile and travel long distances to search out food sources. Foraging habitat is selected based on availability of food source (carrion, small – medium size mammals and ungulates) rather than access to thermoregulatory or shelter features; as such, this species tends to be a habitat generalist. Denning occurs in bowls at high elevation and they mostly range in mountainous terrain along the coast (COSEWIC 2003b). No suitable denning habitat has been recorded in the Project area	No. The Project area does not support unique or important wolverine habitat such as denning habitat. Wolverines may occasionally move through and hunt in the Project area; however, it is predicted that wolverine use of the Project area is rare and therefore, Project related effects, if any, are expected to be minimal.	Grizzly bear has been assessed as a surrogate species representing mobile and wide-ranging mammals.	No
	Fisher	No. Not expected to occur in or adjacent to the Project area. Fishers have flexible habitat requirements for foraging while requiring specific habitat types for rearing young. In BC, Fishers select large diameter black cottonwood or balsam poplar (<i>P.b. balsamifera</i>) for whelping (Weir, 2003). The Project study areas do not provide suitable fisher habitat due to lack of suitable tree cover.	No as they are not present in the study areas.	Not applicable due to first two columns.	No
	Grizzly bear	Yes	Yes	No	Yes
	Black bear	Yes	Yes	Grizzly bear has been assessed as a surrogate species representing omnivorous and wide-ranging mammals.	No
	Terrestrial invertebrates	Yes	Yes	Yes. Effects to terrestrial invertebrate species habitat that may be present in the area will be covered in the assessment of other terrestrial VCs.	No
	Environmentally sensitive ecosystems (wetlands, riparian ecosystems, old growth forest)	Yes	Yes	No	Yes
	Ecosystems at-risk	Yes	Yes	No	Yes
	Plant species at-risk	Yes	Yes	No	Yes
	Traditional and medicinal plants	Unknown	Unknown	Unknown	Yes, if not otherwise covered.

Issue	Candidate VCs Carried Forward	Known or Potential to be Present in the Local or Regional Study Areas ⁴	Potential to Interact with the Proposed Project	Can effects be covered within the assessment of another VC. Which one(s)?	Carried Forward as a Selected VC in the EA
Geotechnical and Natural Hazards	Terrain stability	Yes	Yes	No	Yes
	Earthquakes and tsunamis	Yes	Yes	No	Yes
	Climate	Yes	Yes	No	Yes
Surface Water Resources	Water quantity: • base flow • high flow	Yes	Yes	No	Yes
	Water quality: • suspended sediments • chemical quality	Yes	Yes	No	Yes
	Aquatic health • Surface water quality • Periphyton • Benthic invertebrates • Freshwater fish	Yes	Yes	No	Yes
Groundwater Resources	Groundwater quantity (flow)	Yes	Yes	No	Yes
	Groundwater quality	Yes	Yes	No	Yes
Air Quality	Air Quality Indicators	Yes	Yes	No	Yes
Climate Change	Air Quality Indicators Greenhouse gases (GHGs)	Yes	Yes	No	Yes
EA Pillar: Economic					
Sustainable Economy	Regional Economic Development	Yes	Yes	No	Yes
	Labour Market	Yes	Yes	No	Yes
	Local Government Revenue	Yes	Yes	No	Yes
	Real Estate	Yes	Yes	No	Yes
EA Pillar: Social					
Social Conditions	Housing and Accommodation	Yes	Yes	No	Yes
	Emergency Services	Yes	Yes	No	Yes
Marine Transportation	Marine Navigation	Yes	Yes	No	Yes
	Vessel Wake	Yes	Yes	No	Yes
Non-Traditional Land and Resource Use	Forestry	Yes	Yes	No	Yes
	Harvesting Fish and Wildlife	Yes	Yes	No	Yes
	Recreation and Tourism	Yes	Yes	No	Yes
	Minerals and Aggregates	Yes	Yes	No	Yes
Visual Resources	Visual quality	Yes	Yes	No	Yes
EA Pillar: Heritage					
Heritage Resources	Paleontological resources	Yes	Yes	No	Yes
	Archaeological resources	Yes	Yes	No	Yes
EA Pillar: Health					
Public Health	People (includes public health effects related to water quality, air quality and the consumption of country foods)	Yes	Yes	No	Yes
Noise	Noise levels	Yes	Yes	Yes	Yes

Table 4-4 presents a list of VCs considered in the EAC Application/EIS and provides a definition and/or supporting rationale for the selection of each VC. VCs that have been identified are based on currently available information, including ongoing studies and experience in the site and region. Measurement endpoints represent properties of the environment or a population that, when changed, could result in or contribute to a Proposed Project-related effect which may alter an endpoint. Measurement endpoints may be quantitative (e.g., concentrations of chemical in tissues of representative VC species, species density levels, and noise levels) or qualitative (e.g., distribution, movement and behaviour of wildlife from disturbance to travel corridors). Measurement endpoints are described within each of the technical sections (Volume 2, Part B – Section 5.2 through 9.2).

4.3 Establish Assessment Boundaries

4.3.1 Spatial Boundaries

Spatial boundaries of the Regional Study Areas (RSAs) and Local Study Areas (LSAs) were developed for each discipline or VC for the aquatic, terrestrial and human environment were developed using the following criteria:

- Physical extent of the Proposed Project;
- Physical extent of Proposed Project-related effects; and
- Physical extent of key environmental systems (e.g., watershed boundary of potentially affected streams).

Local Study Areas (LSAs) for the biophysical components of the environmental assessment were designated to include the immediate freshwater and terrestrial Proposed Project footprint and adjacent areas. These areas are where potential Proposed Project-related disturbances could occur during the construction, operation, reclamation and closure phases.

Regional study areas (RSAs) for human / social and biophysical environmental assessment disciplines were selected to be larger in scope, encompassing an area broader than the immediate footprint of the Proposed Project. RSAs seek to consider a potential wider range of direct and indirect effects of the Proposed Project on the biophysical environment and cultural/socioeconomic (human) resources. RSA boundaries were selected to represent an appropriate scale that provides relevant context for consideration of the Proposed Project effects, offer useful and meaningful data, and neither over-emphasizes nor under-emphasizes the scale of the Proposed Project effects. The scope of the assessment does not include shipping from where the barges meet the existing shipping lanes in the Strait of Georgia and in the Fraser River (CEAA Agency 2013).

Discipline specific LSAs and RSAs and the rationale for their selection are presented in Volume 2, Part B -Section 5.1 through Section 9.2.

Table 4-4: EA Pillars, Issues, Selected Valued Components (VCs) and Supporting Rationale

Issue	Valued Component(s)	Definition and/or Supporting Rationale
EA Pillar: Environmental		
Fisheries and Freshwater Habitat	Anadromous Chum, Coho, Pink Salmon and Cutthroat Trout species and their habitats	<ul style="list-style-type: none"> ▪ Fish species are appropriate “sentinels” for the overall aquatic system. A total of six salmon and trout fish species were identified as present within the Proposed Project Area. It is not generally practical to identify and evaluate all fish species as VCs (Hill et al. 2006). A sub-set of VCs was selected that ranked the highest through screening by the following attributes: <ul style="list-style-type: none"> - Distribution within the Proposed Project Area; - Regulatory status (species at risk); - Selectivity of habitat requirements; - Position in the food chain; - Commercial and economic importance; - Recreational and aboriginal importance; and - Availability of information. ▪ Chum, Coho and Pink Salmon and Cutthroat Trout are appropriate indicators of seasonal freshwater and some marine fish habitats and use in the Proposed Project Area. Chum, Coho and Pink Salmon have significant value as commercial, recreational, and First Nations fisheries and have specific habitat requirements which are provided for within the Proposed Project Area. Chum Salmon use freshwater habitats seasonally whereas Coho use these habitats year-round, for spawning, rearing, and overwintering. These populations rely on the integrity of McNab Creek and, specifically with Coho, the ground water channels along the foreshore of the property. Any impacts to the quality and/or quantity of these habitats would be expected to be apparent in the abundance or condition of these VCs; and ▪ Although suggested by Aboriginal groups as a candidate VC, freshwater benthic communities have not been included as selected VC since freshwater productivity is being measured using water quality (including nutrients and chlorophyll), fish distribution and habitat use. Aquatic health is also being assessed as a VC under Surface Water Resources. Attention to higher trophic level VCs (salmonids), supplemented with water quality monitoring is expected to be adequate to assess the anticipated impacts of the Proposed Project. Freshwater benthic samples have been collected as the basis for aquatic health assessment and monitoring during Proposed Project construction and operations since the use of benthic invertebrates and periphyton can provide meaningful indices for monitoring change in aquatic environments.
	Freshwater resident Cutthroat Trout and their habitats	<ul style="list-style-type: none"> ▪ Cutthroat Trout are resident in streams within the Proposed Project Area and they are an appropriate indicator of the year-round habitat use and conditions. Cutthroat Trout are distributed within many similar freshwater systems in the region and have recreational, economic and Aboriginal importance. Cutthroat Trout is positioned high in the aquatic food chain, and have specific habitat requirements; and

Issue	Valued Component(s)	Definition and/or Supporting Rationale
Marine Resources	Marine Water and Sediment Quality (Pathway VC) ⁵	<ul style="list-style-type: none"> ▪ The quality of marine sediment affects the quality of habitat for benthic communities, as well as the quality of overlaying water column. The quality of this VC may be affected by historical or current operations and activities, and/or future activities or operations associated with Proposed Project during both the construction and operation phases. Sediment quality may be affected through sediment re suspension, siltation or accidental release of chemicals. The VC measurement endpoints are physical (particle size composition) and chemical (e.g., metals and contaminant concentrations) composition.
	Marine Benthic Communities (Epifauna / Epiflora ⁶ and Infauna ⁷)	<ul style="list-style-type: none"> ▪ Impacts can result from the installation of marine facilities (habitat loss), changes in water and sediment quality, increased navigation, and accidental release of toxic substances. Abundance, taxonomic composition, and diversity of benthic communities are good indicators of the quality of the marine habitat; ▪ Accidents and malfunctions could result in the loss of barge materials, and barges and tugs. This could result in the release of toxic substances, all of which could impact marine benthic communities, including glass sponges; and ▪ Although suggested by Aboriginal groups as a candidate VC, northern abalone has not been included as selected VC since it has not been identified as a species that may potentially occur within the Proposed Project Area and there are no known occurrences of northern abalone at the site. The conclusion that there are no known occurrences is based on a desktop review (SARA Registry, BC Conservation Data Centre) and a review of habitat suitability. These results were calibrated based on dive and underwater camera video survey observations.
	Marine Fish ⁸ – including Forage Fish and their habitat: <ul style="list-style-type: none"> ▪ Herring; ▪ Surf smelt; and ▪ Pacific sand lance 	<ul style="list-style-type: none"> ▪ Forage fish (e.g., Herring, Surf Smelt and Pacific Sand Lance) was raised as issue of concern by Aboriginal groups and the public because of their importance in marine food webs; and ▪ Herring is an important part of the marine ecosystem, a key component of the marine food web as prey for many marine species (e.g. salmon, cod, hake, Halibut and harbour seal). Herring is also an important commercial fisheries species. Herring spawn in Howe Sound and there is therefore the potential for an interaction with marine-related Proposed Project activities.
	Marine Birds	<ul style="list-style-type: none"> ▪ Taxa listed under the federal Species at Risk Act (SARA); and red-listed (endangered or threatened) or blue-listed (special concern) species; ▪ Migratory seabirds whose known range overlaps the Proposed Project Area; and

⁵ Pathway components are identified when the component does not represent an assessment endpoint but a pathway through which other VCs may be affected.

⁶ Marine vegetation and invertebrates that live on, or near the surface, of marine substrate.

⁷ Marine organisms living within marine substrate (e.g., burrowing invertebrates).

⁸ Marine fish include all marine forage fish and predatorial fish excluding anadromous fish such as salmonids which are assessed separately in the Fisheries and Freshwater Habitat EA Chapter (Volume 2, Part B - Section 5.1)

Issue	Valued Component(s)	Definition and/or Supporting Rationale
		<ul style="list-style-type: none"> ▪ These groups may be affected by changes in noise conditions (during construction), light conditions, water and sediment quality, physical presence of marine facilities and increased navigation.
	Marine Mammals	<ul style="list-style-type: none"> ▪ Taxa listed under the federal Species at Risk Act (SARA); and red-listed (endangered or threatened) or blue-listed (special concern) species (e.g., Steller sea lion, grey whale, southern killer whale, humpback whale, and harbour porpoise); and ▪ Pacific white-sided dolphins have been identified as a species of public concern.
Terrestrial Wildlife and Vegetation	<p>Terrestrial wildlife species and their habitat:</p> <ul style="list-style-type: none"> ▪ Amphibian Species-at-Risk, including Coastal tailed frog; ▪ Western screech owl (<i>Megascops kennicottii kennicottii</i>); ▪ Common nighthawk (<i>Chordeiles minor</i>); ▪ Northern goshawk (<i>Accipiter gentilis langi</i>); ▪ Band-tailed pigeon (<i>Patagioenas fasciata</i>); ▪ Marbled murrelet (<i>Brachyramphus marmoratus</i>); ▪ Roosevelt elk (<i>Cervus elaphus roosevelti</i>); and ▪ Grizzly bear (<i>Ursus arctos</i>). <p>Terrestrial vegetation and their habitat:</p> <ul style="list-style-type: none"> ▪ Environmentally sensitive ecosystems and ecosystems at risk; ▪ Plant species at risk, including: <ul style="list-style-type: none"> - Fleshy Jaumea; - Kamchatka spike-rush; - Menzies' burnet; - Northern adder's tongue; 	<ul style="list-style-type: none"> ▪ Provincially red-listed (endangered or threatened) or blue-listed (special concern) taxa; ▪ Taxa listed under the provincial Integrated Wildlife Management Strategy (IWMS); ▪ Taxa listed under the federal <i>Species at Risk Act</i> (SARA) or by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC); ▪ Regionally-important wildlife; ▪ Migratory birds whose known range overlaps the Proposed Project Area; ▪ Provincially (red/ blue) listed or sensitive/ unique ecosystems which may occur at or adjacent to the Proposed Project could be affected by changes to area conditions including clearing of vegetation or changes to hydrological regimes; ▪ Taxa or subtaxa of provincially (red/ blue-listed) and/or federally (SARA Schedule 1) designated plant species which may occur within the Proposed Project Area could be affected by alterations or loss of habitat; ▪ Species or species groups known to occur at or adjacent to the Proposed Project Area. Changes to noise or light regimes could affect normal species behaviour such as nesting or foraging; ▪ Species and communities of importance to Aboriginal groups that have not been otherwise identified, where this information is made available through consultation; and ▪ Some species suggested by Aboriginal groups as candidate VCs have not been included as selected VCs (e.g., barn swallow; great blue heron, other raptor species and their nests; and moose, deer and black bear). In each case, selected VCs were chosen because they are particularly vulnerable or represent a biological niche that is representative of other species. For example, common nighthawk was selected as a representative insectivorous bird species.

Issue	Valued Component(s)	Definition and/or Supporting Rationale
	<ul style="list-style-type: none"> - Small spike rush; - Snow bramble; - Western St. John's wort; and - White adder's mouth orchid 	
Geotechnical and Natural Hazards	Terrain stability (including snow avalanches),	<ul style="list-style-type: none"> ▪ Alteration of physical terrain; ▪ Road and site construction and clearing can increase the chances of landslides and ground stability;
	Earthquakes and tsunamis	<ul style="list-style-type: none"> ▪ Could induce earthquake drive liquefaction, and fault ruptures;
	Climate	<ul style="list-style-type: none"> ▪ Mine operation may create new avalanche trigger zones; and ▪ May increase storm event frequency, sea surge.
Surface Water Resources	Surface water flows: <ul style="list-style-type: none"> - base flow; and - high flow 	<ul style="list-style-type: none"> ▪ Mine operation may alter contribution to base flows in watercourses; and ▪ Mine operation may alter runoff.
	Surface water quality: <ul style="list-style-type: none"> - suspended sediments; and - chemical quality. 	<ul style="list-style-type: none"> ▪ Increase in TSS / TDS may alter clarity and quality of runoff and base flow; ▪ Accidental release of chemicals may alter clarity and quality of runoff and base flow; and ▪ Redirection and use of groundwater.
	Aquatic Health	<ul style="list-style-type: none"> ▪ Changes in TSS / TDS and chemical quality may impact: <ul style="list-style-type: none"> - Periphyton – food source for invertebrates and fish; - Benthic invertebrates – link to food chain between periphyton and fish; also food source for fish and birds; and - Fish – top predator in freshwater food web.
Groundwater Resources	Groundwater flow regime; and Groundwater quality	<ul style="list-style-type: none"> ▪ Mine operation may alter local groundwater regime by lowering water levels, reduce infiltration rates from and to adjacent rivers and creeks; and ▪ Mine operation may allow marine water infiltration into the aggregate pit.

Issue	Valued Component(s)	Definition and/or Supporting Rationale
Air Quality	Air quality indicators	<ul style="list-style-type: none"> BC Ambient Air Quality Objectives (AAQO) and National Ambient Air Quality Objectives (NAAQO) for TSP, PM10, and PM2.5, SO2 and NO2, where applicable; Relevant air quality indicators and targets specified in the Sea-to-Sky Air Quality Management Plan (SSAQMP); Particulate deposition resulting from Proposed Project operations will be quantified to be used in the Public Health and other assessments, as needed; and Since Proposed Project-related exhaust emissions will be limited, it is expected that emissions of SO2 and NO2 from the Proposed Project will be minimal and will not contribute significantly to the ambient air quality.
Climate Change	Greenhouse gas (GHG) emissions	<ul style="list-style-type: none"> Relevant GHG emission indicators and targets specified in the SSAQMP; and Comparison with totals across Canada including BC, Alberta and all territories.
EA Pillar: Economic		
Sustainable Economy	Regional economic development	<ul style="list-style-type: none"> Proposed Project will offer new contracting opportunities, which may result in diversification and expansion of the local economy; Proposed Project labour demand during construction and operation phases will draw upon labour supply in the vicinity of the Proposed Project and effects would be adverse or beneficial depending on conditions that prevail at the time this demand enters the market; Potential change in local government expenditure and revenue streams; and Presence of Proposed Project construction, infrastructure and/or operations may affect local property values and the local owners' use of their real estate.
	Labour market	
	Local government revenue	
	Real estate	
EA Pillar: Social		
Social Conditions	Housing and Accommodation	<ul style="list-style-type: none"> Temporary influx of Proposed Project construction workers may lead to pressures on accommodation availability and cost and increased demand for accommodation has the potential to generate incremental revenues for local providers; and Proposed Project construction and operation in a remote location could affect emergency response abilities and cost of emergency services.
	Emergency Services	
Marine Transportation	Marine Navigation	<ul style="list-style-type: none"> Change in vessel traffic levels; and Physical interference.
	Vessel Wake	<ul style="list-style-type: none"> Increased vessel traffic within the barge shipping route may lead to an increased impact on shoreline habitats.
Non-Traditional Land and Resource Use	Forestry	<ul style="list-style-type: none"> Conversion of forested private lands to non-forestry uses and potential change in access to Crown forested lands and associated change in timber harvesting and wood processing; Proposed Project may affect resident and tourist access to and use of outdoor recreation areas and resources adjacent to and in the Proposed Project activity zones; Proposed Project may affect access to and use of tenured guide outfitting and trapping areas.
	Harvesting fish and wildlife	
	Recreation and tourism	
	Minerals and aggregates	

Issue	Valued Component(s)	Definition and/or Supporting Rationale
		<ul style="list-style-type: none"> The Proposed Project may change environmental setting, fish and wildlife populations and opportunities to trap, hunt and fish; and The Proposed Project will affect access to and development of mineral and aggregate tenures and deposits.
Visual Resources	Visual quality	<ul style="list-style-type: none"> Visual quality of the surrounding landscape could potentially be adversely affected by the presence of aggregate pit and processing infrastructure, marine barge loading, processing and barge loading facilities lighting and barge shipping.
EA Pillar: Heritage		
Heritage Resources	Paleontological resources	<ul style="list-style-type: none"> Construction and operation of the Proposed Project could directly or indirectly affect heritage resources in the Proposed Project Area.
	Archaeological resources	
EA Pillar: Health		
Public Health	People (includes public health effects related to water quality, air quality and the consumption of country foods)	<ul style="list-style-type: none"> Public health issues including changes to water quality, air quality, and country foods (including food trapped, fished, hunted, harvested or grown for subsistence or medicinal purposes, or obtained from recreational activities such as sport fishing and/or game hunting) will be incorporated from across all relevant disciplines.
Noise	Noise levels (dB)	<ul style="list-style-type: none"> Potential noise effects of the Proposed Project, including vibration induced by low frequency noise, on seasonal, semi-permanent and permanent residents in proximity.
EA Pillar: All		
Aboriginal Interests (NOTE: effects assessment to be described in Volume 3, Part C – Section 10.0 to 13.0)	Past, present, and anticipated future uses of lands and resources in the Proposed Project Area for traditional purposes.	<ul style="list-style-type: none"> To identify potential effects of the Proposed Project on Aboriginal rights and interests, including but not limited to current uses of land and resources for traditional purposes, and proposed mitigation to avoid or minimize adverse effects and/or to enhance benefits.

4.3.2 Temporal Boundaries

Based on the Proposed Project schedule, the temporal boundaries for the effects assessment are as follows:

- Project construction (up to 2 years);
- Project operation and maintenance (16 years); and
- Project reclamation and closure (on-going⁹ and 1 year beyond operations).

The Proposed Project is expected to commence construction in summer 2017. Rational for the use of different temporal boundaries for certain VCs or to capture temporal effects on are presented in Volume 2, Part B - Section 5.1 through Section 9.2.

4.3.3 Administrative Boundaries

Administrative boundaries refer to the limitations on the assessment imposed by political, economic or social constraints (BCEAO 2013). These may not be applicable to all VCs. Where administrative boundaries have constrained the assessment of potential effects, the nature of the administrative boundaries and their influence on the assessment are documented.

4.3.4 Technical Boundaries

Technical boundaries refer to constraints on the assessment imposed by limitations in the ability to predict effects (e.g., access to parts of the LSA or RSA during sampling) leading to a gap in the knowledge or data about a selected VC. For example, the use of models may also impose technical limitations on the analysis (e.g., margin of error) (BCEAO 2013). These may not be applicable to all VCs. Where technical boundaries have constrained the assessment of potential effects, the nature of the technical boundaries and their influence on the assessment of specific VCs are documented.

4.4 Describe Existing Conditions

To assess the potential effects of the Proposed Project, it is necessary to document the existing or 'baseline' conditions for each identified VC. For each discipline-specific study, detailed summaries of current baseline conditions are provided in in Volume 2, Part B - Section 5.1 through Section 9.2. These baseline summaries are based on existing reports, data collection and analysis, consideration of traditional ecological knowledge (where available) and field and laboratory methods. Detailed baseline data reports are provided in Volume 4, Part G - Section 22.0.

⁹ Progressive and ongoing reclamation activities will occur throughout all phases of mine development.

4.5 Effects Assessment

The EA framework guidelines on how to conduct an environmental assessment under the former CEAA (1992) “A Reference Guide for the *Canadian Environmental Assessment Act: Determining Whether a project is Likely to Cause Significant Environmental Effects*” (FEARO 1994a) and the BCEAA “Guideline for the Selection of Valued Components and Assessment of Potential Effects” (BC EAO 2013) provide slightly different methods for determining and assessing potential Proposed Project related effects. Table 4-5 outlines the major steps presented in both guidelines. The determination regarding whether significant adverse environmental effects are likely is provided in Volume 3, Part D – Section 15.0.

Table 4-5: Provincial and Federal EA Frameworks

Provincial under BCEAA	Federal under the Former CEAA
Determine Potential Effects	Decide Whether the Environmental Effects are Adverse
Identify Mitigation Measures	Decide Whether the Adverse Environmental Effects are Significant (after mitigation is applied): <ul style="list-style-type: none"> ▪ Characterize Adverse Environmental Effects (using rating criteria below); and ▪ Determine Significance.
Characterize and Evaluate Residual Effects: <ul style="list-style-type: none"> ▪ Characterize Residual Effects (using rating criteria below); ▪ Determine Likelihood; ▪ Determine Significance; ▪ State Level of Confidence; ▪ Conduct Additional Risk Analysis (if required); ▪ Determine Significance; ▪ State Level of Confidence; and ▪ Conduct Additional Risk Analysis (if required). 	Decide Whether the Significant Adverse Environmental Effects are Likely: <ul style="list-style-type: none"> ▪ Characterize Based on Likelihood and the Level of Confidence.

4.5.1 Determine Potential Effects

Potential interactions between the Proposed Project activities and the selected VCs across all spatial and temporal phases of the Proposed Project were identified to scope potential effects of the Proposed Project. A preliminary evaluation was undertaken to characterize the Proposed Project-VC interactions as either:

- Positive, none or negligible adverse effects expected – no further consideration warranted; or
- Potential adverse effect requiring additional mitigation – warrants further consideration.

Potential Proposed Project-VC interactions were evaluated for each of Proposed Project activities in Table 4-6.

Table 4-6: BURNCO Aggregate Project: Phases of Development and Associated Activities

Project Activities	Description
Construction	
1. Crew and equipment transport	<ul style="list-style-type: none"> ▪ Daily water taxi ▪ Tug and barge transport of machinery/materials (est. 8 loads) ▪ Barge household and industrial solid waste barged off-site
2. Site preparation, including construction of the berms and dyke	<ul style="list-style-type: none"> ▪ Logging, clearing and grubbing ▪ Grading ▪ Construction of the berms and dyke ▪ Compaction and laying of gravel base ▪ Limited improvements to existing on-site road infrastructure
3. Processing area installation, including conveyors and materials handling system	<ul style="list-style-type: none"> ▪ Installation and use of portable concrete batch plant for construction ▪ Installation of concrete foundations ▪ Installation of screens, crushers, wash plant, conveyor system and automated materials-handling system (i.e., reclaim tunnels) ▪ Installation of groundwater well as a source of make-up water for the wash plant
4. Substation construction and connection	<ul style="list-style-type: none"> ▪ Construct electrical substation adjacent to existing BC Hydro transmission line ▪ Construct outdoor switchyard, electric building, and 100 m transmission line
5. Marine loading facility installation	<ul style="list-style-type: none"> ▪ Remove existing mooring dolphins ▪ Steel pile installation ▪ Installation of conveyor, barge movement winch and mooring dolphins
6. Pit development	<ul style="list-style-type: none"> ▪ Dry excavation to remove overburden/topsoil ▪ Installation of clamshell and floating conveyor
7. Other ancillary land-based construction works	<ul style="list-style-type: none"> ▪ Temporary construction infrastructure set up (trailers, temporary power, etc.) ▪ Upgrades to the existing heavy equipment maintenance shop and warehouse ▪ Upgrades to the existing fuelling facility for the storage of diesel and gasoline for on-site equipment ▪ Construct site office, communications building, workers lunch/dry room, caretaker's cabin, first aid facility and helipad ▪ Install contained washroom facilities ▪ Construct pump room for well/stream intake water distribution and fire-fighting
8. Other ancillary marine construction works	<ul style="list-style-type: none"> ▪ Removal of existing small craft dock; install temporary dock for worker access ▪ Construct new floating small craft dock, the with tie-up area for a float plane, serviced with 30 amp (A) 125 volt (V) shore power ▪ Barge household and industrial solid waste off-site
Operations	
9. Crew transport	<ul style="list-style-type: none"> ▪ Daily water taxi
10. Aggregate mining	<ul style="list-style-type: none"> ▪ Use of electric powered floating clamshell dredge ▪ Primary screening and conveyance of extracted material to processing area ▪ Install channel plug in WC 2

Project Activities	Description
11. Processing (screening, crushing, washing)	<ul style="list-style-type: none"> ▪ Screening to separate aggregate sizes ▪ Oversized gravels crushed ▪ Operation of wash plant fed using recycled water from two large storage tanks, supplemented with make-up water by a groundwater well. ▪ Drying and storage of fines and silt
12. Progressive reclamation	<ul style="list-style-type: none"> ▪ Ongoing earth works (including site clearing, surface material removal) ▪ Fines and silt mixed with organic overburden material and used for infilling, re-vegetation and landscaping
13. Stockpile storage	<ul style="list-style-type: none"> ▪ Processed sand and gravel conveyed to stockpile area ▪ Storage of processed materials in stockpiles
14. Marine loading	<ul style="list-style-type: none"> ▪ Transfer of stored material using marine conveyor system ▪ Barge loading ▪ Site and navigational lighting
15. Shipping	<ul style="list-style-type: none"> ▪ Barge traffic (delivery/collection) in Howe Sound, Ramillies Channel, Thornbrough Channel, and Queen Charlotte Channel ▪ Tug and barge transport of fuel and consumables ▪ Navigational lighting
16. Refueling and maintenance	<ul style="list-style-type: none"> ▪ Refueling and maintenance of on-site equipment
Reclamation and Closure	
17. Crew and equipment transport	<ul style="list-style-type: none"> ▪ Daily water taxi ▪ Tug and barge transport of machinery/materials ▪ Barge household and industrial solid waste barged off-site
18. Removal of land-based infrastructure	<ul style="list-style-type: none"> ▪ Remove surface facilities, including clamshell dredge, conveyor system, screens, crushers, wash plant, automated materials-handling system, heavy equipment maintenance shop and warehouse, fuelling facility, site office, communications building, workers lunch/dry room, caretaker's cabin, first aid facility, helipad and contained washroom facilities
19. Removal of marine infrastructure	<ul style="list-style-type: none"> ▪ Remove marine facilities, in marine load out facility, jetty, conveyors and piles
20. Site reclamation	<ul style="list-style-type: none"> ▪ Final completion of the pit lake, landscaping and re-vegetation to develop a functional ecosystem in the freshwater pit ▪ Landscaping and re-vegetation of processing area, berms and dyke

Additional rationale is provided in each discipline-specific sections if adverse effects are considered “No or negligible adverse effects expected – no further consideration warranted”. For those Proposed Project-VC interactions carried forward in the assessment, potential effects (both adverse and positive) arising from those interactions are described in Volume 2, Part B - Section 5.1 through Section 9.2. Potential effects considered include:

- **Direct effects** - are relatively straight forward to identify. For example, the effect of clearing vegetation on the site on the number and diversity of trees present; and
- **Indirect effects** - are more subtle, and sometimes harder to identify. For example, the effect of changes to air quality as a result of terrestrial vegetation removal. In order to address these indirect effects, effective inter-discipline communications and cooperation is required.

Potential adverse effects that will be addressed by the proposed mitigation measures are described in Volume 2, Part B - Section 5.1 through Section 9.2.

4.5.2 Identify Mitigation Measures

Potential adverse Proposed Project-related effects arising from those Proposed Project-VC interactions carried forward in the assessment were analyzed to determine appropriate mitigation that may be applied to prevent or reduce the effects to an acceptable level. Mitigation proposed includes:

- Design techniques used to avoid Proposed Project-related effect (e.g., avoid siting the road in a sensitive area);
- Methods used to minimize or limit the effect (use dust suppressant methods on roads in dryer months);
- Methods used to rehabilitate/repair an effect (reclaim a sensitive area after disturbance); and
- Activities undertaken to compensate for the effect (provide alternate access to a site if original access is damaged).

Proposed mitigation described in the discipline-specific sections took into consideration the technical and economic feasibility of the measures and described their suitability for the Proposed Project- and site-specific application, if necessary. The level of detail provided is commensurate with the risk associated with the potential effect being mitigated, and the degree to which the proposed mitigation was proven effective in the same or similar applications elsewhere. Any uncertainty associated with the effectiveness of proposed mitigation measures is described in the technical EA sections.

Mitigation measures considered in the EA included those incorporated into the Proposed Project description (e.g., site and route selection, scheduling, design, and construction and operation procedures and practices) as well as standard mitigation, best management practices (BMPs), environmental protection and management plans and other general practices. Rationale for the proposed suite of mitigation and the need for and scope of any proposed compensation or offset is provided within the discipline specific sections (Volume 2, Part B – Section 5.2 through 9.2).

Volume 3, Part E - Section 16.0 and 17.0 provides a detailed outline of the proposed Environmental Management Programme and the monitoring and follow-up programme for the Proposed Project.

4.5.3 Evaluate Residual Effects

Potential Proposed Project-related residual effects were characterized as the basis for determining the significance of potential residual adverse effects for each VC. The characterization of effects was carried out for all potential residual and cumulative Proposed Project-related effects on VCs following application of appropriate mitigation measures.

Potential residual effects and their significance were characterized using the following standard residual effects criteria:

- **Context** – describes the current and future sensitivity and resilience of the VC to change caused by the Proposed Project. For example, the effects of a project may cause an impact if they occur in areas that are ecologically sensitive and that have little resilience to imposed stresses. Consideration of Context draws heavily on the description of existing conditions of the VC, which reflect the effects of other projects and activities currently operating or that have been carried out in the Proposed Project Area, as well as natural and other human caused trends in the condition of the VC;
- **Magnitude** – the expected size or severity of the residual effect. Each discipline of study will describe the criteria used to classify magnitude for each residual effect as negligible, low, medium or high;
- **Extent** – the spatial scale over which the residual effect is expected to occur; typically classified as the local confined to the LSA, the regional confined to the RSA or beyond regional;
- **Duration** – the length of time the residual effect persists. The duration of an effect can be short-term, medium-term, or long-term. Duration thresholds are typically a product of the Project Description (Volume 1, Part A - Section 2.0). Unless otherwise stipulated in the discipline specific sections, short-term refers to the construction phase, medium-term to the full period of operations, and long-term to beyond Proposed Project life;
- **Reversibility** - indicating whether the effect is fully reversible, partially reversible, or irreversible. Reversible effects may have lower impacts than permanent effects; and
- **Frequency** – how often the residual effect occurs, typically classified as low, medium or high frequency.

4.5.3.1 Likelihood

The likelihood of potential residual effects occurring was characterized for each VC using appropriate quantitative or qualitative terms, with sufficient description of how conclusions were reached. The following scale was used, unless otherwise specified in the discipline specific sections, for the assessment of likelihood:

- Low - likelihood of occurrence (0 to 40%) – Residual effect is possible but unlikely;
- Medium - likelihood of occurrence (41 to 80%) - Residual effect may occur, but is not certain to occur; and
- High - Likelihood of occurrence (81% to 100%) - Residual effect is likely to occur or is certain to occur.

Likelihood may be influenced by a variety of factors, such as the likelihood of a causal disturbance occurs or the likelihood of mitigation being successful. The likelihood of each residual effect occurring is presented in the discipline specific sections Volume 2, Part B - Section 5.1 through Section 9.2

4.5.3.2 Significance

A conclusion on the significance of all residual adverse effects of the Proposed Project was provided for each VC based on:

- Residual effects criteria described above;
- The likelihood of a potential residual effect occurring,
- A review of background information and available field study results;
- Consultation with government agencies, First Nations, and other experts; and
- Professional judgment.

The scheme used for combining the assessment measures to determine the significance of adverse residual effects was designed to be both transparent and reproducible. The effects assessment concludes that the potential adverse residual effect on the each selected VC is **Negligible-Not Significant**, **Significant** or **Not Significant**.

The residual effect of the Proposed Project on a given VC may be Significant if, after taking into account proposed mitigation measures, there is a reasonable expectation that the effect of the Proposed Project would:

- Exceed established environmental standards, guidelines, or objectives;
- Be beyond the natural variability of the environmental or social conditions; and/or
- Affect the viability of the VC (i.e., the ability of the population, ecosystem or community to work and function over time within the defined spatial and temporal boundary).

Significant effects are carried forward to the cumulative effects assessment.

If, after taking into account proposed mitigation measures, there is a reasonable expectation that the residual effect of the Proposed Project does not meet the above criteria, the adverse residual effect on a given VC was determined to be either Negligible-Not Significant or Not Significant.

A Negligible-Not Significant residual effect is defined, for the purposes of this assessment, as a residual effect that will result in no change or an incremental change to the indicator that is not measurable or within the natural variability of the system. Negligible-Not Significant residual effects are not carried forward to the cumulative effects assessment.

Not Significant residual effects are those that are greater than Negligible-Not Significant but that do not meet the definition of Significant residual effects described above. Not Significant effects are carried forward to the cumulative effects assessment.

4.5.4 Evaluating Confidence and Risk

There is inherent uncertainty associated identifying the level of confidence and therefore significance of the potential Proposed Project-related effects on VCs which is based on 1) the methods used and 2) the extent of existing and compiled baseline information. When the level of confidence and predicted significance for an impact was considered low, then a subjective assessment was made based on; (a) careful review of the extent, characteristics and utility of available information and (b) professional opinion and judgement. Cases where the assessment of effects were not able to be made with a level of confidence were accompanied with a recommendation for research or monitoring in order to provide additional information to support the effects assessment and prediction of significance of the effect.

The level of confidence for each predicted effect is discussed in each discipline-specific section to characterize the level of uncertainty associated with both the significance and likelihood determinations. The sources and nature of uncertainty associated with residual effect predictions, including limitation of data collection and impact assessment methodologies are also described to provide the basis for the stated level of confidence.

Level of confidence is typically based on expert judgement and was characterized as:

- Low: Limited evidence is available, models and calculations are highly uncertain, and/or evidence about potential effects is contradictory.
- Moderate: Sufficient evidence is available and generally supports the prediction.
- High: Sufficient evidence is available and most or all available evidence supports the prediction.

4.5.5 Cumulative Effects Assessment

The cumulative effects assessment methodology was based on guidance provided by the BCEAO described below and the following guidelines and standards:

- Operational Policy Statement: Addressing Cumulative Environmental Effects under the *Canadian Environmental Assessment Act* (CEA Agency 2007);
- Addressing Cumulative Environmental Effects. A Reference Guide for the *Canadian Environmental Assessment Act* (CEA Agency 1994);
- Cumulative Effects Practitioners Guide (CEA Agency 1999); and
- Guideline for the Selection of Valued Components and Assessment of Potential Effects (BCEAO 2013).

MFLNRO is currently working on cumulative effects framework to help manage compounding changes to the environment. The cumulative effects framework is being actively applied in the Northeast, and MFLNRO plans to expand the framework to Howe Sound (MFLNRO 2015). Under this framework, Howe Sound will be considered as one region when impacts of major projects are assessed (Squamish Chief 2015). No announcement from MFLNRO has yet been made with respect to the cumulative effects framework implementation in Howe Sound.

Cumulative effects are defined as Proposed Project-related residual effects that combine and act cumulatively with similar effects from other past, present or reasonable foreseeable future projects and activities. The scope and methodology of the cumulative effects assessment were designed to achieve regulatory requirements of both the BCEAO and the CEA Agency as shown in Figure 4-2 and as follows:

- 1) Determine if the Proposed Project activity will have a residual adverse effect on a VC.
- 2) Establish spatial and temporal boundaries for potential cumulative effects interaction and overlap with the Proposed Project activity. Temporal boundaries of the Proposed Project are provided in Section 4.3.2. Spatial boundaries for cumulative effects were determined to be the RSAs for the VCs which were determined to have not-significant or significant residual effects.
- 3) Identify other past, present and reasonably foreseeable future projects and activities with the potential to overlap within assessment boundaries and have the potential to act in a cumulative fashion with the Proposed Project and cause potential cumulative environmental effect. Reasonably foreseeable future projects will include those projects and activities that:
 - Have entered into a formal project approval or permitting process; or
 - Have not entered a formal process but that have been discussed publicly by proponents; or
 - Have been specified through discussion with regulators, Aboriginal groups, and/or other stakeholders; and
 - Possess sufficient project-description information to inform a cumulative effects assessment.

Past and present projects will include those projects and activities that:

- Have a formal project approval or permit; or
 - Have been discussed publicly by proponents; or
 - Were known or are known to be occurring the Proposed Project Area through publicly available information; and
 - Possess sufficient project-description information to inform a cumulative effects assessment.
- 4) Evaluate on a VC specific basis where residual Proposed Project-related effects will interact with other past, present and reasonably foreseeable future projects and activities.
 - 5) Establish if additional mitigation measures or follow-up monitoring programs are required to address potential cumulative effects from the Proposed Project in combination with other past, present and reasonably foreseeable future projects and activities.
 - 6) Evaluate using the potential significance of the cumulative effects (using the residual effect criteria set out in Section 4.5.3) between the residual effects of other past, present and reasonably foreseeable future projects and activities and the predicted residual effects of the Proposed Project.

The focus of the cumulative effects assessment is on the incremental effects directly attributable to the Proposed Project on a specific VC. The baseline environmental conditions assessed for each of the VCs reflect the current conditions of the biophysical or human environment within the defined assessment boundaries of the Proposed Project and account for accumulated residual environmental effects from the construction and ongoing presence and operation of other past and present projects and activities with spatial and temporal overlap with the Proposed Project. Some maintenance or other ongoing activities associated with past or existing projects may also be considered within the cumulative effects assessment because they may cause potential changes in the existing conditions during the life of the Proposed Project outside what was assessed as baseline conditions for the Proposed Project.

Cumulative effects were considered for each VC determined to have a Proposed Project-related residual effect. The residual cumulative environmental, socioeconomic, and health effects were characterized and evaluated using the same criteria and significance thresholds established for the VC residual effects significance assessment. The cumulative effect assessment is provided within the discipline specific sections (Volume 2, Part B – Section 5.2 through 9.2).

The following information sources were used to compile the list of past, present and reasonably foreseeable projects considered as part of the cumulative effects assessment as summarized in Table 4-7:

- Port of Metro Vancouver's Status of Project Permit Applications (PMV 2015);
- The Canadian Environmental Assessment Registry (Canadian Environmental Assessment Agency 2015);
- The BC Project Information Centre (e-PIC); and
- Municipal development websites.

Past, present and reasonably foreseeable projects are also shown in Figure 4-3 through Figure 4-7. Rationale for including or excluding potentially relevant projects from the cumulative effects assessment is also provided in each discipline specific sections.

Mitigation measures that will assist in minimizing interactions between Proposed Project effects and similar environmental effects from other reasonably foreseeable project activities are described for each VC. Three types of mitigation were considered:

- Mitigation that can be implemented exclusively by the Proposed Project;
- Mitigation that can be implemented by the Proposed Project in cooperation with other project proponents, government, Aboriginal groups, stakeholders and the public; and
- Mitigation that can be implemented exclusively by other project proponents, government, Aboriginal groups and/or the public.

For mitigation that may be implemented in cooperation or exclusively by another entity the ability of the Proposed Project to implement the mitigation is described. In addition, the cumulative effects assessment assumed that projects would implement similar levels of mitigation as described in the residual effects assessment as required by accepted professional standards.

Table 4-7: Projects and Activities considered in the Cumulative Assessment

Project (Proponent)	Timeline	Phase of the project overlaps with the Proposed Project ¹⁰	Project Description
Past or Present Projects			
McNair Creek Hydroelectric Project (McNair Creek Hydro LP (AltaGas))	Since 2005	Operations	<ul style="list-style-type: none"> Operating run-of-river project since 2005 with 9.8 MW capacities. Two tributary intakes and one main intake, with powerhouse and 25kV transmission line. 200 m fisheries enhancement channel with rearing pond and spawning channel habitat used by chum.
Port Mellon Pulp and Paper Mill (Howe Sound Pulp and Paper)	Since 1909	Operations	<ul style="list-style-type: none"> Oldest existing pulp mill in BC operating since 1909. Uses 100% biomass fuel in power boiler under BC Hydro green initiative in 2010. Additional emission sources (recovery boiler, lime kiln, smelt dissolving tank) use other fuels (black liquor, natural gas).
Sechelt Sand and Gravel (Lehigh Hanson Material Inc.)	Expected to continue producing until 2039	Operations	<ul style="list-style-type: none"> Recognised as the largest open pit sand and gravel operation in North America. Shipped 3 million tonnes in 2010; approx. 20% of product to California (MEMPR 2009) and 80% to Lower Mainland. Production expected to continue producing until 2039.
Squamish Terminals (Squamish Terminals Ltd.)	Since 1972	Operations	<ul style="list-style-type: none"> Deep water terminal operating since 1972 operating two berths. Accepts Handimax sized vessels at a rate of approx. 80 per year. On April 17, 2015 the Squamish deep sea berth terminal caught fire, destroying many of its structures. No plans have been made public as to when the construction/restoration of the terminal will occur.
Retired and Active Forest Tenures (Various)	Ongoing	Operations	<ul style="list-style-type: none"> Large scale logging near to and within the Proposed Project Area. The proposed material loading facility is located within the waterlot used by Canfor to store and boom logs
Log dump and storage	Ongoing	Operations	
Road-building for forestry (Various)	Current and ongoing	Operations	<ul style="list-style-type: none"> Current Howe LU road length: 355 km

¹⁰ When timelines are uncertain it was assumed that the Proposed Project would overlap with both construction and operations.

Project (Proponent)	Timeline	Phase of the project overlaps with the Proposed Project ¹⁰	Project Description
Reasonably Foreseeable Future Projects			
<p>Box Canyon Hydro (Box Canyon Hydro Corp. [Sound Energy Inc.]</p>	<p>Proposed start in 2017</p>	<p>Construction and operations</p>	<ul style="list-style-type: none"> ▪ Temporary Use Permit issued in February of 2014 to construct concrete batch plant relating to the construction project. ▪ Planned future run-of-river hydroelectric project with a capacity of 15 MW and proposed start of 2017. ▪ Total project footprint will be 64.5 ha ▪ Electricity Purchase Agreement obtained from BC Hydro 2010 Clean Power Call ▪ Multiple water intakes in three McNab drainages: Box Canyon, Marty, and Cascara creeks are planned with total penstock length of 7,847 m. ▪ All intake water delivered to a powerhouse located on the Banks of McNab Creek ~1250 m upstream in existing cut block. ▪ A 2.8 km 138 kV timber pole overhead line will connect powerhouse to BC Hydro 1L31 138 kV transmission line along the McNab Ck FSR. ▪ Habitat compensation is planned for Box Canyon Creek (possibly Marty and Cascara) in the form of rearing habitat for juvenile Coho salmon and cutthroat trout ▪ Website: http://www.elementalenergy.ca/projects/
<p>Woodfibre LNG (Woodfibre Natural Gas Ltd.)</p>	<p>Construction to start in 2015</p> <p>Operations in the second quarter of 2017</p> <p>Assumes permit issuance in 2015/early 2016</p>	<p>Operations</p>	<ul style="list-style-type: none"> ▪ Development of the former Western Forest Products Woodfibre Mill; an LNG facility has been proposed. ▪ Three to four times per month an LNG carrier will travel through well-established shipping lanes to the Woodfibre LNG terminal. Each carrier will travel at 8 to 10 knots in Howe Sound, be accompanied by at least three tugboats, at least one of which will be tethered to the carrier, and have two BC Coast Pilots on board, who are experts on BC's coast. ▪ Website: http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_project_home_408.html

Project (Proponent)	Timeline	Phase of the project overlaps with the Proposed Project ¹⁰	Project Description
Woodfibre Substation (BC Hydro)	Selecting a preferred alternative in 2015. Have assumed same timeline as Woodfibre LNG Project.	Operations	<ul style="list-style-type: none"> ▪ BC Hydro is constructing a new substation and connection to the 138 kilo volt (kV) transmission line. The purpose of the new substation would be to deliver electricity to the Woodfibre LNG Project. ▪ Website: https://www.bchydro.com/energy-in-bc/projects/woodfibrelng/whats-being-done.html
Culliton Creek Hydro Project (BC Hydro)	Construction April 2014 – December 2015 Commencement of Operation December 2015	Operations	<ul style="list-style-type: none"> ▪ The Culliton Creek Hydro project is a 15 mW hydroelectric project located on Culton Creek, approximately 27km north of the project. Site preparation work began in May 2014. ▪ Containing 2 X 7.5 MW Vertical Pelton turbines. ▪ 12.6 km of 69 kV wood-pole transmission line ▪ Website: http://www.blueearthrenewables.com/portfolio/culliton-creek-hydro-project/
Eagle Mountain Woodfibre Gas Pipeline Project (Fortis BC)	Construction to begin Q3 2015. Operations starting in Q4 2016 to exceed 50 yrs.	Operations	<ul style="list-style-type: none"> ▪ Fortis BC has proposed an approximately 52km long 20 inch diameter natural gas pipeline from the area north of the Coquitlam Watershed; additional compression at existing compressor stations at Eagle Mountain in Coquitlam and Port Mellon north of Gibson's; a new compressor station in Squamish; and metering facilities at the receipt and delivery points. ▪ The pipeline would deliver natural gas to the project. This project is currently in the EA process. ▪ Website: http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_project_home_406.html
Eaglewind Community Development (Solterra Development [Squamish Holding] Corp)	Construction has started.	Construction and operations	<ul style="list-style-type: none"> ▪ Eaglewind is a 25-acre new master planned community in downtown Squamish. The development is currently under construction, with some areas completed and future phases planned. The development is located approximately 7km northeast of the project. ▪ Website: http://www.eaglewindsquamish.com/home

Project (Proponent)	Timeline	Phase of the project overlaps with the Proposed Project ¹⁰	Project Description
Garibaldi at Squamish (Garibaldi at Squamish, Inc.)	Construction phase: estimated to be a 20 year period. Specific start date unknown. EA is still under review.	Assumed the Proposed Project will overlap with the construction phase.	<ul style="list-style-type: none"> ▪ A proposed all-season destination ski resort proposed for Brohm Ridge in the Cheakamus River watershed, approximately 22km north of the project. ▪ Overall Project Area is 2,759 ha ▪ Website: http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_project_home_404.html
Porteau Cove Residential Development (Concord Pacific)	Unknown.	Assumed construction and operations.	<ul style="list-style-type: none"> ▪ Under a partnership between Squamish Nation and Concord Pacific, this residential development proposes 1,400 homes, lots, and commercial space, located on the east side of Howe Sound, 12.3km south of the project. ▪ This work includes 6 water reservoirs, water source development/treatment, sewage treatment plant, ocean discharge, stormwater systems and Best Management Practices. ▪ The development includes 18km of roads including a new highway interchange. ▪ Website: http://www.pwlpartnership.com/our-portfolio/planning-urban-design/porteau-cove
Skookum Creek Hydro Project (Skookum Creek Power)	Construction completed in 2013. Currently in operations phase.	Operations	<ul style="list-style-type: none"> ▪ The Skookum Creek Hydro Project is a 25mW hydro project on Skookum Creek, approximately 20km east-northeast of the project. ▪ Website: http://skookumcreekpowerproject.com/
Squamish Oceanfront Development Plan (City of Squamish)	Construction to commence in April 2015. Phased development over 20 years.	Construction	<ul style="list-style-type: none"> ▪ A City of Squamish-proposed oceanfront development plan incorporates residential, recreational and commercial opportunities. The development is located approximately 6km northeast of the project. ▪ Website: http://www.squamishoceanfront.com/plan/vision/phasing
South Britannia (Taicheng)	No details on timeline available.	Unknown. Assume construction and operations.	<ul style="list-style-type: none"> ▪ South Britannia is a 200-ha development located on the Makin lands at Britannia Beach proposing a mix of 3,000 residences, as well as retail and light industrial land uses. South Britannia is 6.5 km southeast of the Project on the east side of Howe Sound.

Project (Proponent)	Timeline	Phase of the project overlaps with the Proposed Project ¹⁰	Project Description
Britannia Beach (MacDonald Development)	Zoning is in place. No details on timeline available.	Unknown. Assume construction and operations.	<ul style="list-style-type: none"> ▪ Zoning is in place for a new commercial and retail development incorporating many renovated historic buildings. The development is located approximately 6 km southeast of the Project.
Rebuilding Project (Columbia Containers)	Construction from March 2015 to March 2016. Operations to follow.	Operations	<ul style="list-style-type: none"> ▪ New Grain Transloading Facility and Silos at their existing terminal. ▪ Columbia Containers proposes to modernize the facility and increase the existing throughput from 735,000 metric tonnes (MT) per year (2014) to 750,000 MT per year (2017). ▪ Website: http://www.portmetrovancover.com/working-with-us/permitting/project-and-environmental-reviews/status-of-applications/
Desalination Facility Project (Saltworks Technologies Incorporated)	Construction from February to June 2015, with the facility operational in July or August 2015.	Operations	<ul style="list-style-type: none"> ▪ Build a new desalination testing facility at 2205 Commissioner Street. Location in the Burrard Inlet provides direct access to seawater which required for testing and commissioning the systems before shipping to customers. ▪ The proposed facility would be used for light assembly, staging, and testing of desalination equipment. ▪ Website: http://www.portmetrovancover.com/working-with-us/permitting/project-and-environmental-reviews/status-of-applications/
Coal Handling Expansion Project (Neptune Terminals)	<p>Construction for coal upgrades from January 31, 2014 to January 31, 2015.</p> <p>Construction for phosphate terminal August 30, 2013 to August 30, 2014.</p> <p>Operations following.</p>	Operations	<ul style="list-style-type: none"> ▪ Expand the terminal's coal and phosphate handling capacity. ▪ The project included a second railcar dumper, a conveyor to transport the steelmaking coal from the new dumper to the storage area, replacement of a quadrant shiploader and foundation reinforcement at Berth One. ▪ Approximately one additional train per day and one additional ship per week are expected to call on the terminal following the project's completion. ▪ Build new phosphate rock storage and handling facilities. ▪ Website: http://www.portmetrovancover.com/working-with-us/permitting/project-and-environmental-reviews/status-of-applications/

Project (Proponent)	Timeline	Phase of the project overlaps with the Proposed Project ¹⁰	Project Description
Grain Storage Capacity Project and Hopper Bin (Richardson International)	Construction May 30, 2014 to May 30, 2015.	Operations	<ul style="list-style-type: none"> ▪ Construction of two 40,000 metric tonne concrete storage annexes at 375 Low Level Road in North Vancouver ▪ Construct a new Hopper Bin (Pellet Bin 6) for grain pellet storage. ▪ Website: http://www.portmetrovanancouver.com/working-with-us/permitting/project-and-environmental-reviews/status-of-applications/
Rail Improvement Project (Cargill Limited)	Construction March 31, 2016 to March 31, 2017.	Operations	<ul style="list-style-type: none"> ▪ Reconfigure the existing rail track system in their rail yard, including the addition of a new lead track and installation of a new rail car indexer to increase capacity and efficiencies at their terminal in North Vancouver ▪ Annual increase in vessel calls from 88 to 132 and in train locomotive trips from the 325 to of 500. ▪ Daily increase in the total number of rail cars unloading at the terminal from 140 to 200. ▪ Daily increase in the number of delivery truck trips from the 8 to 10. ▪ The project will eliminate the noise and exhaust emissions associated with use of the existing 250 bhp diesel shuttle wagon which will no longer be required to shunt rail cars. ▪ Website: http://www.portmetrovanancouver.com/working-with-us/permitting/project-and-environmental-reviews/status-of-applications/
Canola Handling Facility Project, Potash Handling Facility Project and Wastewater Treatment Facility Project (Pacific Coast Terminals)	Construction of all components to be completed by March 2017. Operations to follow.	Operations	<ul style="list-style-type: none"> ▪ Development of a canola handling facility at their existing terminal ▪ Potash Handling Facility at their existing terminal ▪ New railcar unloading facility with a railcar indexer and dust collection systems, covered and/or completely enclosed conveyors with transfer point dust collection systems, a potash storage shed, rail track modifications in the PCT yard, and foreshore extension for additional rail trackage between PCT and the Reed Point Marina area to the west, shiploader modifications, and habitat compensation sites near the terminal. ▪ Construction of a sludge dewatering building, a clarifier tank and associated pipes and pumps.

Project (Proponent)	Timeline	Phase of the project overlaps with the Proposed Project ¹⁰	Project Description
			<ul style="list-style-type: none"> ▪ Website: http://www.portmetrovancover.com/working-with-us/permitting/project-and-environmental-reviews/status-of-applications/
<p>Gallery Replacement Project (Alliance Grain Terminal Limited)</p>	<p>Construction March 31, 2015 to March 31, 2016. Operations to follow.</p>	<p>Operations</p>	<ul style="list-style-type: none"> ▪ Replacement of their existing conveyor gallery which loads ships. ▪ Demolition of the existing gallery following the commissioning of the new system. ▪ Installing approximately 30 new piles next to existing piles. ▪ new foundations for the new gallery above the existing pier structure ▪ Four (4) loading towers erected along the length of the wharf, each equipped with two (2) loading spouts, on either side. ▪ Installing a new conveyor gallery, approximately 16 metres higher than the existing gallery and extending 37 metres further north than the existing gallery. ▪ Website: http://www.portmetrovancover.com/working-with-us/permitting/project-and-environmental-reviews/status-of-applications/
<p>Shipping Upgrade Project (Viterra Pacific Elevators)</p>	<p>Construction September 30, 2015 to September 30, 2016. Operations to follow.</p>	<p>Operations</p>	<ul style="list-style-type: none"> ▪ Viterra for operational upgrades at their existing Pacific Terminal located at 1803 Stewart Street. Viterra facilities are under lease with Port Metro Vancouver, and are located in Vancouver. ▪ Dredging. ▪ Structural, Seismic and Electrical Upgrades. ▪ Ship Loading System Upgrade. ▪ Modernization of Dust Control Systems. ▪ Website: http://www.portmetrovancover.com/working-with-us/permitting/project-and-environmental-reviews/status-of-applications/
Reasonably Foreseeable Future Activities			
<p>Active and Pending Forest Tenures (Various)</p>	<p>Several. Exact timelines for tenures are unknown.</p>	<p>Construction and operations</p>	<ul style="list-style-type: none"> ▪ Crown component of Timber Harvesting Forestry Land Base in Howe LU is 11,285 of 52,209 total gross hectares.

Project (Proponent)	Timeline	Phase of the project overlaps with the Proposed Project ¹⁰	Project Description
Projects not considered for the Cumulative Effects Assessment			
Rainy River Hydro Project	Not applicable.	Project terminated in September of 2008.	<ul style="list-style-type: none"> The environmental assessment was terminated on September 24, 2008 because the proponent had withdrawn the Proposed Project (CEAA 2012). Website: http://www.ceaa.gc.ca/052/details-eng.cfm?pid=7857
Site B (Province of BC and Squamish Nation)	Unknown.	Specifics on the timeline associated with this development plan have not been provided.	<ul style="list-style-type: none"> Development plan for the Squamish River Estuary. 158 acres of industrial/commercial land owned by the Province of BC and Squamish Nation in the Squamish River estuary west of Stawamus. The industrial/commercial area comprises 350 hectares (866 acres) and is dedicated to industrial, commercial and other forms of development. Website: http://na.ca/assets/PDF/3.14.4-Squamish-Estuary-Management-Plan-1999.pdf
Squamish Terminals fire restoration (Squamish Terminals Ltd.)	Unknown.	No plans have been made public as to when the construction/ restoration of the terminal will occur.	<ul style="list-style-type: none"> On April 17, 2015 the Squamish deep sea berth terminal caught fire, destroying many of its structures.
Dredging Project (Pacific Coast Terminals)	Construction from 2015 to 2016.	No operations phase. Operational aspects at the Terminal are capture in the development projects identified above.	<ul style="list-style-type: none"> Pacific Coast Terminals is proposing to dredge a section of the navigation channel in the Port Moody Arm to increase the depth of the channel from -10.5 metres to -13.5 metres at low water. Dredge area is approximately 150 metres wide and 1000 metres long. The Dredging project proposes to dispose at sea approximately 550,000 m³ of sediment from the channel in 2015-2016. Website: http://www.portmetrovanancouver.com/working-with-us/permitting/project-and-environmental-reviews/status-of-applications/pacific-coast-terminals-dredging-project/
Pipeline Removal Project (Imperial Oil Company)	Construction from 2015 to 2016.	No operations phase.	<ul style="list-style-type: none"> The IOCO project is linked to the PCT Dredging project. The removal of the pipes is necessary to facilitate the deepening of the navigation channel to Pacific Coast Terminals in Port Moody. The two projects are proceeding through the review process in parallel.

4.6 Summary

The Assessment Methodology described reflects accepted EA practice in BC and Canada in accordance with the BCEAO Guideline for the Selection of Valued Components and Assessment of Potential Effects (BCEAO 2013). These methods have been used to predict the significance of potential Proposed Project-related effects on the identified VCs and to identify measures to avoid or reduce these potential effects through redesign and operational improvements. Specific assessment methods were required for some VCs and are described within VC specific sections.

The assessment sections that follow are organized by discipline area related to VCs as presented in Table 4-8.

Table 4-8: Assessment Section Organization

Section	Discipline Area	Value Components
5.1	Fisheries and Freshwater Habitat	<ul style="list-style-type: none"> ▪ Anadromous Chum, Coho, Pink and Cutthroat Trout and their habitats ▪ Resident Cutthroat Trout and their habitats
5.2	Marine Resources	<ul style="list-style-type: none"> ▪ Marine water and sediment quality (Pathway VC)¹¹ ▪ Marine benthic communities ▪ Marine fish¹² ▪ Marine mammals ▪ Marine birds
5.3	Terrestrial Wildlife and Vegetation	<ul style="list-style-type: none"> ▪ Amphibian species at risk ▪ Western screech-owl ▪ Common nighthawk ▪ Northern goshawk ▪ Band-tailed pigeon ▪ Marbled murrelet ▪ Roosevelt elk ▪ Grizzly bear ▪ Environmentally sensitive ecosystems ▪ Ecosystems at-risk ▪ Plant species at-risk
5.4	Geotechnical and Natural Hazards	<ul style="list-style-type: none"> ▪ Earthquakes and tsunamis ▪ Terrain stability
5.5	Surface Water Resources	<ul style="list-style-type: none"> ▪ Surface water flow ▪ Surface water quality ▪ Aquatic health
5.6	Groundwater Resources	<ul style="list-style-type: none"> ▪ Groundwater flow ▪ Groundwater quality
5.7	Air Quality	<ul style="list-style-type: none"> ▪ Air quality indicators
5.8	Climate Change	<ul style="list-style-type: none"> ▪ Climate change

¹¹ Pathway components are identified when the component does not represent an assessment endpoint but a pathway through which other VCs may be affected.

¹² Marine fish include all marine forage fish and predatorial fish excluding anadromous fish such as salmonids which are assessed separately in the Fisheries and Freshwater Habitat EA Chapter (Volume 2, Part B - Section 5.1),

Section	Discipline Area	Value Components
6.1	Sustainable Economy	<ul style="list-style-type: none">▪ Labour market▪ Regional economic development▪ Local government revenue▪ Real estate
7.1	Social Conditions	<ul style="list-style-type: none">▪ Housing and accommodation▪ Emergency services
7.2	Marine Transportation	<ul style="list-style-type: none">▪ Marine navigation▪ Vessel wake
7.3	Non-Traditional Land and Resource Use	<ul style="list-style-type: none">▪ Forestry▪ Harvesting fish and wildlife▪ Recreation and tourism▪ Minerals and industrial development
7.4	Visual Resources	<ul style="list-style-type: none">▪ Visual quality
8.1	Heritage Resources	<ul style="list-style-type: none">▪ Heritage resources
9.1	Public Health	<ul style="list-style-type: none">▪ People
9.2	Noise	<ul style="list-style-type: none">▪ Noise levels

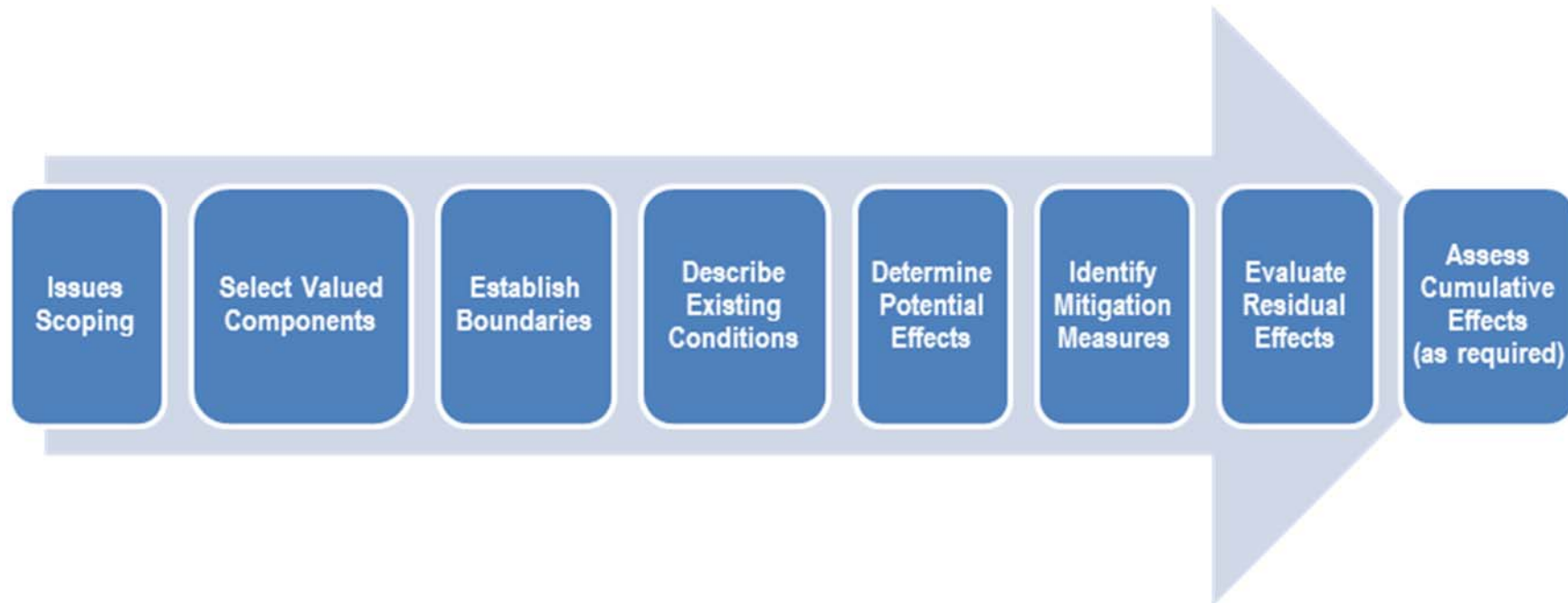


Figure 4-1: Summary of Methodological Steps (BCEAO 2013)

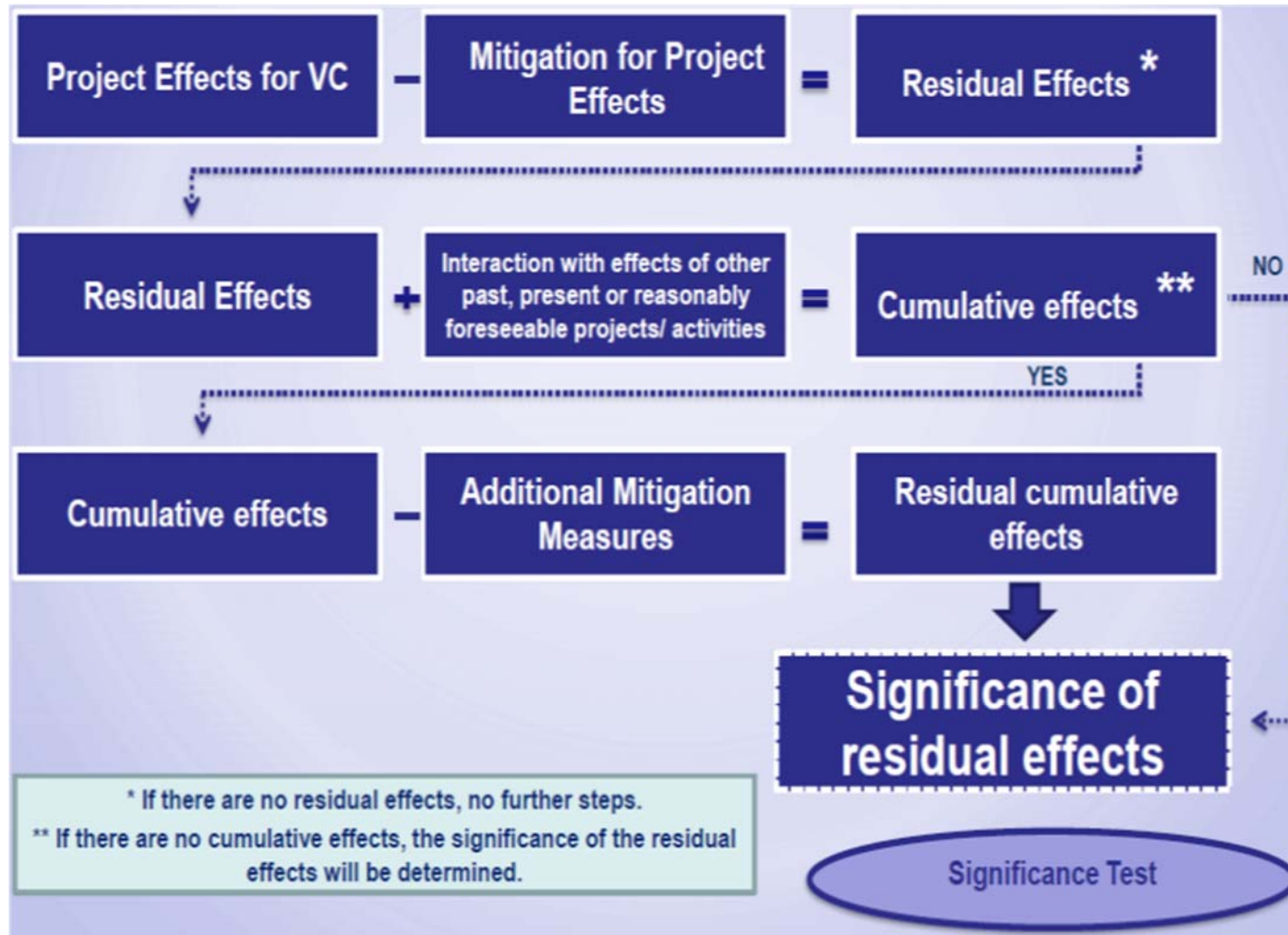
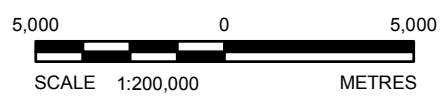
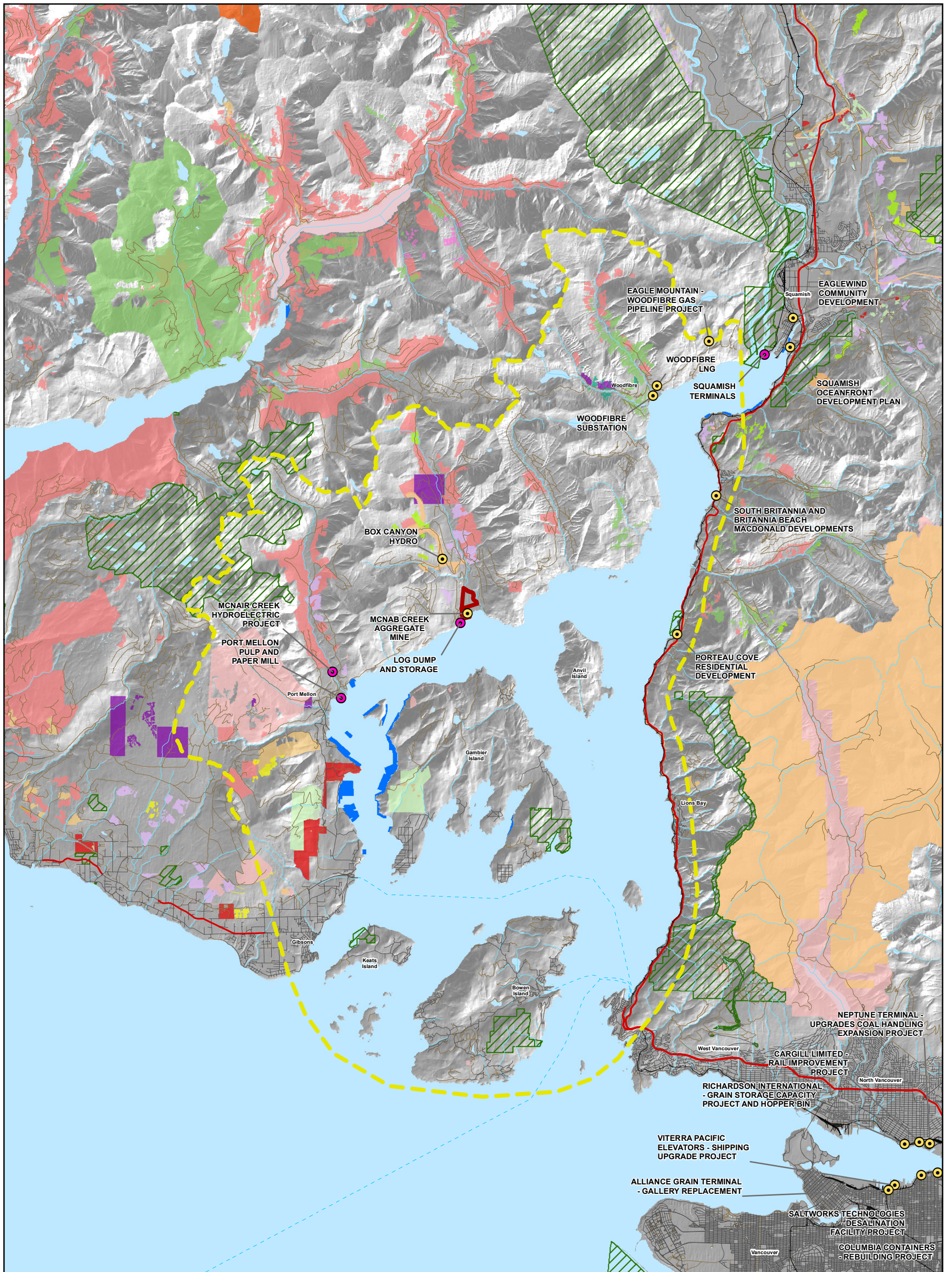


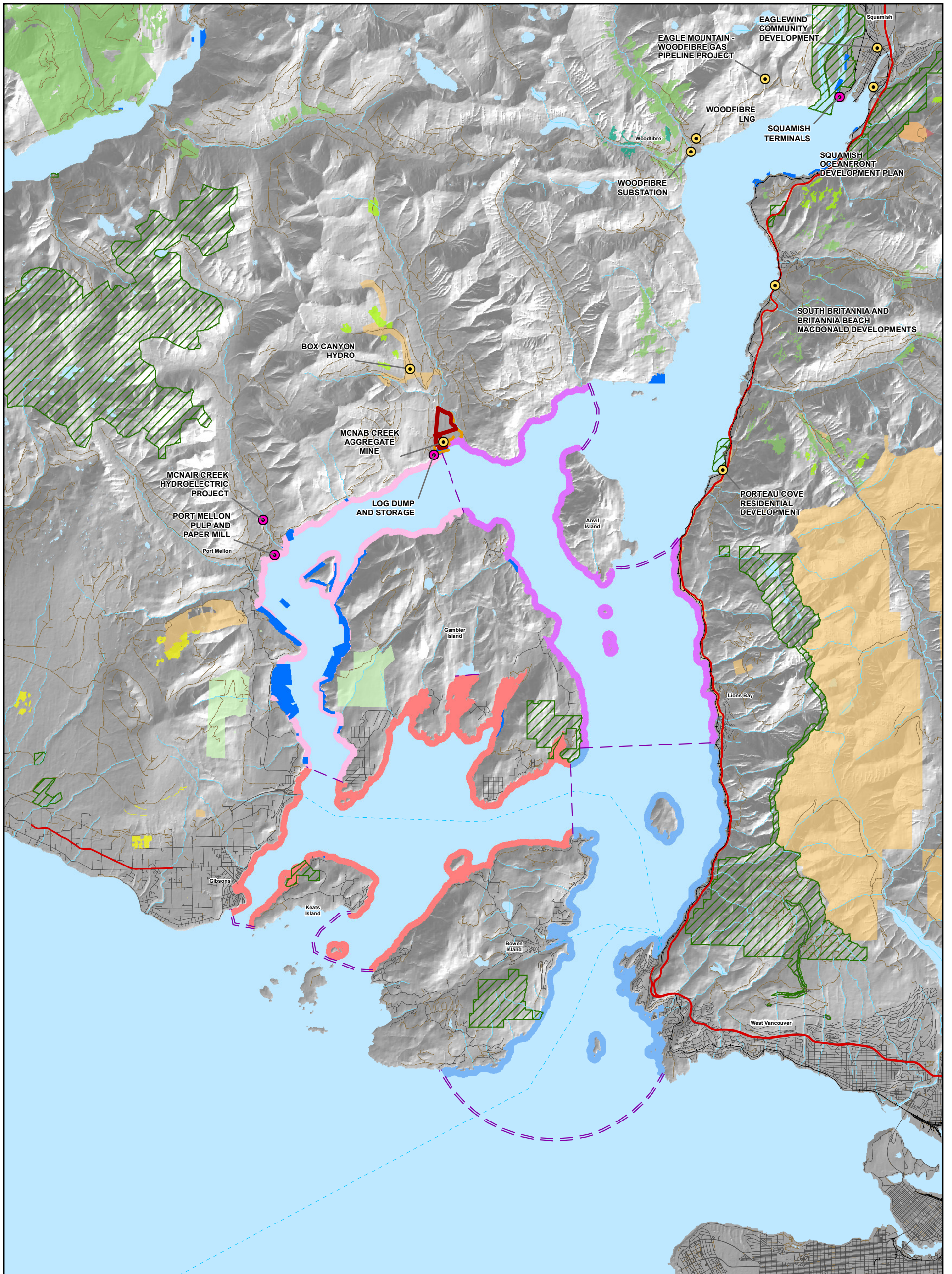
Figure 4-2: Cumulative Effects Assessment Methodology (adapted from BCEAO 2013)



LEGEND	
	Past or Present Project
	Reasonable Foreseeable Project
	Project Area
	Cumulative Effects Assessment
	Park / Protected Area
	Highway
	Road
	Resource Road
	Railway
	Watercourse
	Ferry
Active Forest Tenures	
	Timber Sale Cutting Permit
	Timber Sale Licence Minor
	Wood Lot Licence Cutting Permit
	Forest Licence Cutting Permit
	Licence to Cut
	Christmas Tree Permit
Pending Forest Tenures	
	Timber Sale Licence Minor
	Licence to Cut
	Tree Farm Licence
	Christmas Tree Permit
	Community Forest Agreement
	Log Handling / Storage Tenure
Retired Forest Tenures	
	Timber Sale Cutting Permit
	Timber Sale Licence Major
	Timber Licence Cutting Permit
	Timber Sale Licence Minor
	Wood Lot Licence Cutting Permit
	Forest Licence Cutting Permit
	Licence to Cut
	Tree Farm Licence
	Christmas Tree Permit
	Community Forest Agreement

REFERENCE
 Forest tenure harvesting authority polygons from BC Ministry of Forests, Lands and Natural Resource Operations. Parks/protected areas from the Province of British Columbia. Elevation from Geobase. Base data from CanVec. Projection: UTM Zone 10 Datum: NAD 83

PROJECT		BURNCO ROCK PRODUCTS LTD. BURNCO AGGREGATE PROJECT, HOWE SOUND, B.C.	
TITLE		REASONABLY FORESEEABLE FUTURE PROJECTS CONSIDERED IN THE CUMULATIVE EFFECTS ASSESSMENT	
	PROJECT NO.	11-1422-0046	PHASE No.
	DESIGN	KZ 16 Jun. 2016	SCALE AS SHOWN
	GIS	SB 20 Jun. 2016	REV. 1
	CHECK	KZ 28 Jun. 2016	FIGURE 4-3
REVIEW	AC 28 Jun. 2016		



LEGEND	
	Project Area
	Archaeology LSA
	Howe Sound Basin RSA Sector
	Queen Charlotte Channel RSA Sector
	Ramillies Channel RSA Sector
	Thornbrough Channel RSA Sector
	Limit to Heritage Resources RSA
	Sectors within Heritage Resources RSA
	Past or Present Projects
	Reasonable Foreseeable Project
	Highway
	Road
	Resource Road
	Railway
	Watercourse
	Ferry
	Park / Protected Area
	Active Forest Tenures
	Timber Sale Cutting Permit
	Timber Sale Licence Minor
	Wood Lot Licence Cutting Permit
	Forest Licence Cutting Permit
	Licence to Cut
	Pending Forest Tenures
	Timber Sale Licence Minor
	Licence to Cut
	Other Tenures
	Log Handling / Storage Tenure

REFERENCE
 Forest tenure harvesting authority polygons from BC Ministry of Forests, Lands and Natural Resource Operations. Parks/protected areas from BC LRDW. Elevation from Geobase. Base data from CanVec10. Projection: UTM Zone 10 Datum: NAD 83

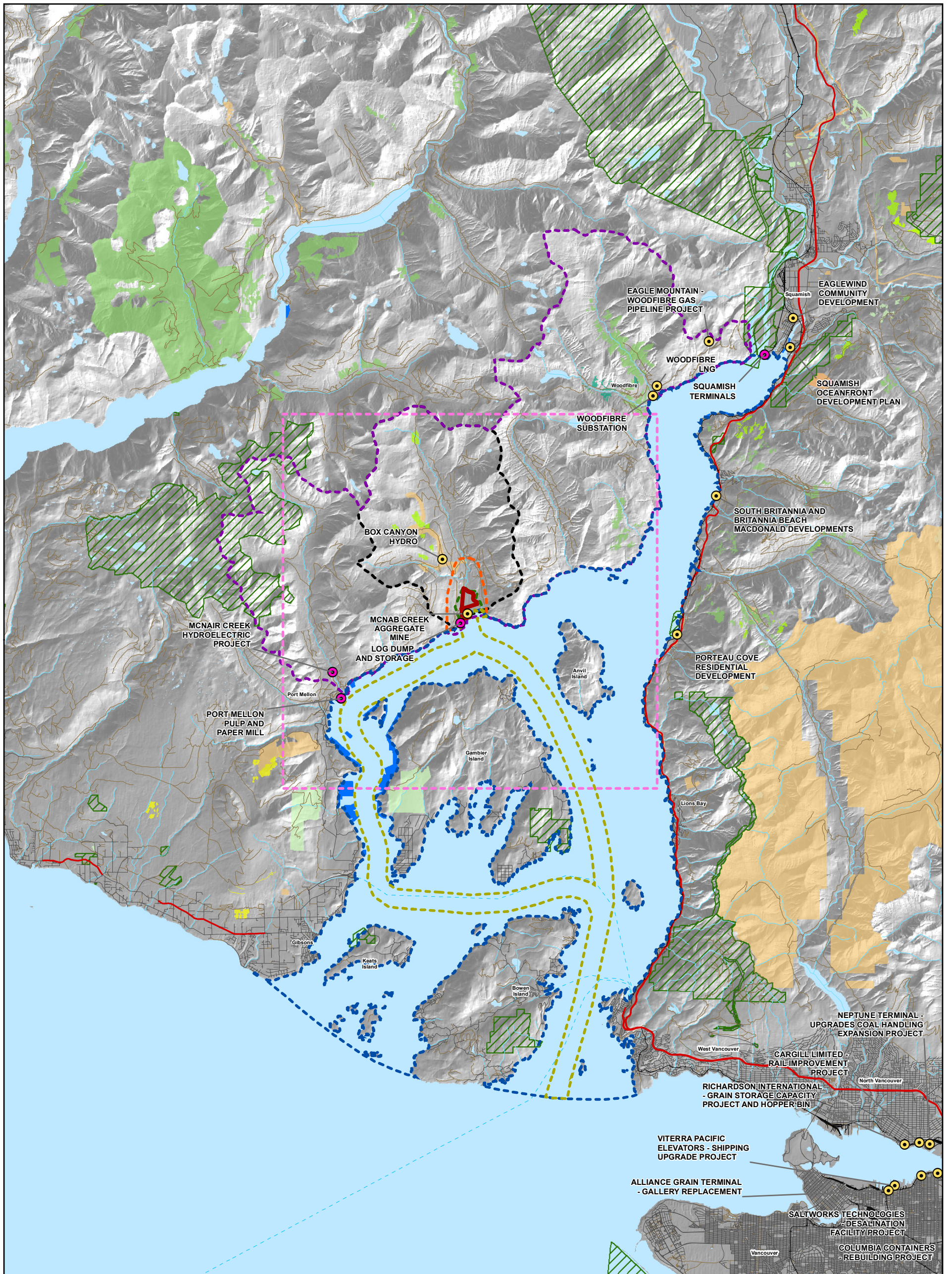


PROJECT		BURNCO ROCK PRODUCTS LTD. BURNCO AGGREGATE PROJECT, HOWE SOUND, B.C.	
TITLE		REASONABLY FORESEEABLE FUTURE PROJECTS CONSIDERED IN THE CUMULATIVE EFFECTS ASSESSMENT FOR HERITAGE VCS	
PROJECT NO. 11-1422-0046		PHASE No.	
DESIGN	KZ 16 Jun. 2016	SCALE AS SHOWN	REV. 1
GIS	SB 20 Jun. 2016	FIGURE 4-4	
CHECK	KZ 28 Jun. 2016		
REVIEW	AC 28 Jun. 2016		



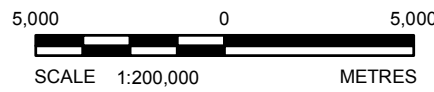
Path: \\golder\gds\gsl\van\spatial_data\project_data\bc\m\c\burnco_cea_figure_4-4_cumulative_effects_heritage_vcs.mxd

Path: \\golder.gds\gsl\vancouver\spatial_data\project_data\bc\mcburnco\figures\mxd\ce\burnco_cea_figure_4-5_cumulative_effects_environmental_vcs.mxd



LEGEND	
	Project Area
	Marine Resources Local Study
	Marine Resources Regional Study Area
	Terrestrial Wildlife and Vegetation Local Study Area
	Terrestrial Wildlife and Vegetation Regional Study Area
	Fisheries and Freshwater Local Study Area
	Fisheries and Freshwater Regional Study Area
	Air Quality Cumulative Effects Study Area
	Past or Present Projects
	Reasonable Foreseeable Project
	Highway
	Road
	Resource Road
	Railway
	Watercourse
	Ferry
	Park / Protected
	Active Forest Tenures
	Timber Sale Cutting Permit
	Timber Sale Licence Minor
	Wood Lot Licence Cutting Permit
	Forest Licence Cutting Permit
	Licence to Cut
	Christmas Tree Permit
	Pending Forest Tenures
	Timber Sale Licence Minor
	Licence to Cut
	Other Tenures
	Log Handling / Storage Tenure

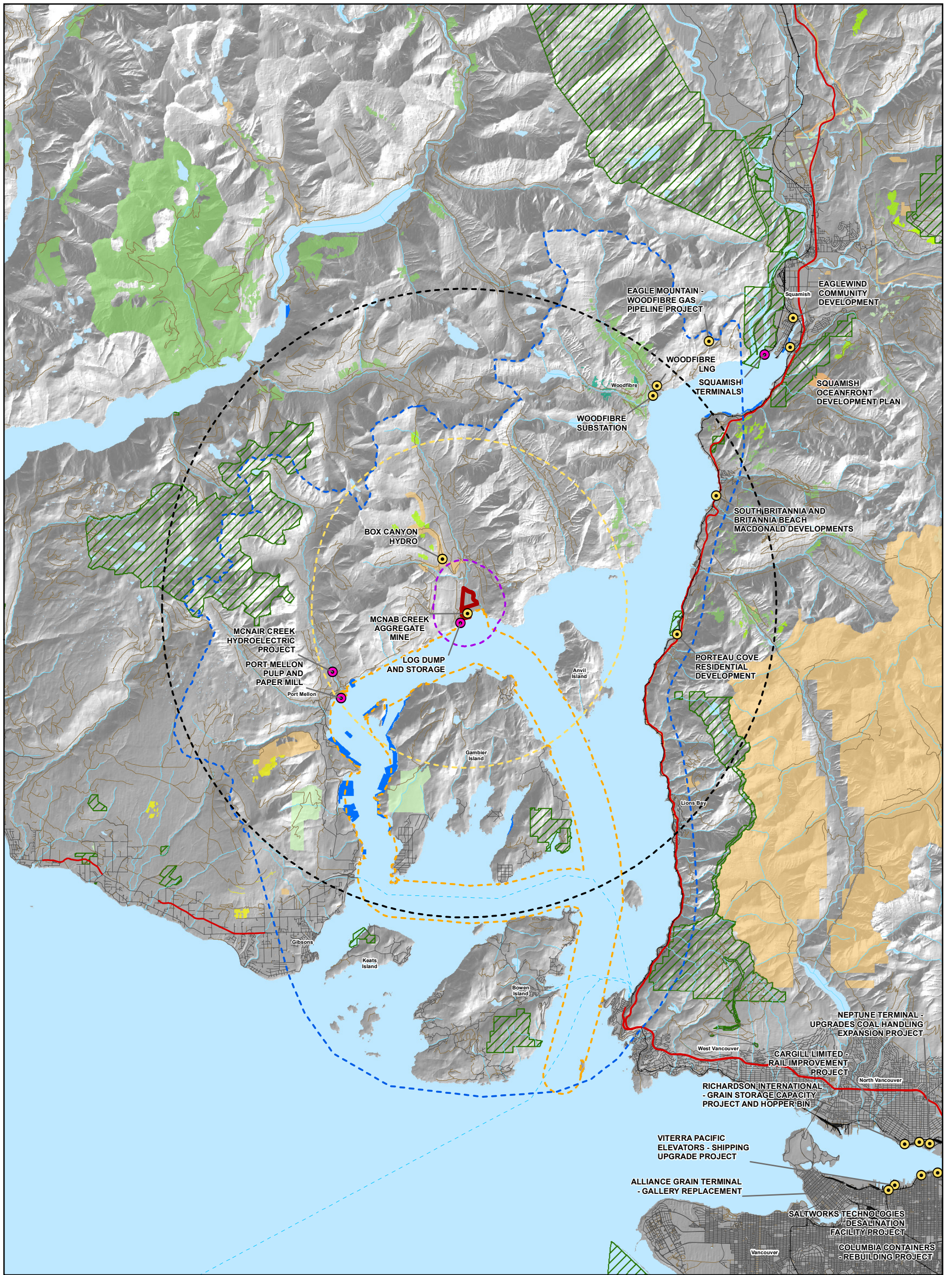
REFERENCE
 Forest tenure harvesting authority polygons from BC Ministry of Forests, Lands and Natural Resource Operations. Parks/protected areas from BC LRDW. Elevation from Geobase. Base data from CanVec10. Projection: UTM Zone 10 Datum: NAD 83



PROJECT		BURNCO ROCK PRODUCTS LTD. BURNCO AGGREGATE PROJECT, HOWE SOUND, B.C.	
TITLE		REASONABLY FORESEEABLE FUTURE PROJECTS CONSIDERED IN THE CUMULATIVE EFFECTS ASSESSMENT FOR ENVIRONMENTAL VCS	
PROJECT NO. 11-1422-0046		PHASE No.	
DESIGN	KZ	16 Jun. 2016	SCALE AS SHOWN
GIS	SB	20 Jun. 2016	REV. 1
CHECK	KZ	28 Jun. 2016	FIGURE 4-5
REVIEW	AC	28 Jun. 2016	

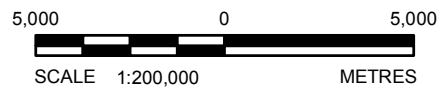


Path: \\golder.gds\gsl\vancouver\spatial_data\project_data\bc\mcnab\figures\mxd\ceaburnco_cea_figure_4-6_cumulative_effects_social_vcs.mxd



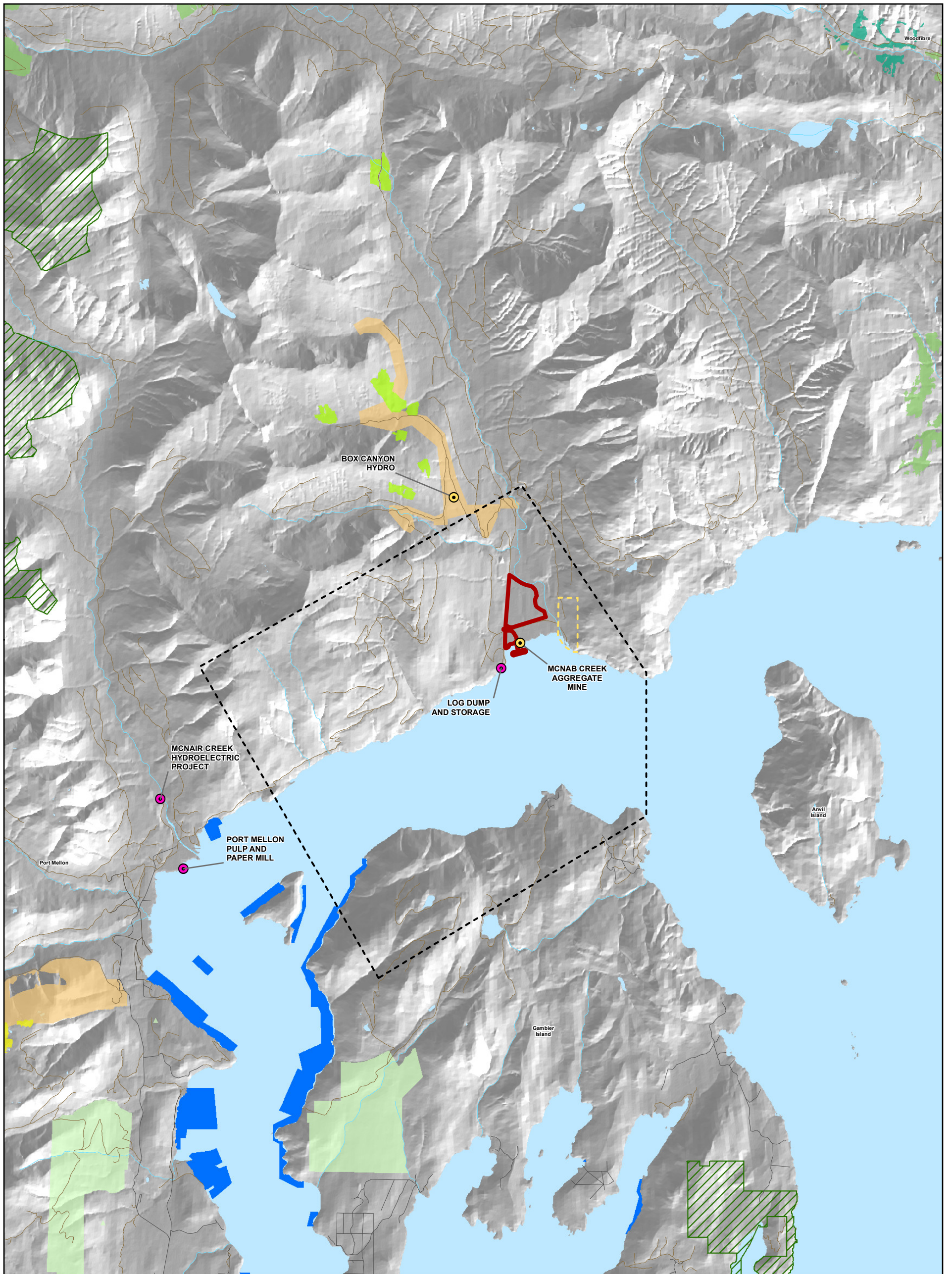
LEGEND	
	Project Area
	Visual Resources Local Study Area
	Visual Resources Regional Study Area
	Land and Resource Use Local Study Area
	Land and Resource Use Regional Study Area
	Marine Transportation LSA / RSA
	Past or Present Projects
	Reasonable Foreseeable Project
	Highway
	Road
	Resource Road
	Railway
	Watercourse
	Ferry
	Park / Protected Area
	Active Forest Tenures
	Timber Sale Cutting Permit
	Timber Sale Licence Minor
	Wood Lot Licence Cutting Permit
	Forest Licence Cutting Permit
	Licence to Cut
	Christmas Tree Permit
	Pending Forest Tenures
	Timber Sale Licence Minor
	Licence to Cut
	Other Tenures
	Log Handling / Storage Tenure

REFERENCE
 Forest tenure harvesting authority polygons from BC Ministry of Forests, Lands and Natural Resource Operations. Parks/protected areas from BC LRDW. Elevation from Geobase. Base data from CanVec10. Projection: UTM Zone 10 Datum: NAD 83



PROJECT		BURNCO ROCK PRODUCTS LTD. BURNCO AGGREGATE PROJECT, HOWE SOUND, B.C.	
TITLE		REASONABLY FORESEEABLE FUTURE PROJECTS CONSIDERED IN THE CUMULATIVE EFFECTS ASSESSMENT FOR SOCIAL VCS	
PROJECT NO. 11-1422-0046		PHASE No.	
DESIGN	KZ	16 Jun. 2016	SCALE AS SHOWN
GIS	SB	20 Jun. 2016	REV. 1
CHECK	KZ	28 Jun. 2016	FIGURE 4-6
REVIEW	AC	28 Jun. 2016	





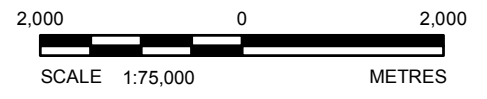
Path: \\golder.gds\gsl\vancouver\spatial_data\project_data\bc\burnco\figures\mxd\ceaburnco_cea_figure_4-7_cumulative_effects_economic_vcs.mxd

LEGEND

- Project Area
- Economic Local Study
- Economic Regional Study
- Past or Present Projects
- Reasonable Foreseeable Project
- Highway
- Road
- Resource Road
- Railway
- Watercourse
- Ferry
- Park / Protected
- Active Forest Tenures**
- Timber Sale Cutting Permit
- Timber Sale Licence Minor
- Wood Lot Licence Cutting Permit
- Forest Licence Cutting Permit
- Licence to Cut
- Pending Forest Tenures**
- Timber Sale Licence Minor
- Other Tenures**
- Log Handling / Storage Tenure

REFERENCE

Forest tenure harvesting authority polygons from BC Ministry of Forests, Lands and Natural Resource Operations. Parks/protected areas from BC LRDW. Elevation from Geobase. Base data from CanVec10. Projection: UTM Zone 10 Datum: NAD 83



PROJECT	BURNCO ROCK PRODUCTS LTD. BURNCO AGGREGATE PROJECT, HOWE SOUND, B.C.			
TITLE	REASONABLY FORESEEABLE FUTURE PROJECTS CONSIDERED IN THE CUMULATIVE EFFECTS ASSESSMENT FOR ECONOMIC VCS			
	PROJECT NO. 11-1422-0046		PHASE No.	
	DESIGN	KZ	16 Jun. 2016	SCALE AS SHOWN
	GIS	SB	20 Jun. 2016	REV. 1
	CHECK	KZ	28 Jun. 2016	FIGURE 4.7
REVIEW	AC	28 Jun. 2016		