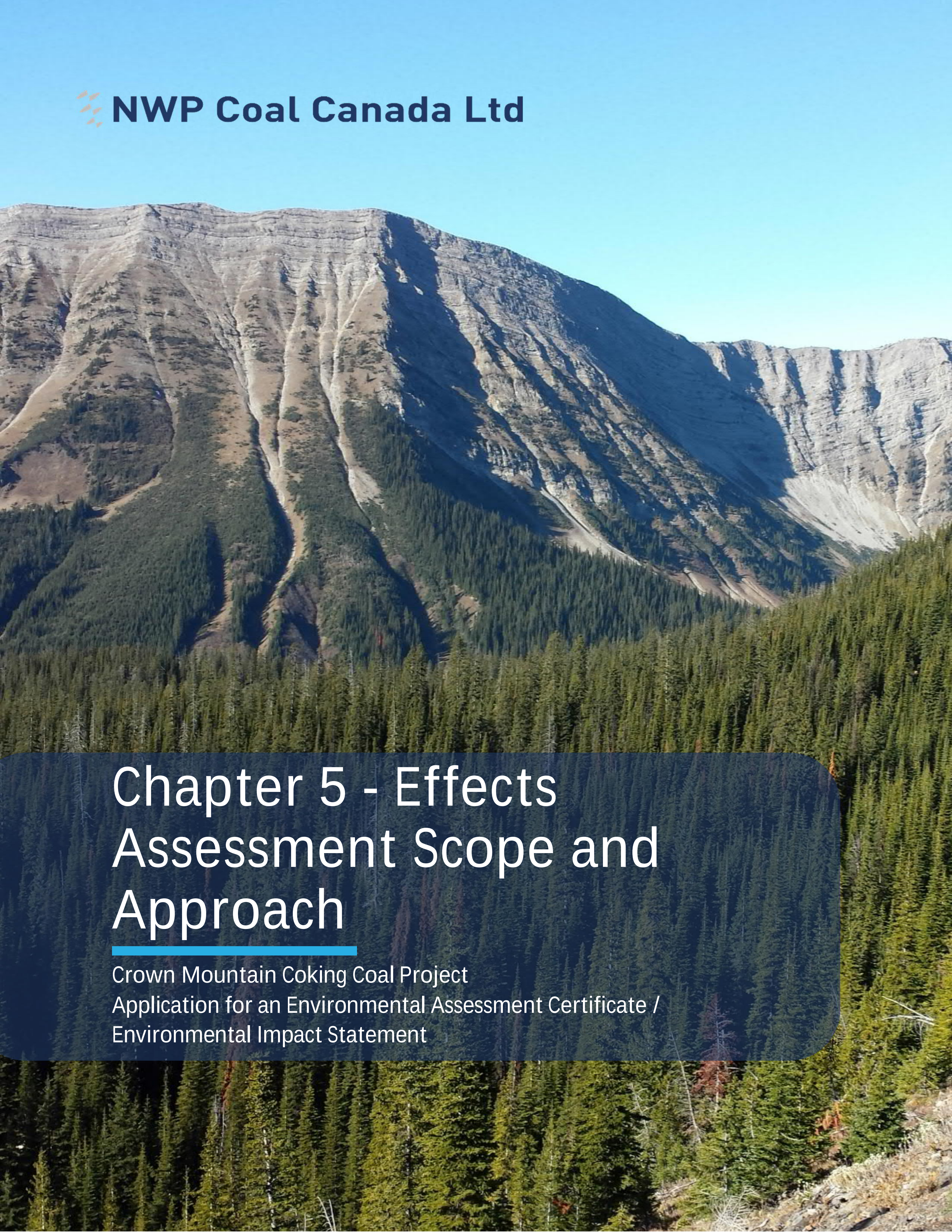

NWP Coal Canada Ltd

Chapter 5 - Effects Assessment Scope and Approach

Crown Mountain Coking Coal Project
Application for an Environmental Assessment Certificate / Environmental Impact Statement

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5. Effects Assessment Scope and Approach

5.1 Scope of the Environmental Assessment

Chapter 5 of the Application for an Environmental Assessment Certificate/Environmental Impact Statement (Application/EIS), describes the methods used to identify and assess the potential environmental effects of the Crown Mountain Coking Coal Project (the Project). This environmental assessment (EA) is intended to address the following primary objectives:

- Identify potential interactions between Project components and activities and the biophysical and socio-economic environments surrounding the Project;
- Identify potential effects on Valued Components (VCs) as a result of the Project;
- Propose mitigation measures to avoid, minimize, or compensate/offset potential adverse effects;
- Identify Project residual effects that remain after the implementation of mitigation measures;
- Determine the significance of residual effects, their likelihood of occurrence, and the level of confidence in prediction outcomes in consideration of defined boundaries and significance thresholds;
- Identify potential cumulative effects that could result from the interaction between the Project and other past, existing, or reasonably foreseeable future projects or activities;
- Identify mitigation measures for cumulative effects and identify cumulative residual effects;
- Determine the significance of cumulative residual effects and their likelihood of occurrence in consideration of the same defined boundaries and significance thresholds as for Project residual effects;
- Identify Project effects that may cross international or provincial borders and result in potential transboundary effects;
- Identify monitoring programs to measure and demonstrate environmental compliance; and
- Recommend a follow-up strategy to verify the effects predictions and/or effectiveness of mitigation measures where prediction confidence is uncertain.

The scope of the EA has been developed with regard to the requirements in the provincial Application Information Requirements (AIR; Environmental Assessment Office [EAO], 2018a), and the federal Guidelines for the Preparation of an Environmental Impact Statement for the Crown Mountain Coking Coal Project (EIS Guidelines; Canadian Environmental Assessment Agency [CEAA], 2015a) issued for the Project, as well as applicable government policy, standards, and guidance. In particular, the development of methods for this EA were guided by:

- Guidelines for the Selection of Valued Components and Assessment of Potential Effects (EAO, 2013a);
- Crown Mountain Coking Coal Project Application Information Requirements (EAO, 2018a);
- Environmental Assessment Office User Guide – An overview of Environmental Assessment In British Columbia (EAO, 2018b);
- Guidelines for the Preparation of an Environmental Impact Statement for the Crown Mountain Coking Coal Project (CEAA, 2015);
- Procedures for Mitigating Impacts on Environmental Values (Ministry of Environment, 2014);
- Recommended Minimum Standards for Proponents in Determining Significance of Effects in Environmental Assessments (EAs) in the Elk Valley (Ktunaxa Nation Council, 2020);
- Cumulative Effects Assessment Practitioners Guide (Hegmann et al., 1999);
- Assessing Cumulative Environmental Effects under the Canadian Environmental Assessment Act, 2012 Interim Technical Guidance (Minister of Environment and Climate Change Canada, 2018); and
- DRAFT Ktunaxa Perspectives on, and Principles for, Reclamation and Restoration in qukin ʔamakʔis and the Elk Valley (General) (Morris and Candler, 2020).

The methods outlined in Chapter 5 present a structured approach to assessing effects of the Project on the environmental, economic, social, heritage, and health components relevant to this EA. Effects assessment methods may vary by VC and as such, details on the approach to the effects assessment for VC are presented in detail in relevant chapters of the Application/EIS, as applicable.

5.2 Valued Components

To promote a comprehensive assessment of the potential effects associated with a proposed project, environmental assessment in B.C. employs a values-based framework. The values-based framework relies on the use of VCs to focus environmental assessments on aspects of the natural and human environment that are of greatest importance to society and have the potential of being affected by a proposed project. The EAO (2013) defines a VC 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." (p. 4).

Similarly, at a federal level, the Impact Assessment Agency of Canada (IAAC) defines VCs as "… environmental, biophysical or human features that may be impacted by a project" (CEAA, 2015) and includes features that hold scientific, social, cultural, economic, historical, archaeological, or aesthetic importance.

5.2.1 Issues Scoping

Issues scoping involves researching, compiling, and analyzing information to identify natural and human environment issues that may be related to a project. The issues identified through this initial scoping exercise considered regional and local values held by Indigenous communities, the public, and stakeholders. The issues scoping completed for the Project included:

- Review and compilation of available information on the existing environmental and socio-economic baseline information in the local and regional areas, including previously conducted baseline studies, research and academic publications, provincial databases, and private sector studies;
- Review of the Project Description, which includes the proposed Project activities, scheduling, engagement activities, and the identification of potential effects (Chapter 3);
- Engagement with the Ktunaxa Nation Council (KNC) (Chapter 4 and Chapter 23);
- Consultation with public stakeholders, including meetings with the District of Elkford, Municipality of Crowsnest Pass, Fernie Committee of the Whole, Teck Resources Limited (Teck), and District of Sparwood Council (Chapter 4);
- Discussions with regulators, including the B.C. Ministry of Environment and Climate Change Strategy (ENV), B.C. Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNRORD), and Environment and Climate Change Canada (ECCC) regarding baseline programs (Chapter 4);
- Review of publicly available EA and VC documents for other projects in the Elk Valley;
- Review of relevant provincial and federal guidance documents;
- Evaluation of potential Project-environment interactions and effects pathways; and
- Use of professional judgment and engagement with specialists in a variety of disciplines with local knowledge.

Issues that were identified through the scoping process informed the selection of VCs to be assessed as part of the environmental assessment process.

5.2.2 Selection of Valued Components

VCs are the foundation for the assessment of Project effects on the natural and human environment that have scientific, ecological, economic, social, cultural, aesthetic, archaeological, or historical importance. The selection of appropriate VCs helps to ensure a focused, meaningful, and effective assessment of potential effects.

VCs scoped into the assessment were based on the provincial Pre-Application process and associated requirements, including the Valued Components for Environmental Assessment (NWP, 2016) and related guidance document (EAO, 2013a) and the Project AIR (EAO, 2018a). Issues raised during consultation on the Valued Components for Environmental Assessment document (NWP, 2016), the draft AIR, and consultation with the Ktunaxa Nation Council were considered in the selection of VCs. VCs were also scoped into the assessment based on the federal terms of reference for the Project, specifically the EIS Guidelines (CEAA, 2015). In the context of the Canadian Environmental Assessment Act, 2012 (CEA Act, 2012), VCs are selected to identify and analyze environmental effects under federal jurisdiction as described in Section 5 of the Act.

VCs evaluated for inclusion in the Application/EIS were assessed based on several criteria/attributes and additional scoping questions. The EAO (2013) notes that VCs selected for an environmental assessment should have the following attributes:

- Relevant to at least one of the five pillars (i.e., environmental, economic, social, heritage, and health) and clearly linked to the values reflected in the issues raised in respect of the Project.
- Comprehensive, so that taken together, the VCs selected for an assessment should enable a full understanding of the important potential effects of the Project (including all five pillars).
- Representative of the important features of the natural and human environment likely to be affected by the Project.
- Responsive to the potential effects of the Project.
- Concise, so that the nature of the Project-VC interaction and the resulting effect pathway can be clearly articulated and understood, and redundant analysis is avoided.

The selection of VCs relevant to the Project first required identification of all possible VCs (referred to as candidate VCs) that may be affected based on issues scoping. The list of candidate VCs was refined through further issues scoping and analysis. VCs were then evaluated to determine which VCs are intermediate components or receptor components across the potential effects pathways for the Project. Intermediate VCs are those components which may be impacted along the effect pathway of a selected VC. The effect pathway refers to the cause and effect relationship between the Project/Project activities and a VC (EAO, 2013a). Receptor VCs represent those VCs at the end of an effects pathway.

Candidate intermediate and receptor VCs were considered based on the following (EAO, 2013a):

- Is the VC present within the local or regional study areas of the Project?
- Does the VC have the potential to interact with the Project and be adversely affected?
- Do legally-binding requirements exist to protect the component (e.g., regulation or management frameworks)?
- Does the VC reflect a legislative or regulatory requirement or government management priority (e.g., species at risk)?
- Does the VC reflect an Indigenous interest, including Indigenous rights and title, and Treaty rights?
- Is there potential for significant adverse cumulative effects? What stressors are occurring related to this VC on the land base?
- Is the VC or potential adverse effects of concern to the public, Indigenous groups, or the government?
- Is the VC sensitive or vulnerable to disturbance?

In addition to the above questions, the following important questions were used to evaluate sub-components or intermediate VCs and to define measure indicators used to assess effects (EAO, 2013a):

- Can the potential effects of the Project on the VC be measured and monitored?
- Is the candidate VC better represented by another VC?
- Can the potential effects on the candidate VC be effectively considered within the assessment of another VC?
- Is information about the candidate VC needed to support the assessment of potential effects on another VC?

Information on the intermediate VCs and receptor VCs selected for the project are outlined in Section 5.2.2.2.

5.2.2.1 Consultation Feedback on Valued Components

Consultation is an integral component of a project as it involves obtaining feedback from those parties may be potentially affected by, or have an interest in, the Project. As part of the provincial pre-application phase of the provincial environmental assessment, the draft Valued Components for Environmental Assessment document (NWP, 2016) was made available to the KNC and Working Group members to obtain feedback. The VCs for Environmental Assessment document outlines the VCs that are evaluated during the environmental assessment and describes the methods and assessment boundaries used for conducting baseline studies. Input and feedback from the KNC and stakeholders was a key step in the development of the draft VC for Environmental Assessment document and association selection of VCs to be carried forward for assessment.

In addition to the VC for Environmental assessment document, feedback on VCs was also provided through the development of the draft provincial AIR, the federal draft EIS Guidelines, and Working Group meetings on the terrestrial environment. Comments and feedback to inform the selection of VCs was obtained through the following:

- Federal draft EIS Guidelines and 30-day public comment period from December 22, 2014 to January 30, 2015;
- An in-person Working Group meeting in Cranbrook, B.C. on October 15, 2015 led by the EAO and attended by provincial and federal government representatives, the KNC, NWP, and NWP's consultants;
- KNC review of the draft VC for Environmental Assessment document and the draft AIR;
- VC for Environmental Assessment document 30-day public comment period held between May 13 and June 13, 2016;
- Community open house held on May 25, 2016 in Sparwood, B.C. on the draft VC for Environmental Assessment document; and
- KNC feedback on wildlife VCs in a terrestrial Working Group meeting on February 22, 2018.

Selected VCs are presented in the final AIR, issued April 26, 2018 (EAO, 2018a), and the final EIS Guidelines, issued February 20, 2015 (CEAA, 2015). Information on the results of consultation and engagement undertaken for the Project is presented in Chapter 4.

5.2.2.2 Selected Receptor and Intermediate Valued Components

Receptor VCs and intermediate VCs to be included in the Project effects assessment as well as the rationale for the selection of these VCs are presented in Table 5.2-1. Receptor VCs represent those VCs that occur at the end of an effects pathway, while intermediate VCs are those environmental components of a natural system that are pathways to effects on receptor VCs. In some cases, selected VCs serve as representative indicators for impacts to components that are not carried forward for individual assessment. Rationale for the selection of the receptor and intermediate VCs is based on information outlined in the Valued Components for Environmental Assessment (NWP, 2016) document as per EAO's Guideline for the Selection of Valued Components and Assessment of Potential Effects (EAO, 2013a). Interactions of intermediate and receptors VCs are discussed in each VC assessment chapter.

Measurement indicators (i.e., characteristics of the environment that are used to evaluate changes in the conditions or trends of a VC along an effects pathway) were developed for each VC and provide useful data to adequately understand potential effects of the Project on VCs. Intermediate components and measurements indicators are important in the determination of the significance of effects on VCs and are outlined in each effects assessment chapter. Details on measurement indicators used in the assessment of effects for both intermediate and receptor VCs as well as linkages between intermediate and receptor VCs are provided in the effects assessment chapters.

The Project EIS Guidelines (CEAA, 2015) lists VCs under federal jurisdiction that require inclusion in the effects assessment to evaluate and assess predicted changes, specifically effects on:

- Fish and fish habitat;
- Migratory birds;
- Species at risk;
- Transboundary lands; and
- Indigenous peoples, including health and socio-economic conditions, physical and cultural heritage, the current use of lands and resources for traditional purposes, and any structure, site or thing that is of historical, archaeological, paleontological, or architectural significance.

Impacts to federal VCs were evaluated based on the predicted changes to the VCs outlined in Table 5.2-1. Assessment of potential impacts on Indigenous peoples included assessment of effects on treaty rights and interests for the following (additional information provided in Chapters 23 to 31):

- Ktunaxa Nation;
- Shuswap Indian Band;
- Stoney Nakoda First Nations;
- Métis Nation of British Columbia;
- Kainai First Nation (Blood Tribe);
- Piikani Nation;
- Siksika Nation;
- Tsuut'ina Nation; and
- Métis Nation of Alberta, Region 3.

Receptor and intermediate VCs presented in the Application/EIS generally reflect those identified in the AIR and the Project EIS Guidelines (CEAA, 2015) with the exception of two receptor VCs, mountain goat and commercial land use. Mountain goat were added as a VC in May 2019 based on feedback from the KNC regarding the potential effects to mountain goats. NWP included an effects assessment of mountain goats under the bighorn sheep VC. Additional information regarding the rationale for the addition of mountain goats as a VC and the related effects assessment is provided in Chapter 15 and Appendix 15-A. Commercial land use was added as a VC to the social discipline to differentiate commercial land use from recreation and tourism land use. Additional information on the land use VCs is presented in Chapter 17.

Table 5.2-1: Application Information Requirements Selected Receptor and Intermediate Valued Components

Pillar	Selected Valued Component	Receptor Valued Component?	Intermediate Valued Component?	Rationale for Inclusion
Environment	Groundwater Quality and Quantity		✓	Groundwater quantity and quality are key components of the biophysical environment, as they interact with the creeks and drainages in the vicinity of the Project. Changes to groundwater quality and quantity have potential linkages to other intermediate and receptor VCs when groundwater interacts with surface water as baseflow contribution to watercourses within the Project area. Potential changes in groundwater quality and quantity can also affect sources of drinking water. Additional information is provided in Chapter 9, Section 9.2.1.
	Surface Water Quality and Quantity		✓	Surface water quality and quantity are essential to the health and maintenance of aquatic ecosystems, vegetation, wildlife, and human health through their direct influence on physical habitat and water quality. Surface water quality and quantity are pathways to effects on various VCs, including but not limited to groundwater, fish, wildlife, and Indigenous communities. Additional rationale is provided in Chapter 10, Sections 10.2.1 and Chapter 11, 11.2.1.
	Soil Quality and Quantity		✓	The quality and quantity of soils are important components of terrestrial ecosystems as they influence biological functions and ecosystem health. Terrain affects water flow and distribution, sedimentation and erosion, biological diversity, and ecosystem distribution and function. Project activities have the potential to result in changes in terrain stability, soil loss, and changes in soil quality, which can result in the reduction or cessation of local ecosystem functions. Soil and terrain effects have linkages to several VCs including but not limited to surface water quality, fish and fish habitat, wildlife and wildlife habitat, vegetation, and landscapes and ecosystems. Additional information is provided in Chapter 8, Section 8.2.1.
	Terrain		✓	
	Fish and Fish Habitat, as represented by: • Westslope Cutthroat Trout • Bull Trout • Kokanee • Burbot	✓		Fish and fish habitat are critical components of the aquatic environment and many fish species serve an important role in the ecological, economic, recreational, and cultural health of B.C. and Canada. Fish and fish habitat VCs were selected for the following reasons: • Westslope Cutthroat Trout (WCT) were identified as a VC for which potential effects resulting from the Project will be assessed due to its regulatory status, value to recreational and traditional fisheries, and sensitivity to fish habitat

Pillar	Selected Valued Component	Receptor Valued Component?	Intermediate Valued Component?	Rationale for Inclusion
	• Longnose Sucker • Mountain Whitefish			degradation and water quality. WCT were also identified as a VC assessed by the Elk Valley Cumulative Effects Management Framework (Province of British Columbia, 2020a). • Bull Trout were identified as a VC for which potential effects resulting from the Project will be assessed due to its provincial status, value to recreational and traditional fisheries in the Elk Valley, and use as an indicator species of general ecosystem health. • Kokanee were identified as a VC for which potential downstream effects to water quality resulting from the Project will be assessed, because it is a representative planktivore species that is directly linked to aquatic impacts at lower trophic levels (e.g., phytoplankton, benthic invertebrates). They also are valuable to recreational and traditional fisheries in B.C. • Burbot were therefore identified as a VC for which potential downstream effects to water quality resulting from the Project will be assessed due to their position as top predator in aquatic ecosystems, making them a valuable indicator of environmental health, specifically related to food web relationships. • Mountain Whitefish and Longnose Sucker were identified as a representative species for fish populations in the Fish and Fish Habitat LSA and Aquatic Regional Study Area because they are typically found in a diverse variety of habitats and have varied diets depending on availability of food resources. The species is also important to recreational and traditional fisheries in the Elk Valley. Additional rationale on the inclusion of the fish VCs is provided in Chapter 12, Section 12.2.1.

Pillar	Selected Valued Component	Receptor Valued Component?	Intermediate Valued Component?	Rationale for Inclusion
	Benthic Invertebrates	✓		Benthic invertebrates are secondary producers and represent a critical link between primary producer communities such as periphyton and phytoplankton and higher aquatic trophic levels such as fish. Changes to water and sediment quality can affect the diversity, abundance, and activities of primary and secondary producer communities. Benthic invertebrates were identified as a VC for which potential effects resulting from the Project will be assessed because they provide a baseline level indicator of aquatic community health, are indicators of physical and chemical aquatic health, and are important food resources for other VCs including fish, amphibians, and birds.
	Landscape and ecosystems: • Avalanche Chutes • Grassland Ecosystems • Riparian Habitat • Old Growth and Mature Forests • Wetland Ecosystems	✓		Landscape and ecosystem VCs were selected for the following reasons: • Avalanche chutes provide important foraging habitat for a number of wildlife VCs during the spring and summer months and are characterized by grass, forbs, and shrub species. Avalanche chutes occur in the vicinity of the Project, and as such have the potential to be impacted by direct and indirect effects of the Project. • Grasslands provide important habitat diversity in areas dominated by forests, including valuable forage for livestock and important habitat for grazing ungulates. They also frequently provide habitat for at-risk species and species of concern. Grassland ecosystems occurring within the vicinity of the Project have the potential to be directly or indirectly as a result of Project activities, and as such, this ecosystem type was selected as a VC. • The Elk Valley Cumulative Effects Management Framework (EV-CEMF) identified riparian habitat as a VC (Province of British Columbia, 2020a). Given that the Project may result in direct and indirect impacts to riparian habitat, this ecosystem was selected as a VC for the Project. • Old growth and mature forest have been impacted by previous activities in the Elk Valley (e.g., mining, agriculture, forestry), and the Project may indirectly and directly impact the amount and accessibility of old growth and mature forest. As such, this ecosystem was identified as VC for the Project. • Wetlands contribute to biodiversity by providing habitat for a variety of terrestrial and freshwater species, including sensitive amphibian species.

Pillar	Selected Valued Component	Receptor Valued Component?	Intermediate Valued Component?	Rationale for Inclusion
				Wetland ecosystems were selected as a VC due to the ecological functions and cultural value they provide, including the potential to support rare and sensitive plant communities and species. Additional rationale on the inclusion of the landscape and ecosystems VCs is provided in Chapter 13, Section 13.3.1.
	Vegetation: • Listed and Sensitive Plant Communities • Limber Pine • Whitebark Pine • Culturally Significant Plants and Ecosystems	✓		The vegetation VCs were selected for their scientific, ecological, social, and cultural importance, as well as the following reasons: • Listed and sensitive plant communities and species are identified as a VC given the threats as a result of habitat loss, invasive species encroachment, and changes in disturbance regimes. Several plant species and ecosystems have the potential to occur within the Project footprint and surrounding the Project. • Limber pine is considered a VC as it is currently provincially Blue-listed and recommended for listing as Endangered by the Committee on the Status of Endangered Wildlife in Canada. Like whitebark pine, limber pine is threatened by white pine blister rust. • Whitebark pine is a VC given its current status as federally listed as Endangered under Schedule 1 of the federal Species at Risk Act (SARA; 2002). Currently, whitebark is at high risk of extirpation in Canada and is threatened by white pine blister rust. Additional rationale on the inclusion of the vegetation VCs is provided in Chapter 14, Section 14.3.1.
	Wildlife: • Ungulates (Elk, Bighorn Sheep, Mountain Goat, and Moose) • Carnivores (Grizzly Bear, Wolverine, American Badger,	✓		Wildlife are critical to the functioning of terrestrial and aquatic ecosystems and are important recreational, economic, heritage, and subsistence resources for the public and Indigenous communities. Wildlife VCs were selected for various reasons, which are outlined in detail in Chapter 15, Table 15.2-2 and each of the VC assessment chapters. Key aspects of why these VCs or VC groups were chosen include: • Ungulates are important for ecosystem health and function through herbivory and providing prey for carnivores and influence vegetation

Pillar	Selected Valued Component	Receptor Valued Component?	Intermediate Valued Component?	Rationale for Inclusion
	American Marten, and Canada Lynx) • Bats (Little Brown Bat, Northern Myotis, and Eastern Red Bat) • Birds: o Migratory Birds (Olive-sided Flycatcher, Barn Swallow, and Woodpeckers) o Raptors (Northern Goshawk) o Waterbirds (Harlequin Duck, Red-winged Blackbird, Spotted Sandpiper, Mallard, and American Dipper) • Amphibians (Western Toad and Columbia Spotted Frog)			structure, composition, succession, and diversity. See Chapter 15, Section 15.4.1 for more information. • Carnivores are important for ecosystem health and function. Carnivore VCs selected include species at risk, species with large space requirements, demonstrated sensitivities to disturbance, and species of social, cultural, and economic importance. Additional information is provided in Chapter 15, Section 15.5.1.1. • Bats are sensitive to human activities such as resource and linear corridor developments that result in a loss of roosting and foraging habitat. As well, bats are currently threatened by white-nose syndrome. See Chapter 15, Section 15.6.1 for more information. • A variety of bird species were selected as VCs. o Migratory birds are ecologically and economically valuable as they help regulate pest insect and rodent populations, act as pollinators, and contribute to socio-economic activities. Barn Swallow and Olive-sided Flycatcher are currently listed under SARA (2002) while woodpeckers were selected to represent cavity nesters. Additional information is provided in Chapter 15, Section 15.7.1.3. o Northern Goshawk is an indicator of old growth and mature forests as it requires extensive area of forest for hunting and nesting. This species is current threatened by habitat loss and forest fragmentation (see Chapter 15, Section 15.7.1.4). o Waterbirds reflect the productivity of aquatic ecosystems and have the potential to be impacted by contaminants (e.g., selenium) and related bioaccumulation. Representative waterbird species have the potential to be impacted by habitat loss (e.g., wetland removal) and degradation (e.g., contamination of aquatic ecosystems). See Chapter 15, Section 15.7.1.5 for more information. • Western toad is listed as Special Concern under Schedule 1 of the Species at Risk Act (2002) and is particularly vulnerable to anthropogenic threats due to its infrequent breeding and extensive movement. Columbia spotted frog, which represents amphibians of the RSA and is common in the Elk Valley, is

Pillar	Selected Valued Component	Receptor Valued Component?	Intermediate Valued Component?	Rationale for Inclusion
	• Gillette's Checkerspot			also under threat due to anthropogenic factors including habitat loss and disturbance. See Chapter 15, Section 15.8.1 for additional information. • Gillette's checkerspot was selected as a receptor VC for the Project because it is listed as a sensitive species globally and within B.C., and it has been documented within the vicinity of the Project. See Chapter 15, Section 15.9.1 for more information.
Economic	Economic Conditions	✓		The Project is expected to contribute positively to economic development, both regionally and locally. Development of the Project also has the potential to change the land use and access in the vicinity of the Project, increase local labour demands, and generate revenue for local and provincial government and generate revenue for the Ktunaxa Nation. See Chapter 17, Section 17.2.1 for more information.
Social	Housing and Community Services and Infrastructure	✓		Housing, community services, and infrastructure was selected as a VC as an increase or influx of employees (and their families) for Project construction and operation may increase demand on local services such as housing, emergency services, and local infrastructure. See Chapter 18, Section 18.2.1 for more information.
	Community Health and Well-being	✓		Community health and well-being was selected as a VC due to the potential for human health to be impacted through direct and indirect sources, such as potential interactions of shift work on employee health and well-being or changes to public safety as a result of exposure to physical hazards or emissions at the Project site. Additional information is provided in Chapter 18, Section 18.2.1.
	Land Use and Access	✓		The Project has the potential to change access to the existing land base as it will create an area of active resource extraction and change the land base to include components relevant for operation of the mine (e.g., haul roads, mine infrastructure, etc.). Changes in the land base may restrict access to areas used for recreational or tourism purposes, as well as for resource harvesting and extraction (e.g., forestry). See Chapter 19, Section 19.2.1 for more information.

Pillar	Selected Valued Component	Receptor Valued Component?	Intermediate Valued Component?	Rationale for Inclusion
	Recreation and Tourism	✓		The Project is located in an area that is used for a variety of recreational purposes, including hunting, fishing, and hiking. As a result of the Project, the existing land use will change and areas once used for recreational purposes will be restricted or have controlled access to ensure public safety. See Chapter 19, Section 19.2.1 for more information.
	Commercial Land Use	✓		Development of the Project may remove lands used for commercial purposes, including resource harvesting. As well, the Project may impact wildlife (furbearing species) abundance, resulting in changes to trapping activities. See Chapter 19, Section 19.2.1 for more information.
	Visual Aesthetics	✓		The Project is located in an area that is used for recreational purposes and thus may cause localized changes to the visual landscape. Visual aesthetics for backcountry recreational users may change as a result of the Project. See Chapter 19, Section 19.2.1 for more information.
Heritage	Archaeological Resources / Physical and Cultural Heritage	✓		Any Project involving ground disturbance has the potential for interaction with physical and cultural heritage. This VC was selected given its importance to the people of the Elk Valley and B.C. as a whole, and because archaeological resources are recognized and managed by provincial regulatory agencies, and potentially affected Indigenous peoples have an interest in the preservation and management of physical and cultural heritage related to their history and culture. See Chapter 16, Section 16.1 for more information.
Health	Air Quality		✓	The Project will result in emissions of criteria air contaminants (CACs), dust, and Greenhouse Gas Emissions (GHGs). CACs and dust emissions can affect local air quality, which is an important environmental factor for vegetation, wildlife, and human health, and in remaining in compliance with federal and provincial regulations. GHGs are associated with climate change and have specific federal and provincial reporting regulations and reduction targets.
	Greenhouse Gas Emissions		✓	
	Climate	✓		Project activities may influence affect air quality near the Project footprint, and GHG emissions released during these phases may contribute to global climate change. Changes to the atmospheric environment from mining activities can

Pillar	Selected Valued Component	Receptor Valued Component?	Intermediate Valued Component?	Rationale for Inclusion
				result in potential effects to receptor VCs, including aquatic health, vegetation, and human and wildlife health. See Chapter 6, Section 6.1 for more information.
	Noise and Vibration		✓	Noise and vibration from the Project have the potential to affect human health and well-being, as well as cause disturbance (including avoidance) to nearby wildlife. Sensory disturbance may affect receptor health and quality of life (e.g., wildlife use of forage areas). Additional information is provided in Chapter 7, Sections 7.1 and 7.2.1.
	Human Health	✓		Major mining projects, such as the Project, have a potential to release chemical contaminants to the environment through controlled or uncontrolled releases such as permitted effluent discharge, surface water runoff, seepage, fugitive dust, and atmospheric emissions from vehicle traffic or other direct facility emissions. These emissions and releases have the potential to alter environmental quality of local and regional landscapes which could potentially expose humans and wildlife (including plants and animals in the terrestrial and aquatic environments) to chemical releases from the Project. See Chapter 21, Sections 22.1 and 22.2.1 for more information.
	Wildlife Health	✓		

5.2.2.3 Valued Components Excluded from the Assessment

Components that were considered but not selected for assessment are summarized in Table 5.2-2.

Table 5.2-2: Rationale for Exclusion of Candidate Valued Components

Excluded Valued Components	Rationale for Exclusion
Periphyton	Periphyton are an important food source for a variety of aquatic species, including fish, amphibians, and invertebrates. Changes in surface water quality and sediment quality may impact the health of periphyton in watercourses within the Local Study Area (LSA). Potential impacts to periphyton are considered through assessment of the benthic invertebrate VC.
Northern Pikeminnow and Peamouth Chub	Impacts to fish species within the Regional Study Area (RSA) are evaluated through a selection of representative species, including Westslope Cutthroat Trout, Bull Trout, Burbot, Mountain Whitefish, and Longnose Sucker. These representative species were selected for their abundance in the Elk Valley and the potential use of available data to complete quantitative effects assessments on fish species.
Higher Trophic Level Bird or Mammal Species (e.g., Great Blue Heron)	Higher trophic level bird species such as Great Blue Heron have the potential to be affected by selenium concentrations if prey with elevated levels of selenium is consumed (such as fish). Waterbird species selected as VCs (i.e., Harlequin Duck, Red-winged Blackbird, Spotted Sandpiper, Mallard, and American Dipper) and these species acted as representative species to assess potential impacts to higher trophic level birds. Higher trophic level mammal species are discussed under mink and river otter below.
Soil Invertebrates	Detailed information on soil invertebrates was not collected during the Terrestrial Ecosystem Mapping (TEM) baseline work; however, soil quality is considered during proposed reclamation and closure activities to ensure appropriate quality soils are used during reclamation activities. Appropriate soil quality information was collected to ensure that the relevant reclamation standards pertaining to growth medium and revegetation are met.
Rock Outcrop Ecosystems	Rock outcrop ecosystems provide habitat for sensitive plant species. Whitebark and limber pine are known to occur within the Project LSA and likely to be associated with rock outcrop ecosystems. Given that whitebark and limber pine have been selected as VCs, they will serve as the species to represent potential impacts to rock outcrop ecosystems.
Mink or River Otter	Aquatic mustalids such as mink and river otter may occur within the LSA. These animals represent a fish-eating furbearer, a potential pathway for selenium uptake. The potential impacts and effects of changes to water quality and the potential bioaccumulation of metals such as selenium is assessed through the aquatic, terrestrial, and human health assessments. In particular, aquatic mustalids are specifically assessed as part of the terrestrial wildlife health risk assessment.
Peregrine Falcon	During baseline studies, Peregrine Falcon and their nesting habitat was not observed within the Project LSA. Further baseline studies for raptors assessed raptor presence within the LSA. Peregrine Falcon is not expected to inhabit or nest within the Project footprint or LSA as this species prefers large and wide-open valleys such as the Rocky Mountain Trench.

Excluded Valued Components	Rationale for Exclusion
Owl Species	Owl species with the potential to occur in the LSA include Western Screech Owl and Boreal Owl. The Western Screech Owl is listed as Threatened under Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and Special Concern (Schedule 1) under Species at Risk Act (SARA; Government of Canada, 2015). The likelihood of Western Screech Owl inhabiting the LSA is low; however, baseline studies were conducted to determine the potential for owls within the LSA. Owls have not been selected as a separate VC as they are represented by the old growth/mature forests VC, habitat which supports owl species. Changes in the old growth/mature forest ecosystem may be used to indicate changes in owl abundance and distribution.
Reptile Species	Sensitive reptile species, such as the western painted turtle, have a low potential of occurring within the Project footprint and LSA.
Wildlife Tree Users	Wildlife tree users include a variety of species such as birds, mammals, and amphibians (Province of British Columbia, 1995). This broader category of wildlife tree users is not recommended as a VC as potential impacts to wildlife tree users is assessed under the old growth/mature forests VC. Old growth/mature forests are important ecosystems as they contribute to biodiversity and structurally provide habitat features not found in younger forests. The EV-CEMF identifies old growth/mature forests as an important VC in the Elk Valley. Evaluating the impacts to old growth/mature forests at an ecosystem level will help to understand potential impacts to species that inhabit this ecosystem such as wildlife tree users.
Sediment Quantity	Sediment quantity was excluded because the Erosion and Sediment Control Plan provided in Chapter 33 will limit the amount of sediment entering the aquatic environment as a result of Project activities.
Sediment Quality	Sediment quality was excluded from the EA because it is assessed as a contaminant exposure pathway for aquatic receptor VCs in the Human and Ecological Health Assessment (Chapter 22).

Two intermediate VCs identified in the initial VC scoping, sediment quantity and quality, were excluded from the Application/EIS. Sediment quantity was excluded because the Project-specific Erosion and Sediment Control Plan provided in Chapter 33 will limit the amount of sediment entering the aquatic environment as a result of Project activities. Sediment quality was excluded from the EA because it is assessed as a contaminant exposure pathway for aquatic receptor VCs in the Human and Ecological Health Assessment (Chapter 22).

5.3 Effects Assessment Methods

The methods to be used to conduct the effects assessment are shown in Figure 5.3-1 and are detailed in the sections that follow.

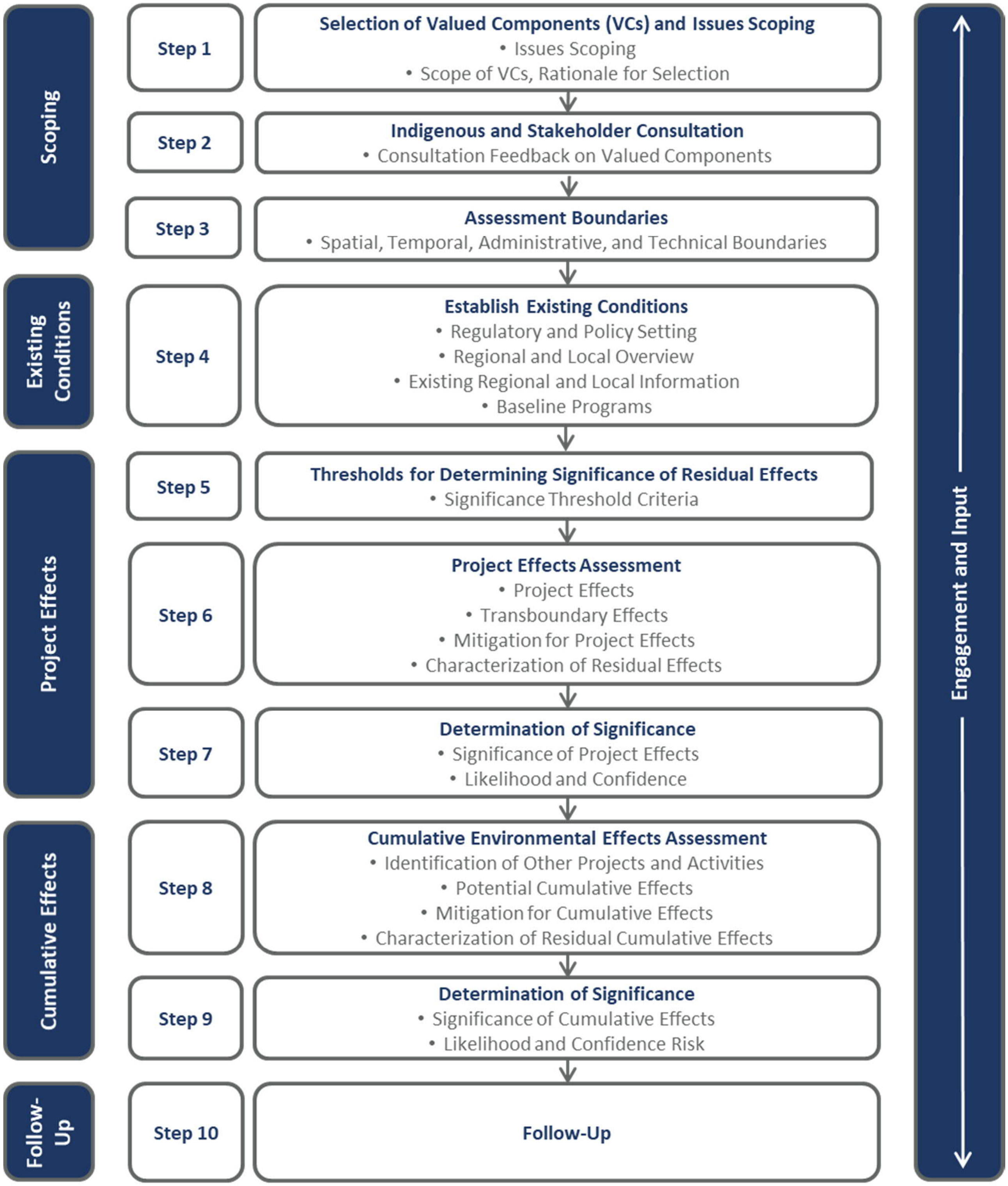


Figure 5.3-1: Effects Assessment Methodology Summary

5.3.1 Indigenous and Stakeholder Information

Information gathered through consultation and engagement was used to support an understanding of the existing conditions for each VC, potential interactions between VCs and the Project, and potential effects on a VC as a result of the Project. In each effects assessment chapter, where relevant, a summary of feedback received through consultation and engagement is provided, as well as information on responses or actions implemented to respond to feedback (Table 5.3-1). The summary of feedback tables are used to demonstrate how feedback from local Indigenous groups, the public, stakeholders and government agencies on receptor and intermediate VCs was incorporated, as appropriate, into the assessments as it relates to feedback received following the scoping phase of the Project (i.e., subsequent to the VC for Environmental Assessment document and the Project AIR). For information on pre-scoping feedback received, refer to Chapter 4.

NWP's approach to consultation and engagement, the activities conducted, and the issues, concerns, and interests raised by Indigenous communities and stakeholders, are detailed in Chapter 4. The final results and outcomes of the consultation and engagement activities conducted are also provided in Chapter 4.

Table 5.3-1: Summary of Consultation Feedback on Valued Components

Topic	Feedback Received*:				Feedback Source	Consultation Feedback	Response or Actions Identified
	IG	G	P/S	O			

Notes:
* IG = Indigenous Group (group specified in feedback source); G = Government (provincial or federal agencies); P/S = Public/Stakeholder (Interest group, local government, tenure and license holders, members of the public); O = Other

5.3.2 Assessment Boundaries

Assessment boundaries define the scope and limits of the assessment of effects on each VC. Boundaries encompass the areas and periods of time during which a project has the potential to interact with a VC (EAO, 2013a). Boundaries used in the assessment include spatial boundaries (i.e., area/limits), temporal boundaries (i.e., timeframes), administrative boundaries (i.e., political, social, and economic constraints or limits), and technical boundaries (i.e., limits for predicting or measuring changes). Sections 5.3.2.1 to 5.3.2.4 provide additional details on the types of boundaries used in the Project effects assessment.

5.3.2.1 Spatial Boundaries

Spatial boundaries encompass the areas, at appropriate scales and spatial extents, in which the Project is anticipated to interact with a VC. For each VC or VC group (e.g., wildlife), spatial boundaries were determined based on the following criteria:

- Scope of the Project and scope of the assessment, including the extent of Project activities and components and potential effects;
- Technical and scientific information (e.g., location and distribution of VCs); and
- Feedback received on VCs and study areas through consultation, stakeholder meetings, or information provided by Indigenous groups.

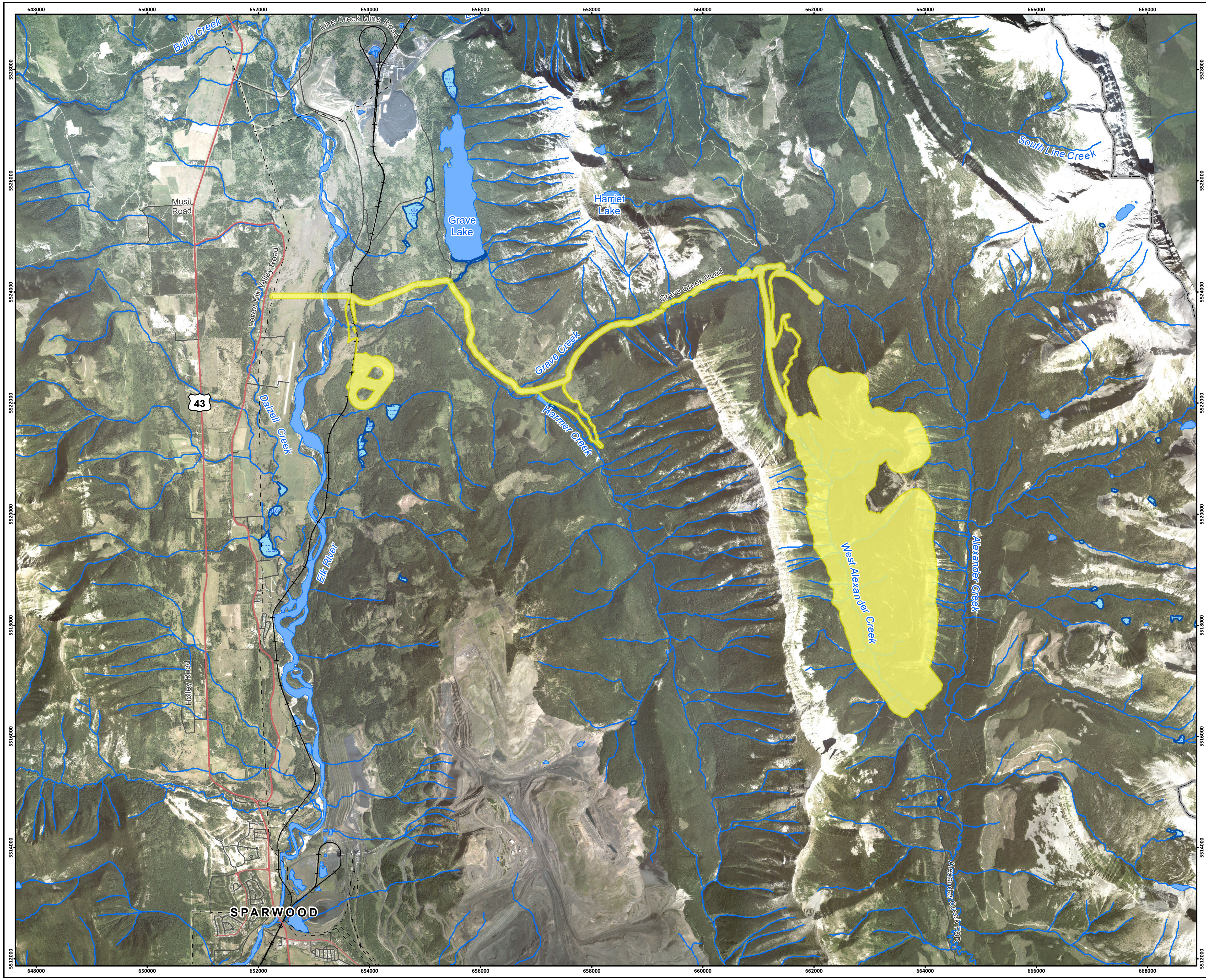
Three types of spatial boundaries were used in the assessment:

- The Project footprint represents the area directly disturbed by Project activities, including temporary and permanent works and physical activities associated with the Project (EAO, 2013a), and covers an approximate 1,280 ha (Figure 5.3-2). The Project footprint is common to all VCs.
- The Local Study Area (LSA) encompasses the Project footprint and the area surrounding the Project footprint within which all or most of the potential Project effects are anticipated to occur. The LSA varies from one VC to another depending on local conditions, species abundance, socioeconomic factors, cultural values, and other factors, and can be thought of as the "zone of influence" of the Project on the VC.
- The Regional Study Area (RSA) includes the LSA and the area surrounding the LSA within which potential direct and indirect Project effects, and Project interactions with other past, present, or reasonably foreseeable future projects/activities in the area (i.e., cumulative effects), are anticipated to occur. The RSA varies from one VC to another and depends on the physical and biological conditions of the VC as well as the type and location of other past, present, or reasonably foreseeable projects or activities that have been or will be carried out. For some VCs, the RSA may be based on a natural transition (e.g., watershed boundary) or an administrative delineation (e.g., economic zone or management area). For VCs that may have direct or indirect effects in Alberta or the United States (U.S.A.), the respective RSA crosses the appropriate border to allow for the assessment of potential transboundary effects.

Spatial boundaries were developed for each VC or VC group and are presented in the VC assessment chapters. The LSA and RSA boundary delineations are VC-specific and consider the spatial characteristics of each VC. Additional details regarding the LSA and RSA used for each VC or VC group, including maps and the criteria used to determine the extent of the spatial boundaries, are provided as appropriate in the VC assessment chapters. Differences between the assessment boundaries presented in the AIR compared to those in the Application/EIS are outlined in Table 5.3-2. Note that those study areas presented in the AIR that remain unchanged from the AIR are not discussed in Table 5.3-2. It should be noted that the Project footprint presented in the Application/EIS was updated in October 2020 and as such, the Project footprint extent shown in the AIR is incorrect.

5.3.2.2 Temporal Boundaries

Temporal boundaries include the time periods during which the Project is anticipated to result in potential effects on VCs (EAO, 2013a). Two types of temporary boundaries were used in the assessment: the temporal limits of the Project, and the temporal characteristics of a VC. The temporal limits of the Project used in the effects assessment include the timing of Project phases and activities, as outlined in Table 5.3-3. Additional detail of the phases and activities related to the Project are outlined in Chapter 3. The temporal boundaries proposed to be used the assessment of VCs were presented in the draft Valued Components for Environmental Assessment document (NWP, 2016) as well as the Project AIR (EAO, 2018a). Input on the draft VC document and the draft Project AIR, both which included information on the Project temporal boundaries (i.e., the key Project phases of construction, operation, and reclamation and closure) was received from the KNC and Working Group members. Information on VC-specific temporal boundaries are presented in the effects assessment chapters for each VC.



Crown Mountain Coking Coal Project

Figure 5.3-2
Project Footprint Spatial Boundary

LEGEND

- Project Footprint
- Highway
- Arterial/Collector Road
- Local/Resource Road
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- British Columbia/Alberta Border

0 1 2
Kilometres

Scale 1:65,000

Map Drawing Information:
Data Provided By NWP Coal Canada Ltd, Dillon Consulting Limited, Province of British Columbia GeoBC Open Data, Government of Alberta Open Data, Natural Resource Canada.
Imagery Provided By GeoBC OrthoImagery (Aug 2016).

Map Created By: LMM
Map Checked By: LKD
Map Coordinate System: NAD 1983 UTM Zone 11N

NWP Coal Canada Ltd

Project: 12-6231
Status: FINAL
Date: 2022-01-13

Document Path: \\42dillon\CAD\GIS\2012 and Prior\126231 Crown Mountain\EA_Report\EAMethods\126231_EM_ProjectFootprintSpatialBoundary.mxd

Table 5.3-2: Rationale for Differences in Valued Component Spatial Boundaries for the Application/EIS Compared to those in the AIR

Valued Component	Study Area in the AIR	Study Area in the Application/EIS	Rationale for Changes to Study Areas from the AIR
Air Quality and Greenhouse Gases	Air Quality LSA	Atmospheric LSA	The study area presented in the Application/EIS has been renamed from the area presented in the AIR. Study area boundaries remain unchanged.
	Air Quality RSA	Atmospheric RSA	The study area presented in the Application/EIS has been renamed from the area presented in the AIR. Study area boundaries remain unchanged.
Acoustic Environment	Acoustic LSA	Acoustic LSA	The extent of the Acoustic LSA presented in the Application/EIS represents an expanded study area as a result of key receptor locations used in the assessment.
Soil Quantity, Soil Quality, and Terrain	Terrestrial LSA and RSA	Soil Quantity and Quality LSA	A specific LSA for soils and terrain, the Soil Quantity and Quality LSA, was used for the soils and terrain VCs as it represents a similar study area to the Terrestrial Ecosystem Mapping (TEM) and the areas that may experience potential indirect and direct effects of the Project.
Groundwater Quality and Groundwater Quantity	Aquatic LSA	Groundwater LSA	A specific LSA for groundwater was used in the Application/EIS and related assessments to better encompass the Project footprint, baseline studies, and the surrounding area within which all or most of the potential Project effects on groundwater quality and quantity have the potential to occur.
	Aquatic RSA	Groundwater RSA	The Groundwater RSA was used in the cumulative effects assessment to encompass the area of potential cumulative effects to groundwater and the hydrogeologically relevant areas to the Project footprint.
Surface Water Quantity and Surface Water Quality	Aquatic LSA	Aquatic LSA	The Aquatic LSA was updated to reflect watershed boundaries and watersheds that have the potential to be influenced by the proposed Project.
Fish (specified species) and Benthic Invertebrates	Aquatic LSA and RSA	Fish and Fish Habitat LSA	The Fish and Fish Habitat LSA was used in the Application/EIS and represents a modified Aquatic LSA presented in the AIR. The Fish and Fish Habitat LSA excludes the Harmer Creek watershed (upstream of the Harmer dam) due to a barrier to fish passage at Teck's dam on Harmer Creek, and includes the portion of the Elk River watershed that contains the rail loadout and service corridor.
Avalanche Chutes, Grassland Ecosystems, Riparian Habitat, and Old Growth and Mature Forest	Terrestrial LSA	Landscapes and Ecosystems LSA	The local area used to evaluate impacts to 4 of the 5 landscapes and ecosystems VCs was based on the Landscapes and Ecosystems LSA. This study area was used to evaluate the zone of influences of the proposed Project within a buffer around proposed infrastructure and coal licenses. The LSA used in the Application/EIS reflects the area in which direct and indirect effects to landscapes and ecosystems VCs predicted to occur as a result of the proposed Project.

Valued Component	Study Area in the AIR	Study Area in the Application/EIS	Rationale for Changes to Study Areas from the AIR
Wetland Ecosystems	Terrestrial LSA	Terrestrial LSA	The boundary of the Terrestrial LSA was updated to include additional potential zones of influence from the Project (e.g., at the proposal haul road at near Harmer Creek), infrastructure (e.g., power line), and additional areas where baseline surveys were completed west of Grave Lake.
Avalanche Chutes, Grassland Ecosystems, Riparian Habitat, Old Growth and Mature Forest, and Wetland Ecosystems	Terrestrial RSA	Landscapes and Ecosystems RSA	For the assessment of cumulative effects to landscapes and ecosystems VCs, the Landscapes and Ecosystems RSA was used as it coincides with the area used to monitor and manage cumulative effects through the Elk Valley Cumulative Effects Management Framework (EV-CEMF) and to encompass projects and activities included in the cumulative effects assessment.
Listed and Sensitive Plant Communities and Species, Whitebark Pine, and Limber Pine	Terrestrial LSA	Landscapes and Ecosystems LSA	The Landscapes and Ecosystems LSA was developed in consultation with the B.C. Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNRORD). The Landscapes and Ecosystems LSA was selected as the LSA for vegetation VCs as it represents the "zone of influence" of the Project on vegetation VCs better than Terrestrial LSA that was identified in the AIR.
	Terrestrial RSA	Landscapes and Ecosystems RSA	Similar to the landscapes and ecosystems VCs, the Landscapes and Ecosystems RSA is the main study area for conducting the cumulative effects assessment on vegetation VCs. This area was selected as it coincides with the assessment area used by the EV-CEMF and includes important landscape features applicable to potential regional effects to vegetation VCs.
All Wildlife VCs	Terrestrial LSA	Terrestrial LSA	The Terrestrial LSA was updated to include a wider range of habitat types and known and anticipated wildlife movement corridors that have the potential to experience direct and indirect effects as a result of the Project.
Wolverine, American Badger, American Marten, Canada Lynx, Elk, Bighorn Sheep, Mountain Goat, and Moose	Terrestrial RSA	Terrestrial RSA	The Terrestrial RSA was updated to include Wildlife Management Units WMU 4-1, 4-2, 4-3, 4-21, 4-22, and 4-23, potential transboundary considerations with the Province of Alberta, additional wildlife populations, as well as landscape features known to facilitate wildlife movements within the regional area.

Valued Component	Study Area in the AIR	Study Area in the Application/EIS	Rationale for Changes to Study Areas from the AIR
Grizzly Bear	Terrestrial RSA	Grizzly Bear RSA	The assessment of cumulative effects for grizzly bear was conducted within the Grizzly Bear RSA, which includes both the South Rockies and Flathead grizzly bear population units, EV-CEMF assessment area, WMUs 404, 402, 303, 400, and Waterton Lakes National Park in Alberta to ensure that regional grizzly bear population context was captured appropriately
Bird VCs (Waterbirds, Raptors, Migratory Birds), Bat VCs (Little Brown Bat, Northern Myotis, and Eastern Red Bat), and Gillette's Checkerspot	Terrestrial RSA	Birds, Bats, and Amphibians RSA	The Birds, Bats, and Amphibians RSA shares the same boundaries as the Terrestrial RSA with the exception of the northwest boundary, which was moved east of the Kootenay River and Top of the World Provincial Park. This boundary was revised to better account for known wildlife movements and corridors for VCs with smaller home range sizes than the ungulate and carnivore VCs.
Physical and Cultural Heritage	Archaeological Resources LSA	Archaeological LSA	The Archaeological LSA used in the Application/EIS extends north-northwest to include the terrain that is to the west of Grave Lake and along the lower segment of the Line Creek drainage in proximity to Line Creek's confluence with the Fording River.
	Archaeological Resources RSA	Archaeological RSA	The Archaeological RSA is spatially equivalent to the Archaeological LSA, as physical and cultural heritage is potentially affected largely by direct disturbance. As such, a comparison between direct potential disturbance and the regional area is not necessary. This Archaeological RSA provides the spatial boundaries for the cumulative effects assessment.
Economic Conditions	Economic and Socio-economic LSA	Economic Conditions LSA	The Economic Conditions LSA was adapted from the Economic and Socio-economic LSA presented in the AIR and updated to include communities (including four Ktunaxa member communities) that may experience potential direct and indirect effects in relation to economic considerations.
	Economic and Socio-economic RSA	Economic Conditions RSA	The Economic Conditions RSA was adapted from the Economic and Socio-economic LSA presented in the AIR and was expanded to include the Province of British Columbia as it is anticipated that the procurement of goods and services to support the Project and government revenues will occur at the regional and provincial levels. In addition, changes to the regional economy and cumulative effects are most likely to occur at the regional and provincial level due to the nature of the mining sector.

Valued Component	Study Area in the AIR	Study Area in the Application/EIS	Rationale for Changes to Study Areas from the AIR
Socio-Community (Housing, Community Services, and Infrastructure, and Community Health and Well-Being)	Economic and Socio-economic LSA	Socio-Community LSA	The Socio-Community LSA was created based on the Economic and Socio-economic LSA in the AIR; however, a new LSA was created to include four Ktunaxa member communities.
Land Use and Access, Recreation and Tourism, and Commercial Land Use	N/A	Land Use and Access RSA	A Land Use and Access RSA was not identified in the AIR and as such, a Land Use and Access RSA was developed and used in the assessment of land use VCs to support the evaluation of potential cumulative effects may occur at a regional scale.
Visual Aesthetics	Visual Aesthetics LSA	Visual Aesthetics LSA	The Visual Aesthetics LSA was increased in size from the LSA presented in the AIR. The updated Visual Aesthetics LSA represents a radius of 10 km around the Project footprint.
	N/A	Visual Aesthetics RSA	No Visual Aesthetics RSA was identified in the AIR. The assessment used a Visual Aesthetics RSA which extends a 20 km radius from the Project footprint.
Wildlife Health, Aquatic Health, and Human Health	Air Quality LSA, Acoustic LSA, Aquatic LSA, Terrestrial LSA	Human Health and Ecological Risk Assessment LSA	Instead of the Air Quality, Acoustic, Aquatic, and Terrestrial LSAs, a specific LSA for the HHERA was used in the assessment and incorporated overlapping portions of the LSAs from relevant VC disciplines that supported the assessment of potential changes to health (e.g., air quality and water quality). The spatial boundary of the assessment was informed by input from the KNC to incorporate identified areas of human traditional land use or occupation.
	Air Quality RSA, Aquatic RSA, and Terrestrial RSA	Human Health and Ecological Risk Assessment RSA	The HHERA RSA is spatially equivalent to the Atmospheric RSA, however the HHERA does not specifically assess critical receptor locations outside of the HHERA LSA. Fate and transport mechanisms would result in attenuation of environmental exposure point concentrations in the RSA as compared to the LSA. Therefore, risk estimates within the LSA are inferred to be conservatively representative of risk estimates in the larger RSA.

Temporal characteristics of the VCs evaluated in the effects assessment encompass the characteristics that inform when and for how long a VC might be affected by the Project. Temporal characteristics include consideration of annual and seasonal variations, such as the timing and duration of sensitive or critical life stages (e.g., spawning, nesting) or the timing and duration of human activities (e.g., recreational activities in winter, hunting) (EAO, 2013a).

Table 5.3-3: Temporal Boundaries for the Project Effects Assessment

Phase	Project Year	Length of Phase	Description of Activities
Construction and Pre-Production	Year 1 to Year 2	19 months	Construction of the following infrastructure: • Road upgrades • Coal Handling Process Plant (CHPP) • Run-of-Mine (ROM) stockpile • Grave Creek reservoir • Water management and water management structures • Interim Sediment Pond • Office/Shop complex • Powerline • Natural gas line • Explosives factory • Overland conveyor • Rail loadout • Waste materials facility Other activities: • Clearing and grubbing of vegetation • Soil salvaging • Stockpiling of wood waste • Logging of merchantable timber • Quarrying for construction materials • Transportation along Highway 43, Line Creek Mine Road, Valley Road, and Grave Creek Road
Operations	Year 3 to Year 17	15 years	Production of: • 270 bank cubic metres (BCM) of waste • 57.5 million metric tonnes (Mt) of ROM coal • 26.3 Mt of clean coal • 31.2 Mt of plant rejects Construction of: • Additional shop in Year 1 • Main Sediment Pond in Year 4 • Mine roads, as necessary Other activities:

Phase	Project Year	Length of Phase	Description of Activities
			• Use of water from the Interim Sediment Pond, contact water from North Pit and as necessary backup reservoir at Grave Creek • Use of on-site facilities and equipment • Coal processing • Sewage treatment • Management of Main Sediment Pond discharge • Transportation along Highway 43, Line Creek Mine Road, Valley Road, and Grave Creek Road • Progressive reclamation
Reclamation and Closure	Year 17 to Year 19	2 years	Decommissioning of the following infrastructure: • CHPP • ROM Stockpile • Grave Creek Reservoir • Construction Water Management • Office/Shop Complex • Powerline • Natural Gas Line • Explosives Manufacturing Site Reclamation of the following infrastructure: • ROM Stockpile • Plant/Office Complex Pad • Pit and mine rock storage facility areas not reclaimed at end of mine life Other activities: • Reclamation, geotechnical, and aquatic effects monitoring and implementation of follow-up and monitoring programs • Management of the Main Sediment Pond discharge • Transportation along Highway 43, Line Creek Mine Road, Valley Road, and Grave Creek Road
Post-Closure	Year 19 through Year 34	15 years	Activities include: • Decommissioning of the Main Sediment Pond • Reclamation, geotechnical, and aquatic effects monitoring and implementation of follow-up and monitoring programs

5.3.2.3 Administrative Boundaries

Administrative boundaries represent limitations imposed on the assessment due to political, economic, and social constraints (EAO, 2013a). Limitations may arise when the use of data in the effects assessment does not have a geographically compatible boundary with the spatial boundary for a VC, resulting in a constraint in the assessment of effects at the spatial scale or when financial or resourcing constraints limit the assessment and understanding of impacts on a VC. Administrative boundaries may also include the legislative, regulatory, and/or policy frameworks as well as regional planning initiatives that apply to the VC. Although administrative boundaries are not necessarily applied to all VCs, the nature of the administrative boundary and the implications for the assessment are documented where they are identified to exist for a VC. If an administrative boundary is found to constrain the identification of potential effects and the assessment of effects, information is presented in the effects assessment chapter for the relevant VC.

Each effects assessment chapter presented in the Application/EIS outlines relevant regulatory and policy information for each VC. Relevant laws, regulators, treaties, conventions, policies (e.g., such as land use management plans and jurisdictional policies), guidelines, standards, objectives, and applicable guidance documents are presented, where applicable, for each VC.

5.3.2.4 Technical Boundaries

Technical boundaries represent constraints imposed on the assessment due to limitations in the ability to predict the effects of the Project (EAO, 2013a). Constraints may include areas that were inaccessible within the study area to collect data (e.g., areas of hazardous terrain or avalanche paths); challenges sampling due to reclusive or sensitive species; limitations in scientific and social information, data analyses, and data interpretation; technical limitations of models or tools used in the analysis of effects; or uncertainties in the assessment. Technical boundaries are presented for each VC in the effects assessment chapters. Although technical boundaries are not necessarily applied to all VCs, where technical boundaries may have constrained the assessment of effects, information is presented in the relevant effects assessment chapter for the VCs.

5.3.3 Existing Conditions

Within each effects assessment chapter for the VCs, the Application/EIS provides the following information:

- Description of the existing (or baseline) conditions in sufficient detail to enable potential interactions of the Project with intermediate VCs and receptor VCs (including interactions between intermediate components and receptor VCs) to be identified, understood, and assessed;
- Description of the quality and reliability of existing or baseline data and its applicability for the purpose used, including any gaps, insufficiencies and uncertainties, particularly for the purpose of defining monitoring activities;
- Summary of the methods and data sources used to compile information on existing (or baseline) conditions, including any standards or guidelines followed;
- Reference to the natural and/or human-caused trends, irrespective of the changes that may occur as a result of the proposed Project or other projects and/or activities in the area;
- Description of if and how past and present projects and activities in the study area that may have affected or are affecting each intermediate VC and receptor VC;

- Feedback received on VCs through Project-specific consultation and engagement programs; and
- Describe Traditional Ecological Knowledge (TEK), including Indigenous Traditional Knowledge, used in the assessment, if applicable.

Where VC-specific field studies were conducted for intermediate VCs and receptor VCs, the scope and methods to be used followed published documents pertaining to data collection and analysis methods, where these are available, and where methods used for the assessment deviate from applicable published guidance, the rationale for the variance is provided in the Application/EIS.

5.3.3.1 Regional and Local Overview

An overview of the regional and local environment is provided in the effects assessment chapter for each VC to provide context for the evaluation of existing conditions and Project effects assessments. Regional and local information presented relates to environmental, social, economic, heritage, health, and aesthetic conditions relevant to each VC. This overview is normally derived from existing literature, government publications, previous EAs conducted in the region, information from conservation agencies, and other sources of information, including traditional knowledge where available.

Projects or activities that are currently in the Pre-Application stages of an EA and/or regulatory permitting processes (i.e., construction has not commenced), or that are planned or proposed but are not yet certain (i.e., reasonably foreseeable developments), may be considered in the assessment of potential cumulative effects but are not included in the regional and local overview. Information regarding potential reasonably foreseeable future projects or activities is presented in Section 5.3.5.3.

5.3.3.2 Existing Regional and Local Data

Available or collected regional and local data for each VC were used to inform existing conditions and to support the characterization of Project effects on VCs. Regional and local data were compiled from a variety of publicly available sources as well as information provided from Working Group members. For VCs with the potential for transboundary effects, existing regional data from the Province of Alberta or the State of Montana were collected to inform existing transboundary conditions and effects assessments.

Information sources for regional and local data included, but was not limited to:

- Existing databases and literature, such as the B.C. Conservation Data Centre (B.C. CDC), the Cross-Linked Information Resources application (CLIR), GeoBC, the Provincial Archaeological Report Library and Provincial Archaeological Site Inventory, B.C. Stats community profiles, and Canadian Species at Risk Registry;
- Scientific studies and journal articles;
- Previous environmental assessments for other projects in the region;
- Provincial land use plans (e.g., Land and Resource Management Plans) and other regional and local studies and plans (e.g., Official Community Plans, Regional Growth Strategies, Regional Sustainability Strategies, Climate Action Plans, and other environmental, social, and/or economic development strategies);
- Available remote sensing imagery and data;
- Available ethnographic information, traditional knowledge, and traditional use studies, if any (subject to any confidentiality constraints that may apply); and
- Government of Canada water level and flow reports;

- Government of Canada air quality reports;
- Government of Canada meteorological reports;
- Government of Canada census reports;
- Federal and provincial government reports;
- Municipal government reports; and
- Scientific research from local non-governmental organizations (NGOs).

Where specific information was available from the Elk Valley Cumulative Effects Management Framework (EV-CEMF) on existing environmental conditions for regional VCs (i.e., Westslope Cutthroat Trout, grizzly bear, bighorn sheep, old growth and mature forest, and riparian habitat), it was reflected in the discussion of existing regional and local data.

5.3.3.3 Baseline Programs

Baseline programs, including site visits, surveys, and field work were conducted for selected VCs to provide site-specific baseline information on the existing conditions relevant to each VC and to inform the effects assessment of the Project. Each effects assessment chapter describes the baseline programs conducted to support the effects assessments for each VC and includes:

- Description of baseline study areas;
- Summary of the data collection methods and techniques;
- Relevant guidance documents and standard protocols that were followed and/or incorporated into the baseline programs;
- Data analysis methods;
- Summary of results; and
- Known limitations and data gaps.

Where VC-specific baseline field studies were conducted for intermediate VCs and receptor VCs, the scope and methods used followed published documents pertaining to data collection and analysis methods, where available and applicable. If methods used to gather baseline data deviated from applicable published guidance, the rationale for the variance is provided in the VC assessment chapters.

Field baseline programs undertaken for the Project VCs are outlined in Table 5.3-4. Technical baseline reports are provided as appendices to the Application/EIS, and key information from the technical reports is summarized in the main body of the existing conditions section of the effects assessment chapters for each VC in a manner that allows the reader to understand the existing (baseline) conditions of each intermediate VC and receptor VC. Baseline assessments for VCs that did not have a field-specific baseline program are described in the respective effects assessment chapters (e.g., visual aesthetics, social, economic baseline studies).

Table 5.3-4: Summary of Completed Field Baseline Programs for the Crown Mountain Coking Coal Project

Valued Component	Survey Type(s)	Survey Dates	Survey Location(s)
Air Quality	Dustfall Monitoring	October - December 2018; May - October 2019	Air Quality LSA
	Climate Station	November 2013 - May 2016	Project footprint

Valued Component	Survey Type(s)	Survey Dates	Survey Location(s)
Noise and Vibration	Sound pressure level monitoring (A-weighted Sound Level Equivalents)	August 2017	Acoustic LSA
Soil Quantity and Quality	Surficial Soil Sampling and Drilling Programs	2017 to 2019	Landscapes and Ecosystems LSA
Terrain	Terrain Stability Mapping	LiDAR - 2012 Field program - September - October 2017	Terrain LSA
Geochemistry	Drill Core Sampling	2012; 2013; 2018	Project footprint
Groundwater Quantity and Quality	Groundwater Monitoring Well Sampling (static water level measurement and chemical analysis)	September 2013 - ongoing	Groundwater LSA
Surface Water Quantity and Quality	Surface Water Sampling (chemical analysis)	Monthly from 2012 to 2016 and quarterly from July 2018 to Present	Aquatic LSA
	Water Level Loggers	May 2012 - May 2016; November 2017 - December 2019	Aquatic LSA
Fish and Fish Habitat	Sediment Quality Sampling (physical and chemical analysis)	October 2017 and September 2019	Fish and Fish Habitat LSA
	Benthic Invertebrate Community Sampling	October 2014, October 2017, and September 2019	Fish and Fish Habitat LSA
	Fish Habitat Assessment Procedures and Fish Inventory Assessments	March 2014, June 2014, August 2014, October 2014, June 2017, October 2017, and September 2019	Fish and Fish Habitat LSA
Terrestrial Ecosystem Mapping	Field Plots	Summer-fall 2014, 2018, and 2019	Landscapes and Ecosystems LSA
Soil and Vegetation Chemistry	Vegetation and soil sample collection	August to September 2017 and July 2019	Landscapes and Ecosystems LSA
Wetland Ecosystem	Wetland ecosystem surveys	2017, 2018, and 2019	Terrestrial LSA
Listed Plants and Plant Communities	Listed Vascular Plant Field Sampling	May to August 2014	Landscapes and Ecosystems LSA
Whitebark Pine	Critical Habitat Surveys and Health Assessment	August 2018	Landscapes and Ecosystems LSA
Invasive Plants	Invasive Plant Surveys	August 2018	Landscapes and Ecosystems LSA

Valued Component	Survey Type(s)	Survey Dates	Survey Location(s)
Amphibians	Wetland Perimeter Searches	June and July 2014, June and July 2017; April, May, and July 2018; and May and July 2019	Terrestrial LSA
	Evening Transect and Road Surveys	May 2018	
	Environmental DNA (eDNA) Collection for Western Toad	July 2019	
	Tissue Collection	July 2017; May and July 2018; May 2019	
	Emergence Surveys	September 2019	
Furbearers	Snow-tracking Surveys	February to March 2015	Terrestrial LSA
	DNA Hair Samples	2016	
	Camera-trap Surveys	January to May 2015	
	Camera Study	October 2017 to February 2019	
Grizzly Bear	GPS Collars	2003-2018	Grizzly Bear LSA and RSA
Badger	Detection/Non-Detection Sign Surveys	July to August 2014; July 2018; July 2019	Terrestrial LSA
Ungulates	Ground transects	February and March 2014; February and March 2015; and July 2019	Terrestrial LSA
	Aerial transects	March and October 2014; June 2015	
	Camera-trap surveys	February to May 2014; January to May 2015; January 2017; and September 2019	
Bird Community	Landbird Point Count surveys	June to July 2014, 2017, and 2018; July 2019	Terrestrial LSA
	Common Nighthawk Surveys	July 2018	
	Migratory Landbird Point Count Surveys	April to May 2018; May 2019; October 2018; and September 2019	
	Owl Surveys	April 2018	
	Northern Goshawk Surveys	June-July 2014, 2017, 2018; July 2019	
	Raptor Standwatch Surveys	April to May 2018; May 2019; October 2018; September 2019	

Valued Component	Survey Type(s)	Survey Dates	Survey Location(s)
	Riverine Bird Surveys	July 2017; June to July 2018; May 2019	
	Wetland bird standwatch surveys	April to July 2014, 2017-2019; October 2018; September 2019	
	Tissue Collection	June to July 2017; July 2018	
Bats	Acoustic Survey	June to July 2017; and October 2019 to June 2020	Terrestrial LSA
	Live Capture	August 2017	
Gillette's Checkerspot	Gillette's Checkerspot Survey	July 2014	Terrestrial LSA
Archaeology	Archaeology Surveys: Phase I Phase II Phase III	2015-2020	Project footprint and Project alternatives

5.3.4 Project Effects Assessment

Once existing environmental conditions are established, the environmental effects of the Project on a VC can then be identified, discussed, and characterized. The methods for conducting the Project effects assessment are detailed below.

5.3.4.1 Thresholds for Determining the Significance of Residual Effects

Threshold criteria were used to determine the significance of residual effects on each relevant VC (i.e., receptor, specified intermediate VCs, and federal VCs). Quantitative and qualitative threshold criteria or management standards were used to determine the threshold beyond which a residual effect would be considered significant. Threshold criteria chosen for each VC were based on established guidelines, management plans, scientific principles and literature, regulatory documents, government or industry regulations and objectives, environmental standards, and established benchmarks. For consistency, the thresholds for a particular VC were the same for Project effects and cumulative effects.

Significance thresholds were established in consideration of the CEAA guidance document Determining Whether a Project is Likely to Cause Significant Adverse Environmental Effects (CEAA, 2018) as well as the KNC's Recommended Minimum Standards for Proponents in Determining Significance of Effects in Environmental Assessments (EAs) in the Elk Valley (Ktunaxa Nation Council, 2020).

Rationale is provided for each threshold criteria which was used as a benchmark for which a residual effect was determined to be significant, and relevant information is presented in the effects assessment chapters.

5.3.4.2 Project Effects

Identification of how selected VCs may be affected by the Project without mitigation being applied is a critical step in the assessment process (EAO, 2018b). The Application/EIS summarizes the overall process and methodology used to identify and assess the potential effects of the Project, whether positive or adverse, on selected VCs. For each VC, the Application/EIS presents:

- Potential interactions of the proposed Project with the considered and selected intermediate VCs and receptor VCs, and the interactions between intermediate VCs and receptor VCs; and
- Identification and description of the potential adverse effects resulting from the proposed Project before mitigation has been applied.

To support the identification of potential effects as a result of the Project, a matrix was developed to identify the interactions between the Project and selected VCs (Table 5.3-5). The interaction matrix evaluated potential interactions of the Project components and activities with receptor VCs and intermediate VCs for each of the Project phases. Interactions are identified by an "X" while no anticipated interaction is indicated by a dash/"-". Interactions between the Project and VCs were determined through the likelihood of the VC to interact with Project components and activities, based on the results of consultation, expert knowledge, and professional judgment.

The interaction matrix identified key Interactions between the Project and VCs that were anticipated to result in adverse effects or be of particular interest to Indigenous communities, the public, and the federal and provincial governments. Potential and key interactions identified in the interaction matrix were further assessed for each VC by ranking interactions for each VC to differentiate interactions that require further analysis in the effects assessment (Table 5.3-6). The ranking of the interaction between the Project and VCs focused the assessment on important interactions. Definitions of the ranking used for Project-VC interactions are as follows (EAO, 2013a):

- Level I = No or negligible effect (positive or adverse) is anticipated; not carried forward in the assessment.
- Level II = Potential adverse effects requiring additional mitigation or substantive positive effects are expected; carried forward in the assessment.
- Level III = Key interaction resulting in potential significant adverse effect or significant concern; carried forward in the assessment.

The interactions carried forward in the effects assessment for each VC are described in detail in the effects assessment chapters and include discussion of potential effects by Project phase. Where no interaction between the Project and the VC is anticipated, such as when negligible adverse effects are anticipated, the interaction is not carried forward in the assessment of potential effects. If an interaction between the Project and a VC is omitted from further analysis, methods and criteria used to support the omission is presented in the effects assessment chapter.

Interactions ranked as Level II and III are carried forward in the effects assessment for each VC to predict the nature and extent of effects that result from interactions with the Project. Measurement indicators are used to evaluate the nature and extent of potential effects through a range of qualitative and quantitative characterization and prediction methods. Methods used to evaluate potential effects resulting from interactions with the Project are described. The assessment of potential effects for each VC employed the use of baseline data, modelling, and professional judgment to predict effects of the Project on VCs. Limitations and uncertainties associated with the assessment of potential effects is presented for each VC.

Only effects related to planned events are discussed in the effects assessment chapters. Effects related to unplanned events (e.g., traffic accidents, slope failures, spills) are presented in Chapter 21.

Table 5.3-5: Project-VC Interaction Matrix

Project Phase	Project Component	Description of Activities	Discipline X			Discipline X			Discipline X		
			VC1	VC2	VC3	VC1	VC2	VC3	VC1	VC2	VC3
Pre-Production and Construction	Component 1		x		x	x		x		x	
	Component 2										
	Component 3										
Operation	Component 1										
	Component 2										
	Component 3										
Reclamation and Closure	Component 1										
	Component 2										
	Component 3										
Post-Closure	Component 1										
	Component 2										
	Component 3										

Table 5.3-6: Rankings of Potential Effects on VCs

Project Phase	Project Component	Project Activities	Discipline X			Discipline X			Discipline X		
			VC1	VC2	VC3	VC1	VC2	VC3	VC1	VC2	VC3
Construction and Pre-Production	Component 1		I	II	III						
	Component 2										
	Component 3										
Operations	Component 1										
	Component 2										
	Component 3										
Reclamation and Closure	Component 1										
	Component 2										
	Component 3										
Post-Closure	Component 1										
	Component 2										
	Component 3										

Notes (after EAO, 2013a):
I = No or negligible effect (positive or adverse) is anticipated; not carried forward in the assessment
II = Potential adverse effects requiring additional mitigation or substantive positive effects are expected; carried forward in the assessment
III = Key interaction resulting in potential significant adverse effect or significant concern; carried forward in the assessment

5.3.4.2.1 Receptor and Intermediate Valued Component Interactions

To adequately assess and understand potential effects on receptor VCs, a receptor-intermediate interaction matrix was developed (Table 5.3-7). The matrix identified potential interactions between intermediate VCs and receptor VCs along the pathway of effects for a receptor VC. Each effects assessment chapter describes receptor and intermediate VC interactions in detail.

5.3.4.3 Transboundary Effects

Transboundary effects occur across provincial or international boundaries, or boundaries between federal and non-federal lands (CEAA, 2015). As per Section 6.1.8 of the EIS Guidelines, the consideration of potential transboundary effects must be included in the Application/EIS (CEAA, 2015). Descriptions of any federal lands, lands outside the province (e.g., Alberta) or outside Canada (e.g., Lake Koocanusa in the State of Montana) and the use of these lands that may be affected by the Project is presented, where relevant, in the effects assessment chapters.

The effects assessment for each VC evaluates whether Project effects have the potential to cross international or provincial borders and therefore result in transboundary effects. There are two jurisdictional boundaries in which Project-related effects may cross geographic boundaries: the Canada-U.S.A. border to the south, and the B.C.-Alberta border to the east. The Project itself does not directly cross jurisdictional borders. A summary of the Project effects that have the potential to cross the Canada-U.S.A. or B.C.-Alberta borders are included in Chapter 32 transboundary effects assessment, including mitigation, monitoring, and follow-up commitments related to these potential transboundary effects.

5.3.4.4 Mitigation Measures

Mitigation measures to avoid, minimize, restore, and compensate and offset Project-related effects to VCs are presented and discussed in each effects assessment chapter. The identification and selection of technically and economically feasible mitigation measures were developed using the approach to the mitigation hierarchy outlined by the Environmental Mitigation Policy for B.C. (Ministry of Environment, 2014a) and the related Procedures for Mitigation Impacts on Environmental Values (Environmental Mitigation Procedures; Ministry of Environment, 2014b). Key components of the mitigation hierarchy (Figure 5.3-3) applied to mitigating potential effects to VCs include:

- Avoidance - Preventing or reducing adverse effects by alternating or adjusting the location, timing or method of a Project component or activity;
- Minimization - Preventing or reducing adverse effects by changing the design of the Project (e.g., altering location of mine rock to limit impact on avalanche chutes) or altering the timing of the Project (e.g., scheduling activities to avoid interactions with sensitive VC windows such as calving);
- Restoration - Where an adverse effect is unavoidable, establish appropriate restoration to re-establish the composition, structure, pattern and ecological processes of the affected VC to support current and future sustainable, resilient, and healthy natural and social systems; and
- Offsetting and Compensation - If measures to avoid, minimize and restore are not practical, offsetting impacts to VCs through compensation that results in a neutral or beneficial effect to the VC.

Table 5.3-7: Intermediate-Receptor VC Interaction Matrix

Receptor Valued Components	Intermediate Valued Components								
	Air Quality	Acoustic Environment	Groundwater Quality	Groundwater Quantity	Surface Water Quality	Surface Water Quantity	Soil Quality	Soil Quantity	Terrain
Fish and Fish Habitat									
Westslope Cutthroat Trout	✓	✓	✓	✓	✓	✓			
Bull Trout	✓	✓	✓	✓	✓	✓			
Kokanee	✓	✓	✓	✓	✓	✓			
Burbot	✓	✓	✓	✓	✓	✓			
Longnose Sucker	✓	✓	✓	✓	✓	✓			
Mountain Whitefish	✓	✓	✓	✓	✓	✓			
Benthic Invertebrates	✓	✓	✓	✓	✓	✓			
Landscapes and Ecosystems									
Avalanche Chutes	✓						✓	✓	✓
Grassland Ecosystems	✓				✓	✓	✓	✓	✓
Riparian Habitat	✓		✓	✓	✓	✓	✓	✓	✓
Old Growth and Mature Forests	✓						✓	✓	✓
Wetland Ecosystems	✓		✓	✓	✓	✓			
Vegetation									
Listed and Sensitive Plant Communities	✓						✓	✓	
Limber Pine	✓						✓	✓	✓
Whitebark Pine	✓						✓	✓	✓
Culturally Significant Plants and Ecosystems	✓				✓	✓	✓	✓	✓
Wildlife									
Grizzly Bear	✓	✓	✓	✓	✓	✓	✓	✓	✓

Receptor Valued Components	Intermediate Valued Components								
	Air Quality	Acoustic Environment	Groundwater Quality	Groundwater Quantity	Surface Water Quality	Surface Water Quantity	Soil Quality	Soil Quantity	Terrain
Wolverine	✓	✓	✓	✓	✓	✓	✓	✓	✓
American Badger	✓	✓	✓	✓	✓	✓	✓	✓	✓
American Marten	✓	✓	✓	✓	✓	✓	✓	✓	✓
Canada Lynx	✓	✓	✓	✓	✓	✓	✓	✓	✓
Elk	✓	✓	✓	✓	✓	✓	✓	✓	✓
Bighorn Sheep	✓	✓	✓	✓	✓	✓	✓	✓	✓
Mountain Goat	✓	✓	✓	✓	✓	✓	✓	✓	✓
Moose	✓	✓	✓	✓	✓	✓	✓	✓	✓
At-Risk Bat Species	✓	✓	✓	✓	✓	✓	✓	✓	✓
Amphibians of the RSA (represented by Columbia Spotted Frog)	✓	✓	✓	✓	✓	✓	✓	✓	
Western Toad	✓	✓	✓	✓	✓	✓	✓	✓	
Migratory Birds (Olive-sided Flycatcher and Woodpeckers)	✓	✓	✓	✓	✓	✓	✓	✓	
Raptors (Northern Goshawk)	✓	✓	✓	✓	✓	✓	✓	✓	
Waterbirds (Harlequin Duck, Red-winged Blackbird, Spotted Sandpiper, Mallard, American Dipper)	✓	✓	✓	✓	✓	✓	✓	✓	
Gillette's Checkerspot	✓	✓	✓	✓	✓	✓	✓	✓	✓
Social and Economic Conditions									
Economic Conditions									
Housing and Community Services and Infrastructure	✓	✓							
Community Health and Well-being	✓	✓							

Receptor Valued Components	Intermediate Valued Components								
	Air Quality	Acoustic Environment	Groundwater Quality	Groundwater Quantity	Surface Water Quality	Surface Water Quantity	Soil Quality	Soil Quantity	Terrain
Land-use and Access	✓	✓			✓		✓		✓
Recreation and Tourism	✓	✓			✓	✓			✓
Commercial Land Use	✓	✓			✓				
Visual Aesthetics	✓								✓
Heritage									
Physical and Cultural Heritage								✓	✓
Health									
Greenhouse Gas Emissions	✓								
Human Health	✓	✓	✓		✓		✓		
Wildlife Health	✓	✓	✓		✓		✓		

Figure 5.3-3: Hierarchy of Avoidance and Mitigation

The VC assessment chapters in Application/EIS provides the following:

- The approach to identify and analyze mitigation measures, including applicable legislative and policy requirements, any management and compensation plans which are implemented to address potential effects;
- Description and documentation of data, models, and studies used to evaluate potential effects such that analyses are transparent and reproducible;
- Mitigation measures incorporated into the Project, including site and route selection, Project scheduling, Project design (e.g., the use of best available technologies, equipment selection, placement, emissions abatement measures), and construction and operation procedures and practices;
- Any standard mitigation assumed or proposed to be implemented, including consideration of best management practices, environmental management plans, environmental protection plans, contingency plans, emergency response plans, and other general practices;
- Indication of how the mitigation measures will mitigate the potential adverse effects on VCs;
- Where appropriate, identification of potential situations where the implementation of a mitigation measure for one VC has the potential to adversely affect another VC and the mitigation measures related to such situations;
- The rationale for the proposed mitigation measures, including why further avoidance or reduction measures for adverse effects may not be considered feasible, and the need for and scope of any proposed compensation or offset;
- Evaluation of the anticipated effectiveness of each mitigation measure, rated as low, moderate, high, or unknown (see Section 5.3.4.4.1 for rankings), in terms of the measure's ability to effectively reduce or minimize a particular environmental effect. If there is little

relevant/applicable experience with a proposed mitigation measure and there may be some question as to its effectiveness, a description of the potential risks and uncertainties associated with use of the mitigation is presented, with an applicable follow-up program defined to evaluate the effectiveness of the mitigation measure during Project execution;

- Time required for mitigation to become effective, to enable understanding of the duration of residual effects and the temporal characteristics of reversibility;
- Summary of the mitigation measures for potential Project effects by project phase and identify any mitigation measures that are in management or compensation plans; and
- Where relevant, a discussion on how the provincial Environmental Mitigation Policy and related Environmental Mitigation Procedures (Ministry of Environment, 2014) was considered and applied to address potential impacts and mitigation measures.

The Application/EIS presents the mitigation practices, policies, and commitments that constitutes technically and economically feasible mitigation measures relevant to each effect identified through the effects assessment. Where commitments are made specific to mitigation measures, information on how the commitment will be implemented and the anticipated outcome the mitigation is designed to achieve is outlined in the effects assessment chapters. Where mitigation measures are presented for species and/or critical habitat outlined under the Species at Risk Act, mitigation consistent with relevant recovery strategies and action plans is presented.

5.3.4.4.1 Management and Monitoring Plans

Management plans, which are conceptual in nature, are presented in Chapter 33. Each VC assessment chapter identifies plans relevant to the VC. Management plans included in the Application/EIS include:

- Air Quality and Greenhouse Gas Management Plan;
- Archaeology Management Plan;
- Ecological Restoration Plan;
- Erosion and Sediment Control Plan;
- Fish and Fish Habitat Management Plan;
- Landform Design and Reclamation Plan;
- Noise and Vibration Management Plan;
- Site Water Management Plan;
- Soil Management Plan;
- Spill Prevention, Control, and Countermeasures Plan;
- Vegetation and Ecosystems Management and Monitoring Plan;
- Waste Management Plan;
- Wildlife Management and Monitoring Plan;
- Access Management Plan;
- Mine Emergency Response Plan;
- Health and Safety Management Plan;
- Traffic Control Plan;
- Community Relations and Communications Plan;
- Compliance Reporting Plan; and the
- Indigenous Engagement and Reporting Plan.

A monitoring program has been developed for all phases of the Project to help ensure that the Project is implemented as presented in the Application/EIS and that mitigation measures are effectively implemented and conditions and requirements related to laws and regulations are met. The VC assessment chapters identify proposed monitoring and follow-up programs to verify the predictions of effects and the effectiveness of mitigation measures.

5.3.4.4.2 Effectiveness of Mitigation Measures

An assessment of the anticipated effectiveness of mitigation measures proposed to eliminate or reduce the Project's effects on VCs is presented in each VC chapter. The effectiveness of proposed mitigation measures is ranked as follows:

- Low Effectiveness – The mitigation measure will result in little or no change to the condition of the VC and the effect on the VC is unchanged;
- Moderate Effectiveness – The mitigation measure results in a moderate change in the effect and a moderate improvement in the condition of the VC;
- High Effectiveness – The mitigation measure results in an improvement in the condition of the VC and/or the effects of the Project is eliminated;
- Unknown – The mitigation measure effectiveness is unknown and has not been implemented in a similar circumstance, including on a similar type of project or in a similar environment.

Summary tables are provided in each VC assessment chapter which outline the potential effects of the Project on a VC, the proposed mitigation and associated rationale for selection of measures, anticipated effectiveness of mitigation measures, and whether or not the residual effects are carried forward for characterization in the Application/EIS (Table 5.3-8).

Table 5.3-8: Summary of Proposed Mitigation Measures on VCs

Potential Effect	Mitigation Measure(s)	Rationale	Applicable Project Phase(s)	Effectiveness	Residual Effect

Where a mitigation measure is determined to have an effectiveness of moderate, low, or unknown, a follow-up program was developed to evaluate the effectiveness of the mitigation measure during Project execution.

5.3.4.5 Characterization of Residual Effects

Residual environmental effects are the effects on a VC that remain, or are predicted to remain, after mitigation measures have been implemented (CEAA, 2018). The assessment of residual effects on VCs involves the consideration and evaluation of specific effects assessment criteria based on the degree (i.e., 'level') of potential Project effects. Criteria used to characterize residual effects in the Application/EIS included:

- Duration of time that the effect occurs;
- Magnitude or intensity of the effect;
- Geographic extent, both biophysical and socio-economic scales, of the effect;
- Frequency of the effect (i.e., how often the effect occurs);
- Reversibility of the effect (i.e., if the effect can be reversed); and
- Context (i.e., the sensitivity and resilience of a VC to changes caused by the project).

Definitions and ranges for each criterion are summarized in Table 5.3-9. The criteria and rationale for each residual effects characterization criteria rating is presented for each VC in the effects assessment chapters. Detailed explanations are provided for the conclusions reached for each criterion used to characterize a residual effect. Where feasible, the residual effects characterization criteria are described quantitatively in the Application/EIS for VCs. The quantitative thresholds were based on available regulatory documents, environmental standards and guidelines, and/or regional objectives related to the VC (e.g., air quality, noise). Where such VC-specific information to determine quantitative thresholds was not available or appropriate for use, qualitative criteria were identified for characterizing residual effects on VCs. The use of qualitative terms or ranges of criteria to characterize residual effects is provided, where relevant, in the effects assessment chapters along with definitions of qualitative terms used. Duration is generally based on the temporal Project boundaries and, where necessary, was adjusted for a specific VC where such conditions are warranted.

If a residual effect on a VC was determined and the VC was also considered a "pathway" for potential effects on another VC, the Application/EIS identifies the linkages between the VCs and the discipline-specific studies to which the information has been forwarded for further evaluation.

A determination of significance was completed for each residual effect using the significance threshold identified for each VC, as outlined in Section 5.3.4.1, and was informed by the results of the residual effects characterization criteria.

Table 5.3-9: Description of Residual Effects Characterization Criteria

Characterization Criteria	Criteria Definition	Range of Criteria
Duration	The length of time the residual effect is expected to persist	Short-term: Effect lasts less than 19 months (during the Construction and Pre-Production Phases). Long-term: Effect lasts greater than 19 months and less than 34 years over the course of the Operations, Reclamation and Closure, and Post-Closure phases) Permanent: Effect lasts more than 34 years.
Magnitude	The expected size or intensity of the residual effect on a VC	Negligible: No detectable changes from baseline conditions. Low: Change that is not likely to have a definable, detectable or measurable effect above baseline (i.e., potential effect is within a normal range of variation) or is below established thresholds of acceptable change (e.g., water quality guideline) Moderate: Change that is definable, measurable or detectable and differs from the average value for baseline conditions and approaches the limits of natural variation but is equal to or only marginally above standards/guidelines or established thresholds of acceptable change. High: Change that is easily definable, measurable or detectable and from baseline conditions, exceeding guidelines or established thresholds of acceptable change

Characterization Criteria	Criteria Definition	Range of Criteria
		and results in changes beyond the natural range of variation.
Geographic Extent	The spatial area over which the residual effect on the VC is anticipated to occur	Discrete: Effect occurs within the Project footprint. Local: Effect extends beyond the Project footprint but not beyond the LSA. Regional: Effect occurs beyond the LSA but within the RSA. Beyond Regional: Effect extends beyond the RSA.
Frequency	How often the residual effect occurs	Once: Effect occurs once during any phase of the Project. Intermittent: Effect occurs at intermittent or sporadic intervals during any phase of the Project. Regular: Effect occurs at regular intervals during any phase of the Project. Continuous: Effect occurs continuously during any phase of the Project.
Reversibility	The degree of permanence of a residual effect and whether or not the residual effect can be reversed once the physical activity or activity causing the disturbance ceases	Reversible Short-Term: Effect is readily reversible over a short period of time (e.g., less than or greater to the Project construction phase of 19 months). Reversible Long-Term: Effect is potentially reversible over a long period of time (e.g., years into the Project operation phase and to the end of reclamation). Irreversible: Effect cannot be reversed (i.e., is permanent).
Context	The sensitivity and resilience of a VC to changes caused by the Project given existing conditions, cumulative effects of other projects and activities, and the impact of natural and human-caused trends on the condition of the VC	High context: The component has high resilience to disruption in the receiving environment and can adapt to the effect. Or, the characteristics of the area in which the VC have significantly affected by human activities. Neutral context: The component has neutral sensitivity and resilience to disruption in the receiving environment and may be able to adapt to effect. Or, the characteristics of the area in which the VC is located have been somewhat affected by human activities. Low context: The component has low resilience to disruption in the receiving environment and will not easily adapt to effect. Or, the characteristics of the area in which the VC are located relatively pristine and have not been affected by human activities.

Source: Adapted from EAO, 2018a; CEAA, 2015; CEAA, 2018

5.3.4.5.1 Determination of Significance

The determination of the significance of Project-related effects, after taking into account implementation of technically and economically feasible mitigation measures, is the central focus of an EA (CEAA, 2018). The conclusion of significance for each residual effect is presented in the effects assessment chapters.

The Application/EIS evaluated the significance of residual effects for receptor and intermediate VCs, based on the predetermined significance thresholds identified for each VC or VC group (Section 5.3.4.1). Although the Project AIR (EAO, 2018a) notes that significance will only be determined for specified intermediate VCs (i.e., surface water quality, groundwater, and air quality), the Application/EIS presents a significance determination for each VCs, whether an intermediate or receptor VC. The process and methods used to define and evaluate significance of residual effects is provided in each effects assessment chapter. The primary criteria considered in determining significance is similar to the residual effects assessment criteria and includes evaluation of the magnitude, geographic extent, duration, frequency, reversibility, and context.

Residual effects on VCs were ranked as 'not significant' or 'significant'. The determination as to whether an effect is significant or not significant was made in consideration of the CEAA guidance document Determining Whether a Project is Likely to Cause Significant Adverse Environmental Effects (CEAA, 2018) as well as the KNC's Recommended Minimum Standards for Proponents in Determining Significance of Effects in Environmental Assessments (EAs) in the Elk Valley (Ktunaxa Nation Council, 2020). A significance determination was supported by the residual effects criteria and professional judgement. If there was a residual effect on a VC, whether significant or not, the effect was carried forward to the cumulative effects assessment (Section 5.3.5).

5.3.4.5.2 Likelihood and Confidence

Likelihood, the probability of the predicted significant residual effect of occurring, is presented as applicable for both intermediate and receptor VCs if the significance determination results in a conclusion that the effects of the Project on the VC are significant. Quantitative or qualitative terms were used to describe the likelihood of a significant residual effect on a VC as a result of the Project, where relevant. In addition, assumptions or limitations to determining the likelihood of a predicted significant residual effect were described. Effects that were determined to be not significant do not require a characterization of likelihood.

When a quantitative assessment of likelihood was not possible, qualitative terms were used to determine the likelihood of an effect, including:

- Low likelihood: A significant residual effect is unlikely to occur;
- Moderate likelihood: A significant residual effect is likely to occur but may not occur; and
- High likelihood: A significant residual effect is highly likely to occur.

If a significant residual effect was predicted from the effects assessment, the likelihood of a significant residual effect occurring was discussed.

Confidence refers to the prediction of the significance of a residual effect based on the quality of data used in the assessment, the level of understanding of the residual effect, and the degree to which analyses are complete. The level of uncertainty associated with the residual effects assessment, including the significance determination, was also included in evaluating confidence.

The Application/EIS summarizes the processes and methods used to evaluate the levels of confidence associated with residual effects predictions for intermediate VCs and receptor VCs and in particular, how any identified uncertainty may affect either the likelihood or the significance of the predicted residual effect. Measures used to reduce uncertainty, such as the use of monitoring or follow-up programs, are provided, where relevant, in the effects assessment chapters. Assumptions of statistical analyses completed and for modelling undertaken to evaluate effects is presented in the respective effects assessment chapters. Where possible, uncertainty was addressed through the use of statistical significance.

Confidence considers the reliability of data and analytical methods used in the assessment of effects, confidence of effectiveness of proposed mitigation measures that will reduce or eliminate effects, and the reliability of the predicted outcomes made in the assessment. In the Application/EIS, confidence is described as low, medium, and high as per the definitions outlined in Table 5.3-10. The uncertainty, reliability, and sensitivity of models used to reach conclusions associated with the effects assessment is indicated in relevant VC assessment chapters.

In instances of scientific uncertainty or the use of unproven mitigation technology, a risk analysis was presented. The risk analysis includes information on the processes and methods used to undertake the analysis including conclusions and the range of likely, plausible and possible outcomes with respect to likelihood and significance.

Table 5.3-10: Confidence Ratings and Definitions

Confidence Rating	Confidence Definition
High	• Interactions between the Project and VC are well understood; • Necessary data available to support the assessment; • Low degree of uncertainty in models used in assessment and of modelling results; or • Effectiveness of mitigation measures is considered to be moderate to high.
Moderate	• Interactions between the Project and VC is not fully understood (e.g., VC may be understood in similar ecosystems, in regional area, or literature); • Relative confidence in the modelling results; or • Effectiveness of mitigation measures is considered to be moderate to high and may be proven effective elsewhere.
Low	• Interactions between the Project and VC are not well understood; • Gaps in data and limited evidence available; • Models used in assessment and modelling results are highly uncertain; or • Effectiveness of mitigation measures may not be proven.

5.3.4.5.3 Summary of Residual Effects Assessment

A summary of residual effects, selected mitigation measures, characterization criteria, significance determination, likelihood, and confidence and risk is presented for each VC in the effects assessment chapters, using the example in format in Table 5.3-11.

Table 5.3-11: Summary of Project Effects on VCs

Valued Component	Residual Effect	Project Phase(s)	Mitigation Measures	Summary of Residual Effects Characterization	Significance (Significant, Not Significant)	Likelihood (High, Moderate, Low)	Confidence (High, Moderate, Low)
				Duration: Magnitude: Geographic Extent: Frequency: Reversibility: Context:			

5.3.5 Cumulative Effects Assessment

Cumulative effects are the result of Project residual effects interacting with the effects of other past, present, or future (certain, reasonably foreseeable, or hypothetical) projects and activities to produce a combined effect. An assessment of cumulative effects was completed for both receptor and intermediate VCs, where relevant, and the results are presented in each VC assessment chapter.

The cumulative effects of the Project, in combination with those of other past, present, and reasonably foreseeable future projects or activities, were assessed using a framework similar to that used for the Project effects, as described in Section 5.3.4. Section 5.3.5.3 provides a discussion of how the effects of the Project may overlap with those of past, present, and reasonably foreseeable future projects or activities, mitigation measures, and the characterization of residual cumulative effects.

5.3.5.1 Overview of Approach

Cumulative effects considers overlapping effects for all residual adverse effects, not only those predicted to be significant (EAO, 2013a). Specifically, the approach requires that:

- The Project results in a residual adverse effect on the VC;
- A residual Project effect interacts cumulatively with effects from other projects or activities (i.e., an effect of the Project overlaps spatially and temporally with those of other projects or activities that have been or will be carried out);
- The other projects or activities have been or will be carried out and are not hypothetical; and
- The cumulative effect is likely to occur.

Thus, it was necessary to evaluate predicted residual effects of the Project to determine whether any cumulative interaction with the residual effects of other projects and/or activities was considered likely to occur. If no cumulative interaction was considered likely between the Project and other projects and/or activities, those residual effects are not carried forward into the cumulative effects assessment.

Some predicted residual effects of the Project may be negligible and therefore did not warrant detailed consideration in a cumulative effects assessment (EAO, 2018a). This may be the case for residual effects whose relative contribution to cumulative effects may be so small as to be insignificant. The following questions were considered when determining the inclusion of residual effects in the cumulative effects assessment:

- Would the residual effect of the Project result in a measurable change in the cumulative effect? If not, a detailed cumulative effects assessment may not be warranted.
- Would the residual effect of the Project substantively change the characteristics of the cumulative effect (e.g., substantive increase in magnitude, extent, duration, or frequency)? If not, a detailed cumulative effects assessment may not be warranted.
- Is the VC already significantly adversely affected by other projects and activities? If so, a detailed cumulative effects assessment may be warranted.
- Is the VC so sensitive to additional disturbance that even a small incremental adverse effect may be sufficient to cause a significant adverse cumulative effect? If so, a detailed cumulative effects assessment may be warranted.

5.3.5.2 Assessment Boundaries

To the extent possible, the spatial, temporal, administrative, and technical boundaries for the assessment of cumulative environmental effects on a particular VC mirror the assessment boundaries identified for Project effects on each VC. The use of similar boundaries was chosen to ensure sufficient spatial and temporal overlap between the effects of the Project and those of other projects or activities to enable a meaningful cumulative effects assessment.

It is important to note that the cumulative effects assessment generally focused on a larger spatial boundary for VCs (i.e., the Regional Study Area [RSA]) than study areas used in the Project effects assessment. The spatial boundaries for the cumulative effects assessment for each VC, including figures showing the boundaries of the receptive RSAs, is shown in each VC assessment chapter.

5.3.5.3 Identifying Past, Present, and Reasonably Foreseeable Projects and/or Activities

Past, present, or reasonably foreseeable projects and/or activities which have the potential to have residual effects on intermediate and receptor VCs that overlap either spatially or temporally (or both) with the Project residual effects are outlined in Table 5.3-12 and shown in Figure 5.3-4, Figure 5.3-5, and Figure 5.3-6. Land use activities that have the potential to interact cumulatively with the Project are also outlined in Table 5.3-12. A description of information sources used to identify reasonably foreseeable future projects and/or activities is provided in the effects assessment chapters.

Where a cumulative effects assessment was completed for a VC, only those projects or activities that could result in an overlapping effect, both spatially and temporally, are included in the cumulative effects assessment. The specific projects and/or activities considered for each effect are outlined in the cumulative effects assessment for the VC.

The effects of other past and present projects or activities that have been carried out are generally reflected in the existing baseline environment; in other words, the contributions of past and present projects and activities are normally encompassed in the baseline conditions established for the Project. Therefore, in most cases, it was more appropriate and logical to consider the overlap of the effects of the Project and those of past and present projects and/or activities in the Project-related effects assessment for each VC (with the Project effects contributing to a change in those baseline conditions), and to focus the cumulative effects assessment on the effects of reasonably foreseeable projects or activities. The assessment and evaluation of the cumulative effects of the Project in combination with past, present, and reasonably foreseeable future projects and/or activities considered the nature and degree of change from baseline conditions due to both the Project and the other projects and/or activities.

The screening of other projects and/or activities relevant to the cumulative effects assessment was based on the following development categories:

1. Certain (past and present): Projects and/or activities that are currently operating or under construction and have effects that overlap with those of Project, or past projects that are no longer operational.
2. Reasonably Foreseeable Future: Proposed projects or projects that have been approved to be built (but not built yet) and have effects that potentially overlap with the Project.

Table 5.3-12: List of Projects and Activities Included in the Cumulative Effects Assessment

Project / Activity	Development Category	Project Life	Location	Proponent	Description
Natural Resource Extraction - Mining	Certain (Past)	Various	Various	Various	Past mining operations that are no longer operational include Hosmer Wheeler, Natal Ridge, Michel Creek, Sparwood Ridge, Balmer, and J-Area (Sparwood Operations), McGillivray, and Tent Mountain.
Coal Mountain Operations	Certain (Present)	1905 to 2019	15 km southeast of Sparwood, B.C.	Teck Coal Limited	Coal Mountain Operations is a steelmaking coal mine located approximately 30 km southeast of Sparwood, B.C, and operated by Teck Coal Limited (Teck) (Province of British Columbia, 2020b). Underground mining at Coal Mountain started in 1908. The Project has experienced intermittent mining and has changed ownership several times from 1905 to 2004, with Teck acquiring the mine in 2008. The average production at Coal Mountain is 2.5 million tonnes per year. Currently, Teck is in the process of shutting down active mining operations which includes transiting into the care and maintenance phase of the project including site reclamation (Teck Resources Limited, 2019a).
Elkview Operations	Certain (Present)	1969-present	3 km east of Sparwood, B.C.	Teck Coal Limited	Elkview Operations, operated by Teck, is a steelmaking coal mine located approximately 3 km east of Sparwood, B.C. The mine has been operational for over 100 years, with large scale open-pit mine beginning in the 1960s (Province of British Columbia, 2020c). Currently, annual production capacities of the mine and preparation plant are both approximately 7.0 million tonnes of clean coal (Teck Resources Limited, 2019b). The mine currently employs approximately 920 people (Province of British Columbia 2020e). Elkview Operations also includes the Baldy Ridge Expansion, which is an open-pit extension of the existing Elkview Operations. The expansion increases production capacity by 6.8 million tonnes per year of clean coal (Province of British Columbia, 2020d). The Baldy Ridge Expansion is expected to ensure approximately 1,000 jobs and extend the lifetime of the Elkview Operations to approximately 2045 (Province of British Columbia, 2020e).

Project / Activity	Development Category	Project Life	Location	Proponent	Description
Line Creek Operations	Certain (Present)	1981-present	25 km north of Sparwood, B.C.	Teck Coal Limited	Line Creek Operations is a steelmaking coal mine operated by Teck, located approximately 25 km north of Sparwood, B.C. Currently, annual production capacities of the mine and preparation plant are both approximately 4.0 million tonnes of clean coal (Teck Resources Limited, 2019c). The mine currently employs approximately 490 people. The mine has been in operation since 1981 (Province of British Columbia, 2020f) and coal reserves were anticipated to be exhausted in 2014 (Province of British Columbia, 2013). Line Creek Operations Phase II involves the development of two new areas of operation located directly northwest of the existing Line Creek operational development area (EAO, 2013b). Line Creek Phase II is currently operation/under construction. The Phase II expansion will be mined at a rate of approximately 3.5 million tonnes of clean coal per year for a total of approximately 59 million tons of clean coal over the lifetime of Line Creek Operations Phase II. In 2013, it was estimated that Line Creek Phase II would employ 485 people during the operational period. Phase II is expected to extend the Line Creek Operations by 18 years from 2014 to 2031 (EAO, 2013b).
Fording River Operations	Certain (Present)	1972-present	29 km northeast of Elkford, B.C.	Teck Coal Limited	Fording River Operations is a steelmaking coal mine and thermal coal mine located approximately 29 km northeast of Elkford, B.C. (Teck Resources Limited, 2019d). Currently, annual production capacities of the mine and preparation plant are approximately 9.0 million and 9.5 million tonnes of clean coal, respectively (Teck Resources Limited, 2019b). The mine, which has been in operation since 1972 (Province of British Columbia, 2020g), currently employs approximately 1,100 people (Teck Coal Limited, 2011). Fording River Operations Swift (Swift) is an extension of the Fording River Operations and is located immediately west, south, and north of the active Fording River Operations open-pit mining areas (Teck Coal Limited, 2011). Swift will operate by mining the same coal deposit as the Fording River Operations, using the same methods, operations, and facilities. The Swift extension is estimated to provide approximately 175 million metric tonnes

Project / Activity	Development Category	Project Life	Location	Proponent	Description
					of clean coal and contribute to product blends for 25 years (Province of British Columbia, 2020h). Swift will allow Teck to maintain steady employment from the Fording River Operations (Teck Coal Limited, 2011).
Greenhills Operations	Certain (Present)	1983-present	8 km northeast of Elkford, B.C.	80% Teck Resources Limited (80%) and POSCO Canada Limited (20%)	Greenhills Operations is a steelmaking coal (metallurgical coal or coking coal) mine located approximately 8 km northeast of the community of Elkford, B.C. (Teck Resources Limited, 2019c). Greenhills has been in operation since 1983 (Province of British Columbia, 2019). Currently, annual production capacities of the mine and preparation plant are 5.9 million and 5.4 million tonnes of clean coal, respectively, with operation anticipated for another 28 years (Teck Resources Limited, 2019e). The mine currently employs approximately 600 people. As of 2015, approximately 19% of the Project area has been reclaimed (Province of British Columbia, 2019).
Kootenay West Mine	Certain (Present)	2019-present	12 km northeast of Canal Flats, B.C.	CertainTeed Gypsum Canada Inc.	Kootenay West Mine is an open-pit gypsum mine that is intended to replace the existing Windermere Mining Operations which is anticipated to be depleted in 2021 (EAO, 2018c). Construction was anticipated to start no later than Spring 2019, last for 18 months, and result in 43 construction jobs. Operations will require 17 employees that will be sourced from the Windermere Operations. A total of 17 million tonnes of gypsum will be mined at a rate of 400,000 tonnes per year over the lifetime of the mine. Kootenay West Mine is estimated to have a mine life of 43 years (EAO, 2018c) through to 2063 (CertainTeed, 2017).
Elkhorn Quarry West (Windermere Mining Operations)	Certain (Present)	1982-present	Windermere, B.C.	CertainTeed Gypsum Canada Inc.	Elkhorn Quarry West (Windermere Mining Operations) is a gypsum mine located near Windermere, B.C. Initial exploration work estimated gypsum reserves at 3.3 to 4.0 million tonnes (Province of British Columbia, 2020h). The mine employs 18 people during the operational phase. The mine produces between 100,000 to 1,000,000 tonnes per year. Reserves were expected to be exhausted in 2005 (Ministry of Energy, Mines, and Petroleum Resources, 2012) with the mine anticipated to close in 2021; however, the Kootenay West Operation will extend the operation beyond this time.

Project / Activity	Development Category	Project Life	Location	Proponent	Description
Energy - Elko Dam	Certain (Present)	1924-present	16 km upriver from the Elk's confluence with Lake Koocanusa	B.C. Hydro	Elko Dam is located on the Elk River, approximately 16 km upriver from the Elk River confluence with Lake Koocanusa. The dam was built in 1924 and generated approximately 12 megawatts (MW) of electricity. Currently, the dam is not generating electricity. In 2014, a study was to be conducted on redevelopment options for the Elko Dam, which were later deferred in 2016 as projections indicated that there was no demand for additional electricity at this time. Although the dam is not currently producing electricity, it is operational to maintain health and safety (B.C. Hydro, 2020a).
Koocanusa Reservoir	Certain (Present)	1973-present	B.C. / Montana Border	United States Army Corps of Engineers (USACE) (i.e., Libby Dam)	The Koocanusa Reservoir was created in 1972 as a result of the damming of the Kootenay River through the construction of the Libby Dam in Montana (Van Huizen, 2017). The Reservoir, also known as Lake Koocanusa, spans the Canada-US border between B.C. and Montana. The Koocanusa Reservoir spans 155 km in length with 68 km occurring in Canada and 87 km located in the United States. The reservoir is fed mainly by the Elk River, the Kootenay River, and the Bull River.
Marten Phosphate Project	Certain (Present)	2014-present	Michel Creek watershed	Fertoz International Inc.	The Marten Phosphate Project is located between Barnes Lake and Crowsnest approximately 20 km south east from Sparwood, B.C. Fertoz began exploration work on the Marten Project in 2014 with approval to extract 10,000 tons bulk sample (Fertoz, 2019). In November 2014, 1,500 tons of phosphate rock was mined and sold. In 2019, Fertoz received a draft permit to mine 9,000 tonne of bulk sample with extraction work expected to start in June 2019 (Fertoz International Inc., 2019). The Marten Project received permits to extract 8,000 tonnes per annum in 2020 with targets of extracting 3,000 to 5,000 tonnes (Fertoz International Inc., 2020).
Michel Coal Project	Reasonably Foreseeable Future	Proposed	15 km southeast of Sparwood, B.C.	North Coal Ltd.	The Michel Coal Project is a proposed steelmaking coal mine located approximately 15 km southeast of Sparwood, B.C. The production value of the mine is estimated at 2 million clean tonnes of coal per year (North Coal Ltd., 2020). Construction of the Michel Coal Project is estimated to begin in early 2022 with a first coal target of mid-2024. The mine is anticipated to be active for 25 years and create up to 500 construction jobs and 300 operational jobs (North Coal Ltd., 2020).

Project / Activity	Development Category	Project Life	Location	Proponent	Description
Grassy Mountain Coal Project*	Reasonably Foreseeable Future	Proposed	7 km north of Blairmore, AB	Benga Mining Limited	The Grassy Mountain Coal Project is a proposed open-pit metallurgical coal mine located on a legacy mine site approximately 7 km north of Blairmore, Alberta. Estimated production of the mine is 93 million tonnes of product coal over the mine life, or a maximum of 4.5 million tonnes of processed coal per year with an anticipated project life of approximately 25 years (Government of Canada, 2020a). The mine is anticipated to create up to 500 construction jobs and 385 operational jobs (Riversdale Resources Limited, 2020).
Tent Mountain Mine	Reasonably Foreseeable Future	Proposed	Crowsnest Pass	Montem Resources	The Tent Mountain Mine is a proposed open-pit steelmaking coal mine located in the Crowsnest Pass. The mine is expected to begin construction in mid- to late-2021 and begin production in early to mid-2022 (Montem Resources Limited, 2020). The mine is expected to produce 13 million tonnes of reserve product at a production rate of 1.1 million tonnes per annum (Montem Resources Limited, 2020). Once developed, the mine is anticipated to be in production for approximately 14 years at a production rate of 1.1 million tonnes per year and create up to 200 construction jobs and 190 operational jobs (Montem Resources Limited, 2020).
Fording River Extension Project	Reasonably Foreseeable Future	Proposed	South of Fording River Operations	Teck Coal Limited	The Fording River Extension Project is a proposed extension of the existing Teck Fording River Operations (Teck Resources Limited, 2019f). Anticipated production rate of the Fording River Extension is up to 10 million metric tonnes of clean coal per year (Government of Canada, 2020b). Construction is anticipated to start in 2023 with production starting in 2026. The life of the mine is not known at this time; however, it is anticipated that the Fording River Extension will be operational for several decades (Province of British Columbia, 2020i).
Bingay Main Project	Reasonably Foreseeable Future	Proposed	21 km north of Elkford, B.C.	Centermount Coal Limited	The Bingay Main Project is a proposed open pit coal mine located approximately 21 km north of Elkford, B.C. The proposed project would produce 1 million tonnes of coal per year (Government of Canada, 2020c). The Project is anticipated to employ 200 full time people during regular operations (Centermount Coal Limited, 2017). The Bingay Mine Project is anticipated to be operational for 13 years (Centermount Coal Limited, 2017).

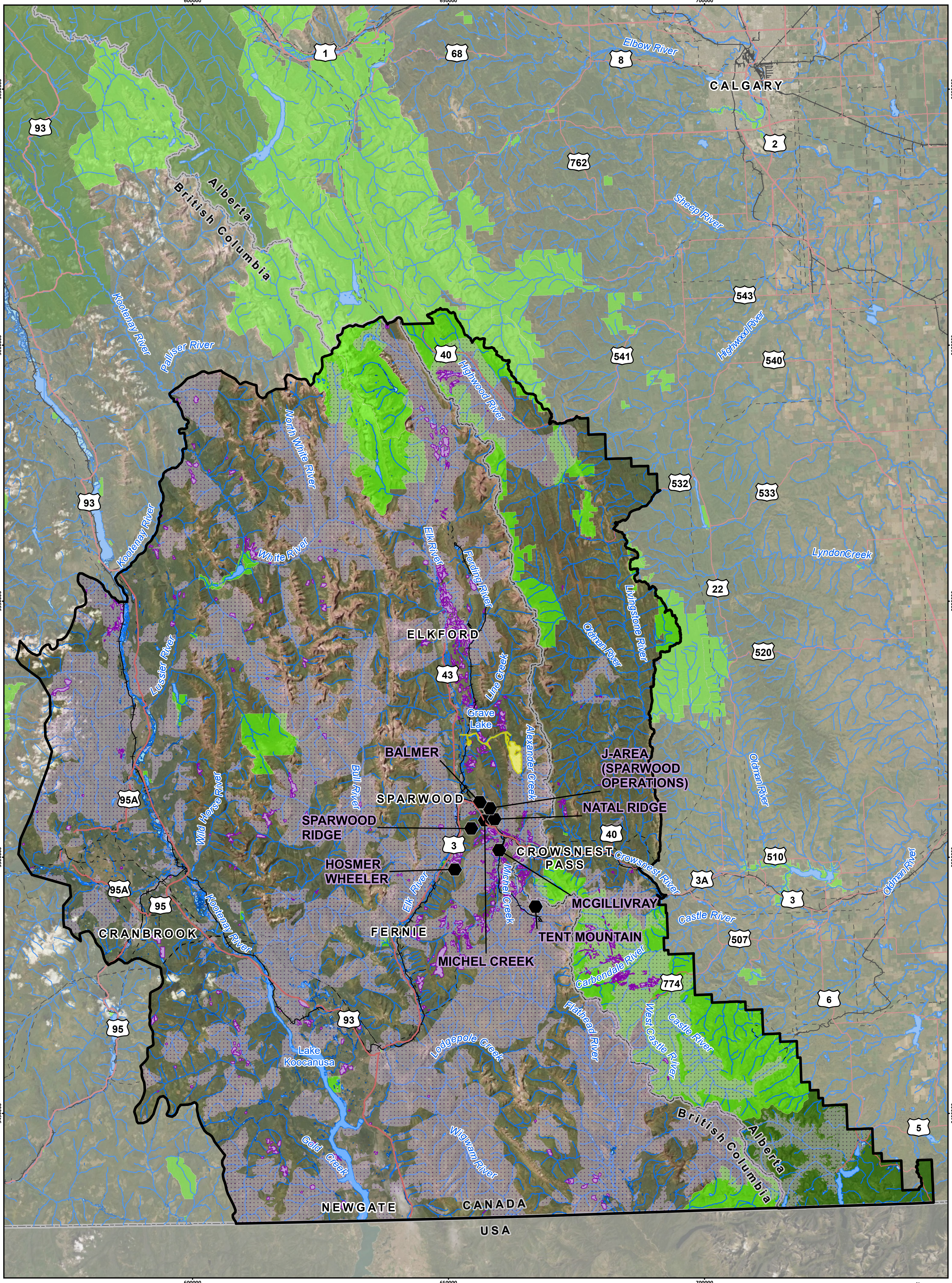
Project / Activity	Development Category	Project Life	Location	Proponent	Description
Elan Hard Coking Coal Project	Reasonably Foreseeable Future	Proposed	Crowsnest Pass	Atrum Coal Ltd.	The Elan Hard Coking Coal Project is a proposed open pit coal mine located in Crowsnest Pass, Alberta, immediately north of the proposed Grassy Mountain Coal Project. The Elan Hard Coking Coal Project includes two areas, Isolation South and Elan South, with a resource estimate of 454 million tonnes over the mine life (Atrum Coal Limited, 2020a). The project has an estimated mine life of 15 to 19 years (Atrum Coal, 2020b).
Climate Change	Reasonably Foreseeable Future	Ongoing	Regional/ Global	Various	Changing climatic conditions are ongoing in the B.C. and the Elk Valley, including changes in extreme weather events related to precipitation, temperature, wind events, and hydrological events. Additional information on effects of the environment on the Project are presented in Chapter 21.
Forestry	Certain (Past and Present) and Reasonably Foreseeable Future	Ongoing	Regional	Various	Forestry occurs on both private and Crown land in the Elk Valley. Timber has been harvested on private lands by several proponents, including but not limited to Tembec, Jemi Fibre Corp, and Canwel Building Materials Group (Canwel). Currently, Canwel harvests timber on privately held lands across the Elk Valley. B.C. Crown Land timber harvests occur throughout the Elk Valley and have been active since the late 1800s. Forestry on Crown Land since this time has included the construction of an extensive road network to access areas harvested for timber. The total allowable cut in the Cranbrook Timber Supply Area is approximately 900,000 cubic meters per year, before taking into account harvesting on private lands (Elk Valley Cumulative Effects Management Framework Working Group, 2018). Forestry is ongoing in the Elk Valley. Publicly available harvest data was used to simulate future forest harvest from harvest dates of 2020 to 2050 for the timber harvest land base (THLB) within the Invermere and Cranbrook Timber Supply Areas (TSAs), and the Spray Lakes Forest Management Unit (FMU) in Alberta (forested areas only). As well, the total area of simulated cutblocks was based on the Elk Valley Cumulative Effects Management Framework (EV CEMF, 2018) Reference Scenario.

Project / Activity	Development Category	Project Life	Location	Proponent	Description
Natural Processes or Events	Certain (Past and Present) and Reasonably Foreseeable Future	Ongoing	Regional	Various	Natural processes or events include geophysical events (i.e., avalanches, seismic events, and landslides) and forest fires that have occurred in the past, are occurring, or that have the potential to occur in the future. Additional information on effects of the environment on the Project are presented in Chapter 20.
Energy - Pipelines	Certain (Past and Present)	Ongoing	Regional	Various	FortisBC and TransCanada Energy (TC Energy) operate natural gas pipelines in the region. FortisBC operates a natural gas pipeline in the Elk Valley, providing natural gas services to the region. The FortisBC underground pipeline generally runs from Elko to Corbin, with a northern extension up to Fernie. The natural gas pipeline runs from Corbin and north, generally along Corbin Road and Highway 3 up to Sparwood and north along Highway 43 to Elkford (FortisBC, 2020). TC Energy currently operates one main natural gas pipeline which runs southwest to northeast across the Elk Valley. The TC Energy pipeline runs from the Canada-US border along Highway 95 to Moyie, along Teepee Creek Road to Elk, and along Highway 3 north to Sparwood and the B.C.-Alberta border. TC Energy is constructing and expanding portions of the NGTL System throughout 2020.
Energy - Electrical Transmission	Certain (Past and Present)	Ongoing	Regional	B.C. Hydro	Several overhead transmission lines occur in the Elk Valley, including 69 kV, 138 kV, 230 kV, and 500 kV lines. Generally running along highways, the transmission lines intersect towns and other linear features in the area (e.g., rail, local roads, and gas pipelines).
Transportation	Certain (Past and Present)	Ongoing	Regional	Various	Linear transportation features across the Elk Valley includes rail, roads (e.g., forestry, exploration, private, and local roads), and highways. Rail runs along major highways in the Elk Valley, servicing existing coal mines. The B.C. Government owns and operates several roads including highways, primary, and secondary roads throughout the Elk Valley. The main highways in the area include Highway 3 which travels in a dominant east and west direction, and Highway 43 which travels in a north and south direction from

Project / Activity	Development Category	Project Life	Location	Proponent	Description
					Sparwood to Elkford. Various other smaller primary and secondary roads are located throughout the Elk Valley in proximity to towns and small communities. Additional local roads and private industry road networks, related to mining, exploration and forestry, are also located throughout the Elk Valley region.
Recreation and Tourism	Certain (Past and Present)	Ongoing	Regional	Various	Recreation and tourism includes both commercial and non-commercial recreation. Hunting, trapping, fishing, and guide outfitting occur as economic, sustenance, and recreational activities. The Project occurs in the Region 4-23 Kootenay Wildlife Management Unit. In this region there are hunting seasons for a variety of ungulates, furbearers, and game birds (Province of British Columbia, 2021). Guide outfitting also occurs for sustenance and recreation. Recreation and tourism take place in front-country and backcountry areas across the Elk Valley. Year-round outdoor recreational activities are common in the area and include hiking, camping, golfing, kayaking, canoeing, mountain biking, equestrian, all-terrain vehicle use, downhill skiing and snowmobiling, snowshoeing and cross country skiing. Fernie Alpine Resort is a downhill ski resort located 5 km south of the community of Fernie, just to the west of Highway 3. The resort offers year-round activities.
Commercial, Residential, and Industrial Use	Certain (Past and Present)	Ongoing	Regional Communities	Various	Lands of nearby communities used for commercial, residential, and industrial use. Includes commercial and industrial development that facilitates commerce and employment as well as areas of residential use.
Parks and Protected Areas	Certain (Past and Present)	Ongoing	Regional	Various	Parks and protected areas occur throughout the Elk Valley and include Provincial Parks, recreation areas, and community and local parks. Parks within the region include but are not limited to Crowsnest Provincial Park (17 km southeast of the Project), Inland Lake Provincial Recreation Area (20 km southeast), Elk Valley Provincial Park (25 km southwest), Mount Fernie Provincial Park (44 km southeast), and Elk Lakes Provincial Park (68 km north). Several community parks occur in towns throughout the Elk Valley (e.g., Sparwood Off-Leash Dog Park).

Project / Activity	Development Category	Project Life	Location	Proponent	Description
Agriculture	Certain (Past and Present)	Ongoing	Regional	Various	Agricultural lands in the Elk Valley are mainly used for farming and grazing purposes, with equine and beef livestock the most common livestock activities (VAST Resources Solutions Inc., 2013)

Notes:
* Grassy Mountain Coal Project is included in the cumulative effects assessments as the assessment of effects on VCs, including related cumulative effects modelling, was completed prior to the Decision Statement issued by the Government of Canada (Government of Canada, 2021).



Crown Mountain Coking Coal Project

Figure 5.3-4
Past Projects and Activities Included in the Cumulative Effects Assessments

LEGEND

- Past Mining Projects
- Retired Cutblocks
- Past Wildfire Extents (1919-2021)
- Terrestrial Regional Study Area
- Crown Mountain Coking Coal Project
- Highway
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- Provincial Park/Protected Area
- National Park
- British Columbia/Alberta Border

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Kilometres

Scale 1:700,000

Map Drawing Information:
Data Provided By NWP Coal Canada Ltd, Dillon Consulting Limited, Province of British Columbia GeoBC Open Data, Government of Alberta Open Data, Natural Resource Canada.
Imagery Provided By ESRI.

Map Created By: LMM
Map Checked By: LKD
Map Coordinate System: NAD 1983 UTM Zone 11N

NWP Coal Canada Ltd

Project: 12-6231
Status: FINAL
Date: 2021-12-06

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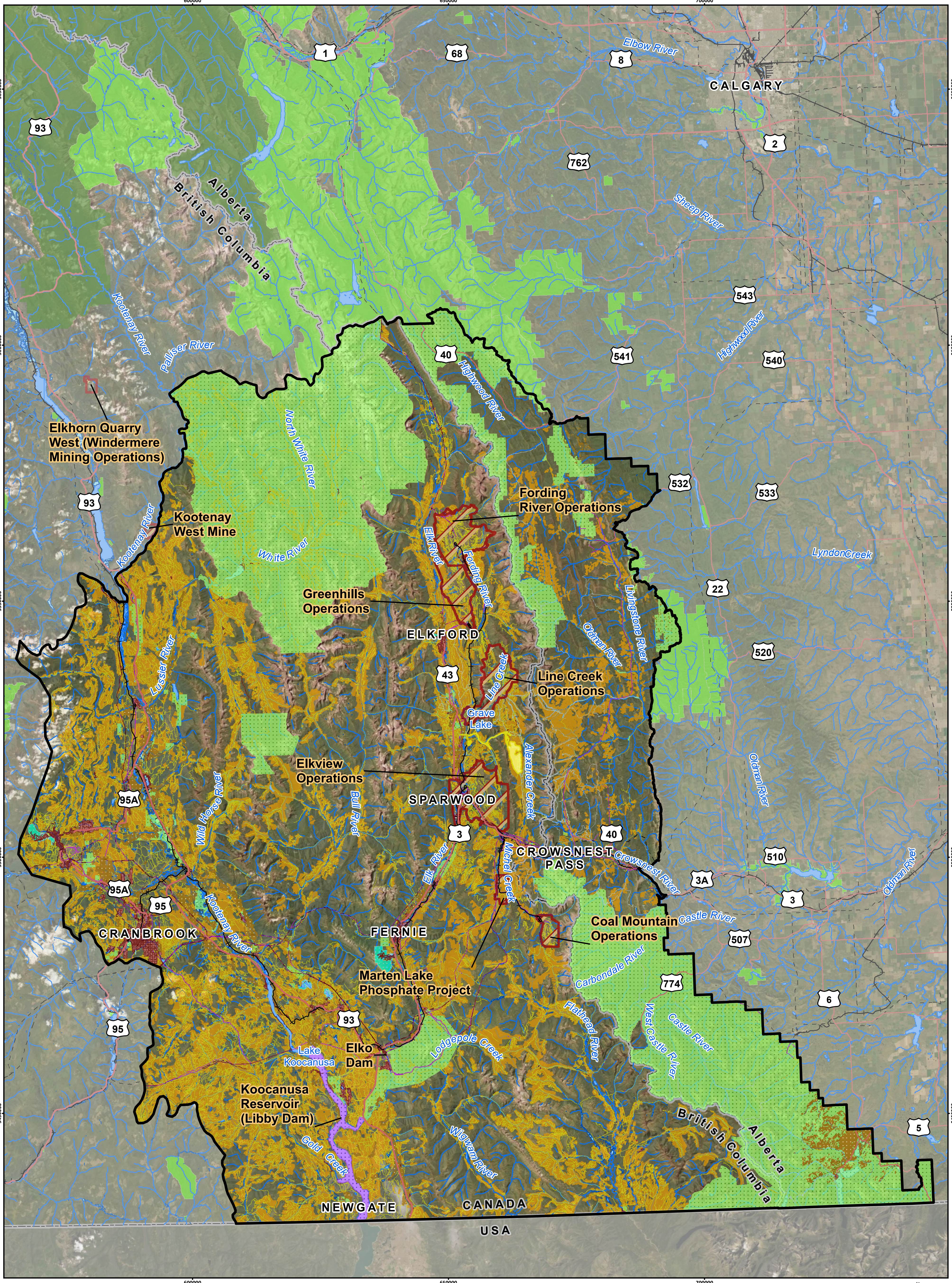

Crown Mountain Coking Coal Project

Figure 5.3-5
Present Projects and Activities included in the Cumulative Effects Assessments

LEGEND

- Present Projects and Activities
- Commercial, Residential, and Industional Use
- Agriculture
- Energy - Pipelines and Electrical Transmission
- Recreation and Tourism
- Transportation
- Parks and Protected Areas
- Terrestrial Regional Study Area
- Crown Mountain Coking Coal Project
- Highway
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- Provincial Park/Protected Area
- National Park
- British Columbia/Alberta Border

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Kilometres

Scale 1:700,000

Map Drawing Information:
Data Provided By NWP Coal Canada Ltd, Dillon Consulting Limited, Province of British Columbia GeoBC Open Data, Government of Alberta Open Data, Natural Resource Canada. Imagery Provided By ESRI.

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Map Coordinate System: NAD 1983 UTM Zone 11N

NWP Coal Canada Ltd

Project: 12-6231
Status: FINAL
Date: 2021-12-06

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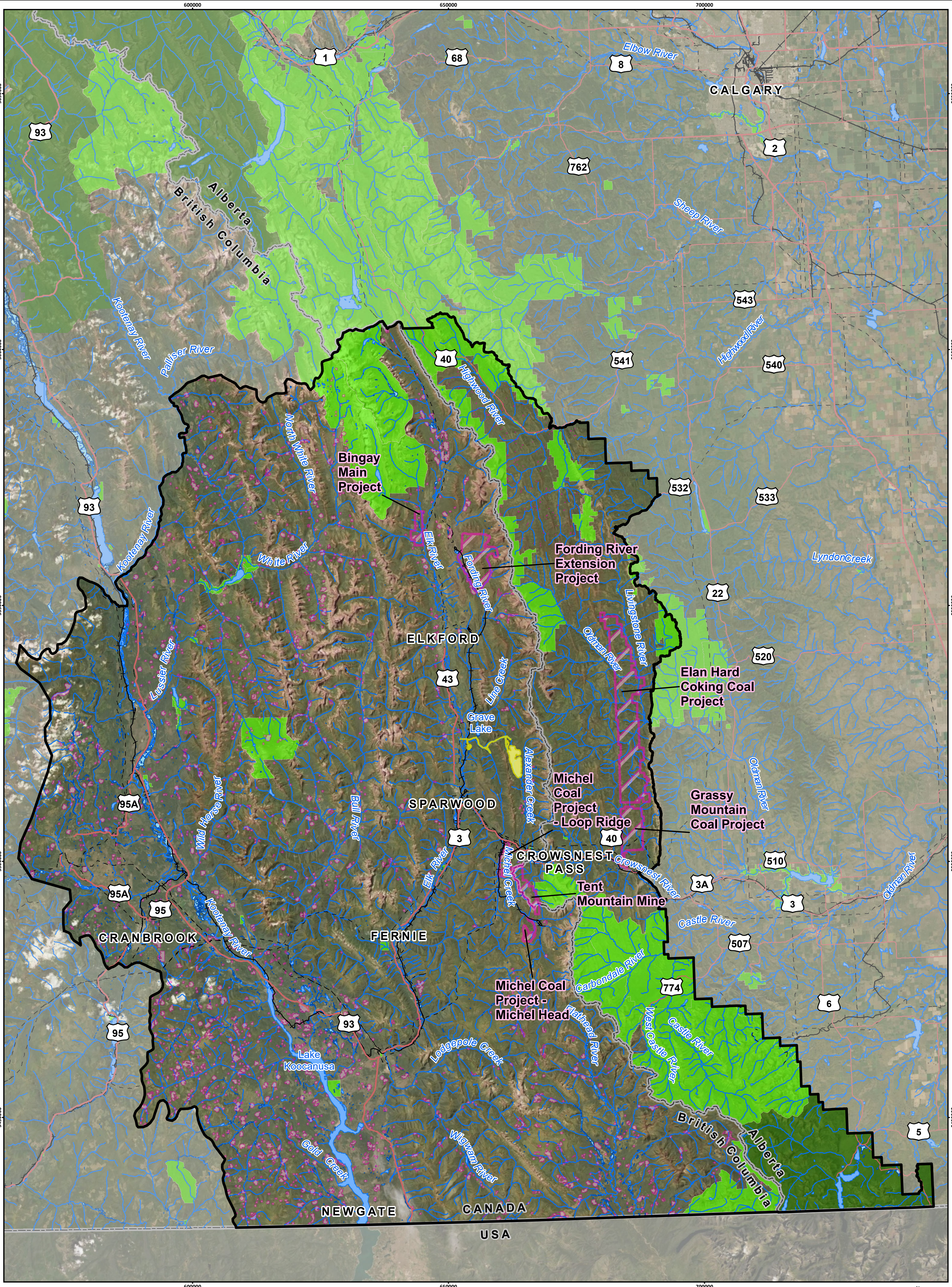

Crown Mountain Coking Coal Project

Figure 5.3-6
Reasonably Foreseeable Future Projects and Activities included in the Cumulative Effects Assessments

LEGEND

- Reasonably Foreseeable Future Projects and Activities
- Reasonably Foreseeable Future Forestry Activities
- Terrestrial Regional Study Area
- Crown Mountain Coking Coal Project
- Highway
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- Provincial Park/Protected Area
- National Park
- British Columbia/Alberta Border

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Map Drawing Information:
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Date: 2021-12-06

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The following projects were considered as past, present, or reasonably foreseeable future projects and/or activities in the cumulative effects assessment but were not included:

- Coal Mountain Phase 2 as the environmental assessment was placed on hold by Teck in 2016;
- Mount Brussilof (Baymag Mine) by Baymag due to no temporal overlap (TBD);
- Barns Lake Phosphate Exploration Project by Fertoz International Inc. given that the project is in exploration phase and no project has been proposed; and
- Cabin Ridge Coal by Warburton Group is in exploration and no project has been proposed.

5.3.5.4 Cumulative Effects Assessment Methods

The approach to assessing cumulative effects generally mirrored the methods used for assessing Project effects as described above, including:

- Review the Project residual effects for each VC - determine the potential spatial and temporal overlap with similar effects of other projects and/or activities;
- Identify potential cumulative environmental effects to which the Project's effects will interact those of other projects and/or activities;
- Identify mitigation measures that could be used to minimize or reduce those cumulative environmental effects;
- Characterize residual cumulative effects by magnitude, geographic extent, duration, frequency, reversibility, and ecological and social context after mitigation has been applied;
- Determine significance of cumulative effects based on the same significance thresholds as were identified for assessing Project environmental effects on the VC; and
- Determine the likelihood, confidence, and risk of cumulative effects identified.

5.3.5.4.1 Identification of Potential Cumulative Effects

After completing the assessment of potential Project-related effects on the VC, where residual effects were identified, a cumulative effects assessment was conducted for those Project-related residual effects that may overlap with the effects of past, present, and reasonably foreseeable future projects and/or activities.

An initial screening for cumulative effects was conducted to determine if there was potential for a cumulative effect. A series of three questions was used to screen cumulative effects:

1. Is there a residual adverse Project effect on the VC?
2. Does the residual adverse Project effect overlap spatially and temporally with the residual effects of other past, present, and reasonably foreseeable future projects and/or activities?
3. To what extent does the Project contribute to cumulative effects? In other words, is the Project's contribution to cumulative effects substantive and measurable or discernible such that there is some potential for substantive cumulative effects that are attributable to the Project?

If, based on these three questions above, a potential cumulative effects could occur, a cumulative effects assessment was carried out to determine if it has the potential to shift a component of the natural or human environment to an unacceptable state.

To support the identification of potential cumulative effects as a result of the Project, a matrix was developed to identify the interactions between the Project and VCs (Table 5.3-13). As with Project effects, the interaction matrix identified key interactions between the Project and other past, present, or reasonably foreseeable future projects and/or activities. Potential overlapping residual effects identified in the interaction matrix are further assessed for each VC by ranking interactions for each other project and/or activity based on the anticipated level of spatial and temporal overlap in their effects that may result in a cumulative effect, focusing the assessment on important interactions. Definitions of the ranking used for the interactions between the Project residual effects and those of other projects and/or activities are as follows:

- Level I – Residual Project effects do not act cumulatively with those of other past, present, or reasonably foreseeable future projects and/or activities. Not carried forward in the assessment.
- Level II – Residual Project effects act cumulatively with those of other past, present, or reasonably foreseeable future projects and/or activities, but are unlikely to result in significant cumulative effects; or residual Project effects act cumulatively with existing significant cumulative effects but the Project will not measurably contribute to these cumulative effects on the VC. Carried forward in the assessment.
- Level III – Residual Project effects act cumulatively with those of other past, present, or reasonably foreseeable future projects and/or activities, and may result in significant cumulative effects; or residual Project effects act cumulatively with existing significant cumulative effects and the Project may measurably contribute to adverse changes in the state of the VC. Carried forward in the assessment.

The overlapping projects and/or activities with the effects of the Project are ranked as Level I, II, or III in a manner similar to that described for Project-VC interactions in Section 5.3.4.2.1 to quantify the level of interaction or overlap between the effects of the Project and those of other past, present, and reasonably foreseeable future projects and/or activities. The use of the Level I, II, and III rankings above for identifying overlapping cumulative allows for the assessment to focus on the key issues of concern for each VC, where the effects of the Project overlap those of other projects and/or activities. Only projects and/or activities that were ranked as Level II or Level III were included in the assessment of potential cumulative effects. Interactions ranked as Level I were discussed and justified, but were not assessed in detail—by definition, their resulting residual cumulative effects were rated not significant, with a high level of confidence.

For those cumulative effects ranked as Level II or III, the assessment of each cumulative effect began with a description of the effect and the mechanisms whereby the Project effects may interact with other projects and/or activities in the RSA as defined for a particular VC. Where possible, the cumulative effect was quantified in terms of the degree of change and the spatial and temporal extent of these changes (i.e., where and when the interactions between the Project's residual effects and the residual effects of other projects or activities might occur).

The nature and extent of potential cumulative effects were assessed through a range of qualitative and quantitative characterization and prediction methods. Methods used to evaluate potential cumulative effects resulting from interactions with the Project are discussed in each VC assessment chapter. The assessment of potential cumulative effects for each VC employed the use of baseline data, modelling, and professional judgment to predict cumulative effects on VCs. Due to the broader scope and greater uncertainties inherent in assessing cumulative effects (e.g., data limitations associated with future projects and activities), in some instances there is greater dependency on qualitative assessment methods

Table 5.3-13: Example Project-VC Interactions Matrix for Potential Cumulative Effects

Past, Present, or Reasonably Foreseeable Future Projects or Activities	Ranking of Potential Cumulative Effect	Justification / Rationale
Past or Present Projects and/or Activities that Have Been Carried Out		
Project/Activity 1	I	(describe rationale)
Project/ Activity 2	II	(describe rationale)
Project/Activity 3	I	(describe rationale)
Reasonably Foreseeable Future Projects and/or Activities That Will Be Carried Out		
Project/Activity 1	III	(describe rationale)
Project/ Activity 2	I	(describe rationale)
Project/Activity 3	II	(describe rationale)

Notes:
I – Residual Project effects do not act cumulatively with those of other past, present, or reasonably foreseeable future projects and/or activities. Not carried forward in the assessment.
II – Residual Project effects act cumulatively with those of other past, present, or reasonably foreseeable future projects and/or activities, but are unlikely to result in significant cumulative effects; or residual Project effects act cumulatively with existing significant cumulative effects but the Project will not measurably contribute to these cumulative effects on the VC. Carried forward in the assessment.
III – Residual Project effects act cumulatively with those of other past, present, or reasonably foreseeable future projects and/or activities, and may result in significant cumulative effects; or residual Project effects act cumulatively with existing significant cumulative effects and the Project may measurably contribute to adverse changes in the state of the VC. Carried forward in the assessment.

and expert judgment. Limitations and uncertainties associated with the assessment of potential effects are presented for each VC.

As the cumulative effects assessment focuses on residual effects, cumulative effects before mitigation are not characterized. The significance of the cumulative effect before the application of mitigation is not described or assessed.

Use of Temporal Cases

Where several effects were evaluated in a particular VC, or where the screening of cumulative effects identifies that a detailed evaluation of cumulative effects was required, temporal cases were defined, where appropriate, to assist in the assessment of cumulative effects. Temporal cases used in the assessment of cumulative effects generally include the following:

1. Base Case – Describes the current status of the VC prior to the start of the Project, including all appropriate past and present projects and/or activities. The Base Case will normally be presented in the existing conditions of the VC assessment chapter, with explicit reference to the fact that the Base Case reflects the contributions of past and present projects and/or activities.
2. Project Case – Describes the status of the VC with the Project in place, over and above the Base Case. This is usually assessed using the peak effect of the Project or the maximum active footprint for the Project.
3. Future Case – Describes the status of the VC as a result of the Project Case in combination with all reasonably foreseeable future projects and/or activities that could be carried out.

The comparison of the Project Case with the Future Case allowed the Project contribution to cumulative effects of all past, present, and reasonably foreseeable future projects and/or activities to be determined.

5.3.5.4.2 Elk Valley Cumulative Effects Management Framework

The Elk Valley Cumulative Effects Management Framework (EV-CEMF) evaluates the historic, current, and potential future conditions of selected VCs while supporting resource management decisions in the Elk Valley (Province of British Columbia, 2020a). The purpose of EV-CEMF is to develop an approach to understand cumulative effects on the environment from various industries and natural events in the Elk Valley by assessing impacts to five region-specific VCs: Westslope Cutthroat Trout, grizzly bear, bighorn sheep, old growth and mature forest, and riparian habitat. The EV-CEMF was used as an additional tool in the cumulative effects assessment for the Project for the region-specific VCs. Cumulative effects predictor models developed by the EV-CEMF are used and the results of the EV-CEMF modelling are presented and discussed for each region-specific VC, specifically Westslope Cutthroat Trout, grizzly bear, bighorn sheep, old growth and mature forest, and riparian habitat.

5.3.5.4.3 Cumulative Effects Assessment for Water Quality

The Project is located within the designated area of the Elk Valley Area Based Management Plan, also known as the Elk Valley Water Quality Plan (EVWQP). The EVWQP is a plan to manage the cumulative effects of coal mining on water quality and was developed by Teck in response to a Ministerial Order issued in April 2013 under the Environmental Management Act 2003 (EMA). Because the EVWQP is a cumulative effects management plan for water quality that was approved by the Minister of Environment under the EMA, a typical cumulative effects assessment for water quality is not required for the Project. Instead, the Application/EIS:

- Demonstrates how the Project will meet:
  - B.C.'s Water Quality Guidelines for selenium, nitrate, cadmium and sulphate for the protection of aquatic health at the property boundary;
  - The water quality targets at the downstream order stations and calcite management objectives of the EVWQP; and
  - The EVWQP Approval Conditions in the Minister's letter.
- Uses Project-specific and regional watershed models for surface and groundwater to predict concentrations of the Order Constituents. Teck's regional watershed model on which the EVWQP is based was used, if available. If Teck's regional model was not used for the Application's predictions, the Application summarizes:
  - The Proponent's efforts to engage and work with Teck to secure use of the model; and
  - How the Proponent's model predictions compare to Teck's model predictions in the EVWQP.
- Identifies how the following were considered during the development and operation of the mine:
  - Best Achievable Control Technology (BACT) contingency measures;
  - Monitoring programs to assess water quality before construction, during construction, operation, closure and post reclamation, including potential trigger action response thresholds; and
  - Adaptive management to ensure that the Project evolves in response to monitoring information and scientific advances; and
- Describes any differences in the water quality prediction and assessment approaches between the EVWQP and the Application/EIS, along with the rationale for the differences.

5.3.5.4.4 Mitigation for Cumulative Effects

The mitigation hierarchy described in Section 5.3.4.4 was also applied to mitigating cumulative effects to VCs. Mitigation measures that reduce the cumulative effects are described in the respective VC assessment chapters, with an emphasis on those measures that would help to minimize the interaction of the Project-related effect with similar effects from other projects, activities, and actions. Three types of mitigation measures were generally considered, as applicable:

1. Measures that can be implemented solely by the Proponent.
2. Measures that can be implemented by the Proponent in cooperation with other project proponents, government, Indigenous organizations, the public, and/or other stakeholders.
3. Measures that can be implemented independently by other project proponents, government, Indigenous organizations, Indigenous groups, and the public or other stakeholders.

In addition, the Elk Valley Cumulative Effects Management Framework (EV-CEMF) was considered as additional mitigation for cumulative effects, as applicable, to the region-specific VCs covered by the framework. Mitigation and management measures recommended by the EV-CEMF were considered, as applicable, in the discussion of mitigation measures for cumulative effects on the region-specific VCs.

5.3.5.4.5 Characterization of Residual Cumulative Effects

Residual cumulative effects are the combined effects of the Project and other projects and/or activities on a VC that remain, or are predicted to remain, after mitigation measures have been implemented (CEAA, 2018). The assessment of residual cumulative effects on VCs involves the evaluation of the potential spatial and temporal overlap of the effects of the Project in combination with that of other past, present, or reasonably foreseeable future projects and/or activities on the VC. Threshold criteria used to characterize residual cumulative effects are the same as for the Project effects (Section 5.3.4.1) and include:

- Duration of time that the effect occurs;
- Magnitude or intensity of the effect;
- Geographic extent, both biophysical and socio-economic scales, of the effect;
- Frequency of the effect (i.e., how often the effect occurs);
- Reversibility of the effect (i.e., if the effect can be reversed); and
- Context (i.e., the sensitivity and resilience of a VC to changes caused by the Project).

Residual cumulative effects are described and assessed, taking into account how the proposed mitigation could alter or change the cumulative effect. The contribution of the Project to cumulative effects was assessed where there is a potential for substantive overlapping of effects to occur. The EV-CEMF was used as an additional tool to assist in the characterization of cumulative effects for region-specific VCs. Cumulative effects of the Project on water quality are considered separately within the framework of the Elk Valley Water Quality Plan.

Determination of Significance of Residual Cumulative Effects

Following the characterization of residual cumulative effects, a determination of the significance of residual cumulative effects was made using the same standards or thresholds for significance developed for the VC. If a significant residual cumulative effect was predicted, the likelihood of that cumulative effect occurring was discussed. The degree of confidence of the significance prediction was also discussed. The determination was presented in a tabular format as shown in Table 5.3-14.

5.3.6 Follow-up Strategy

A follow-up program will be used to verify environmental effects predictions or to verify the effectiveness of mitigation measures. Where the effects assessment for a particular VC determined that there is uncertainty (i.e., low to moderate confidence) in the effects predictions or in the effectiveness of mitigation, the Application/EIS includes a description of a follow-up strategy, that when appropriate:

- Identifies the proposed measures to evaluate the accuracy of the original effects prediction;
- Identifies the proposed measures to evaluate the effectiveness of proposed mitigation measures; and/or
- Outlines an appropriate strategy to apply in the event that original predictions of effects and mitigation effectiveness are not as expected, including reference to further mitigation, involvement of key stakeholders, Indigenous groups, government agencies, and any other measures deemed necessary to manage issues.

Project-specific management and monitoring plans relevant to the follow-up strategies developed for VCs are presented in Chapter 33.

5.3.7 Potential Accidents and Malfunctions

The Application/EIS presents an analysis of the risks of accidents and malfunctions, their potential effects, and presents preliminary emergency measures. Where applicable, for each potential accident and malfunction, one or more scenarios relating to how the accident or malfunction event might occur during the life of the Project is discussed. The focus of the evaluation was on credible accidents and malfunctions that have a reasonable likelihood of occurring during the lifetime of the Project based on the nature of the Project and the environmental effects that may occur, or for those that could result in significant environmental effects even if their likelihood of occurrence is low.

Specific to the accidents and malfunctions assessment, the Application/EIS includes:

- Identification of potential accidents and malfunctions;
- The overall methodology for assessing the potential risk of an event (likelihood and consequence);
- Definitions of each category of likelihood;
- Definitions for each category of consequence;
- An assessment of the likelihood of the event occurring, based on historical trends and predictive models;
- Identification of proposed measures to reduce the likelihood of the event;
- Assessment of consequence of the event, in a manner consistent with the direct effects
- assessment;
- Identification of measures to mitigate the consequences to VCs and discussion on their expected effectiveness; and
- Conclusions on the potential risk (likelihood multiplied by consequence) of the accident or malfunction.

Table 5.3-14: Summary of Cumulative Effects on VCs

Valued Component	Residual Cumulative Effect	Project Phase(s)	Mitigation Measures	Summary of Effects Characterization	Significance (Significant, Not Significant)	Likelihood (High, Moderate, Low)	Confidence (High, Moderate, Low)
				Duration: Magnitude: Geographic Extent: Frequency: Reversibility: Context:			

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