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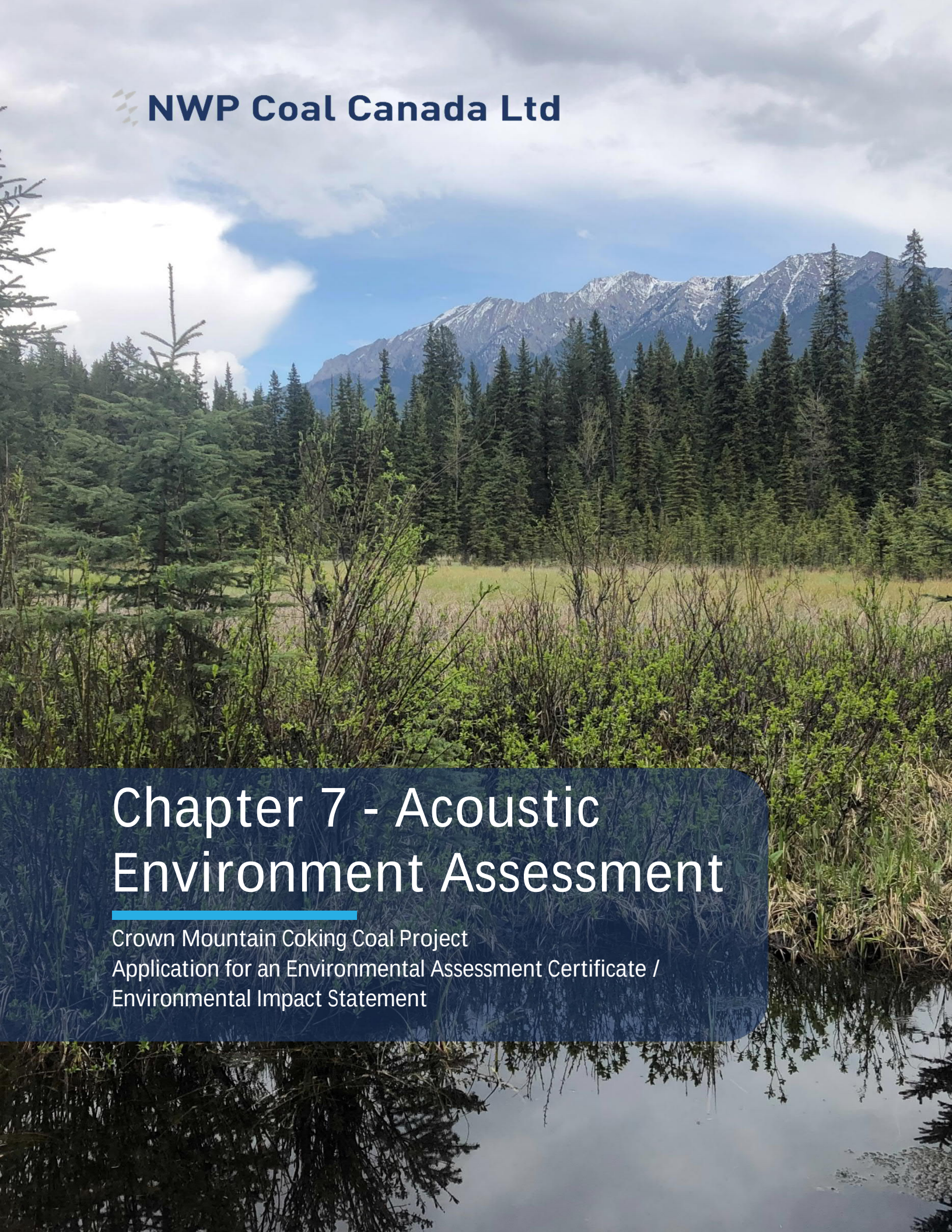

Chapter 7 - Acoustic Environment Assessment

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

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7. Acoustic Environment Assessment

7.1 Introduction

The acoustic environment, as characterized by Project-related noise and vibration, was selected as a valued component (VC) because noise and vibration from the Crown Mountain Coking Coal Project (the Project) have the potential to affect human health and well-being, as well as cause disturbance (including avoidance) to nearby wildlife. As required by the Application Information Requirements (AIR; Environmental Assessment Office [EAO], 2018), the "acoustic environment will be assessed at sensitive receptors (nearby people/communities and wildlife) and include evaluation of the following measurement indicators to determine changes in the environment as a result of the Project:

- Noise levels at receptors (e.g., wildlife habitat, residences [permanent and temporary]); and
- Vibration levels at receptors (e.g., wildlife habitat, residences [permanent and temporary]).

The Application will also identify those VCs for which noise and vibration are the primary pathways to potential effects from the Project. "As stipulated by Section 6.1 in the Guidelines for the Preparation of an Environmental Impact Statement for the Crown Mountain Coking Coal Project (EIS Guidelines; Canadian Environmental Assessment Agency [CEAA], 2015), the EIS will include a description of "current ambient noise levels at key receptor points" and predicted changes in ambient noise levels.

The Project will result in increased local noise and vibration levels due to Project activities. Noise is defined as any unwanted sound that interferes with human or wildlife activity or causes any annoyance. An increase in noise can result in sensory disturbance and health effects to humans and wildlife living in the area, related wildlife avoidance due to sensory disturbance, and potential disruptions to recreational and commercial land uses such as hiking, hunting and trapping, and fishing. Vibration is defined as the mechanical oscillations of an object around an equilibrium point. Ground vibration propagation, as well as concussion of sound waves through the air, can result in changes to human and wildlife health and behaviour patterns.

Given the relationship between noise and vibration and the natural and human environments, the acoustic environment (as characterized by noise and vibration) was identified as an intermediate valued component for the Project, as it is a pathway to, and has the potential to affect, multiple wildlife and human receptor VCs. An understanding of existing noise and vibration within and surrounding the Project, as well as the Project's potential contributions to those existing noise and vibration levels, is critical to the Project design, engineering, operations, and assessment and mitigation of potential environmental effects.

Noise and vibration effects have linkages to several receptor VCs; these effects are primarily assessed in the following chapters:

- Chapter 12: Fish and Fish Habitat Assessment;
- Chapter 15: Wildlife and Wildlife Habitat Assessment;
- Chapter 18: Socio-Community Assessment;
- Chapter 19: Land Use Assessment; and
- Chapter 22: Human and Ecological Health Assessment.

7.1.1 Regulatory and Policy Setting

The regulatory setting for ambient (environmental) noise levels applies to off-site effects. Noise levels in the workplace are regulated by WorkSafeBC and the Health, Safety and Reclamation Code for Mines in British Columbia (Ministry of Energy, Mines and Low Carbon Innovation, 2021). Workplace noise levels are not included in the noise and vibration effects assessment but will be considered for establishing the Project's worker health and safety requirements. British Columbia does not have applicable guidance outlining acceptable methods for measurements or assessment of vibration levels due to mine blasting; therefore, vibration guidelines from the United States (U.S.) Bureau of Mines, American National Standards Institute (ANSI), and the Ontario Ministry of the Environment were used to determine vibration limits for the assessment. Applicable international, federal, provincial, and municipal legislation and guidance documents related to noise and vibration are summarized in Table 7.1-1.

Table 7.1-1: International, Federal, Provincial, and Municipal Legislation and Guidelines Relevant to Noise and Vibration

Legislation/Guideline Name	Year	Description
International		
International Organization for Standardization (ISO) 1996-1:2016: Acoustics — Description, Measurement and Assessment of Environmental Noise — Part 1: Basic Quantities and Assessment Procedures	2016	Defines basic quantities to be used for the description of noise in community environments and basic assessment procedures (ISO, 2016).
ISO 9613-2:1996: Acoustics — Attenuation of Sound During Propagation Outdoors — Part 2: General Method of Calculation	1996 (Under Review)	Describes a method for calculating the attenuation of sound during propagation outdoors in order to predict the levels of environmental noise at a distance from a variety of sources (ISO, 1996).

Legislation/Guideline Name	Year	Description
World Health Organization Guidelines for Community Noise	1999	Defines basic aspects of acoustic measurement, adverse effects, guideline values, and noise management (Berglund et al., 1999).
American National Standards Institute (ANSI) S2.71-1983: Guide to the Evaluation of Human Exposure to Vibration in Buildings	1983	Assesses reactions of humans to vibrations of 1 to 80 Hertz (Hz) inside buildings by use of degrees of perception and associated vibration levels and durations (ANSI, 1983).
Report of Investigations (RI) 8485: Structure Response and Damage Produced by Airblast from Surface Mining.	1980	Indicates safe levels of ground vibration that would ensure high probability of non-damage to structures (Siskind et al., 1980a).
Report of Investigations (RI) 8507: Structure Response and Damage Produced by Ground Vibration from Surface Mine Blasting	1980	Indicates safe levels of airblast that would ensure high probability of non-damage to structures (Siskind et al., 1980b).
Federal		
Guidance for Evaluating Human Health Impacts in Environmental Assessment: Human Health Risk Assessment	2019	Provides guidance on conducting human health risk assessment for environmental assessment in Canada (Health Canada, 2019).
Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise	2017	Provides generic guidance on predicting health risks related to levels and/or types of sound predicted in federal environmental assessments (Health Canada, 2017).
Environmental Code of Practice for Metal Mines	2009	Provides measures to control noise, including ambient noise from mining operations (Environment Canada, 2009).
Provincial		
British Columbia Noise Control Best Practices Guideline V.2.1	2018	Outlines the recommended best practices for noise control of operations associated with wells and facilities in B.C. under the jurisdiction of the Oil and Gas Activities Act (B.C. Oil and Gas Commission [B.C. OGC, 2018]). In the absence of directly applicable regulation, criteria, or assessment guidelines regarding mining noise in B.C., the noise assessment was based on the methods and limits outlined in this guideline.
Ontario Ministry of the Environment Noise and Vibration Limits for Blasting, Publication NPC-119.	1985	Provides cautionary and standard limits for ground-borne vibration and overpressure sound levels from blasting operations (Ontario Ministry of the Environment, 1985).
Municipal		
District of Sparwood Community Standards Bylaw 1194	2018	Outlines designated hours for noise related to construction and excavation (District of Sparwood, 2018).

7.2 Scope of the Assessment

7.2.1 Valued Components and Measurement Indicators

Project Construction and Pre-Production and Operations phases will result in increased local noise and vibration levels in the environment near the Project. Increased levels of noise and vibration from equipment and mining activities can result in potential sensory disturbance to noise receptors, including human and wildlife receptors. Sensory disturbance may affect receptor health and quality of life (e.g., wildlife use of forage areas). Noise and vibration levels at selected human and wildlife receptor locations were selected as the measurement indicators for noise and vibration effects (Table 7.2-1).

Table 7.2-1: Measurement Indicators and Effects Pathways for the Acoustic Environment

Valued Component	Measurement Indicator(s)	Effects Pathway(s)
Acoustic Environment	• Noise levels at receptors (e.g., wildlife habitat, residences [permanent and temporary]); and • Vibration levels at receptors (e.g., wildlife habitat, residences [permanent and temporary]).	VCs or VC groups for which noise and vibration is an effects pathway include: • Fish and fish habitat; • Wildlife and wildlife habitat; • Socio-community; • Land use; and • Human health.

7.2.2 Indigenous and Stakeholder Consultation

NWP conducted consultation with Indigenous groups, public stakeholders, and regulators. A summary of all consultation activities undertaken to date is presented in Chapter 4. In August 2020, the Ktunaxa Nation Council provided the location of sensitive receptors to inform the acoustic, air quality, and human health and ecological risk assessments. These locations were received after the ambient baseline noise monitoring program was completed, but were used in the noise and vibration modelling assessment to quantity residual effects of the Project on noise and vibration levels at representative human receptor locations (refer to Section 7.4.2.1.3).

No other consultation feedback on the acoustic environment was received in the Pre-Application phase.

7.2.3 Assessment Boundaries

7.2.3.1 Spatial Boundaries

As per the AIR (EAO, 2018), potential effects on the acoustic environment, including noise and vibration, were assessed within the Project footprint and within the Acoustic Local Study Area (LSA), as shown in Figure 7.2-1. As detailed in Chapter 5, Table 5.3-2, the spatial boundaries for the acoustic environment VC have changed from the study areas presented in the AIR. A discussion on the spatial boundaries used in the assessment is provided below.

Crown Mountain Coking Coal Project

Figure 7.2-1
Acoustic Local Study Area

LEGEND

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

0 1.5 3
Kilometres

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Scale 1:80,000

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 Landsat 8 (Aug 2018), and GeoBC Ortho Imagery (Aug 2016).

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

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The Project footprint encompasses the location of temporary and permanent works associated with the Project and covers approximately covering approximately 13 square kilometres (km^2) or 1,283 hectares (ha; Figure 7.2-1). The centre of the Project is positioned approximately 12 km northeast of the District of Sparwood and approximately 5 km west of the provincial boundary between B.C. and Alberta (Figure 7.2-1). The Project footprint is defined as the area of physical disturbance associated with the Project and consists of the proposed surface extraction areas (three pits - North Pit, East Pit, and South Pit); Mine Rock Storage Facility; mine infrastructure and support facilities, including the plant area (raw coal stockpile area and processing plant); clean coal transportation route; rail loadout facility and rail siding; and ancillary facilities (i.e., water supply, power supply, natural gas supply, water, sewage treatment, fuel storage, and explosives storage).

The boundary of the Acoustic LSA is based on identified sensitive receptors and environments within a 3 kilometre (km) radius surrounding the boundary of the Project footprint (i.e., Project footprint in addition to 3 km all around) in order to include surrounding terrestrial environments (e.g., wildlife habitat). As well, the Acoustic LSA includes areas used for recreation (e.g., hunting) that could be adversely affected by noise and vibration levels. The distance of 3 km is beyond the 1.5 km criterion used for consideration of cumulative effects in the British Columbia Noise Control Best Practices Guideline (B.C. OGC, 2018) and is a conservative assumption for the potential extent of sound resulting from the Project.

The Acoustic LSA extends across the Lower Elk Valley Road to the west, which is a moderately dense residential area. The northern extent of the LSA overlaps with Grave Creek and Grave Lake, with a campground and an area with seasonal dwellings around Grave Lake. The land is owned by Teck Coal Limited's (Teck) Elkview Operations and is leased to the cabin owners. Additional cabins and/or camping sites may exist in the LSA; however, these are not registered with the land owner and are considered informal. The eastern and southern extents of the Acoustic LSA are densely forested and mountainous with a small number of seasonal cabins and unofficial campsites. For the purposes of this assessment, a campground is considered a designated camping area that is managed and has regular consistent use. An unofficial campsite refers to a location that may be used for camping (i.e., has a space for campers and a fire pit) but is not regulated in any way.

Given the localized extent of sounds and vibrations that may result from the Project, the nature of noise and vibration, which attenuate with increasing distance from their source, and the fact that noise and vibration levels from a source are generally not distinguishable from background levels beyond 2 to 3 km of the source, a Regional Study Area (RSA) was not assessed for noise and vibration effects. Since the use of a RSA is limited to the cumulative environmental effects assessment, and given that there are no other substantial sources of human-made noise and vibration within the immediate vicinity of the Project, there would be no spatial and temporal overlap of the Project with other past, present, or reasonably foreseeable future projects activities that would lead to cumulative effects. Defining a RSA for the Project was therefore not necessary.

7.2.3.2 Temporal Boundaries

Temporal boundaries include the time periods during which the Project is anticipated to result in potential effects on VCs (EAO, 2013). Two types of temporary boundaries were used in the assessment: the temporal limits of the Project in terms of its Construction and Pre-Production, Operations, Reclamation and Closure, and Post-Closure phases, and the temporal characteristics of noise and vibration. The

temporal limits of the Project used in the effects assessment include the timing of Project phases and activities, as outlined in Table 7.2-2. Additional detail of the phases and activities related to the Project are outlined in Chapter 3.

Table 7.2-2: Temporal Boundaries for the Project Effects Assessment for the Acoustic Environment

Phase	Project Year	Length of Phase (Years)
Construction and Pre-Production	1 – 2	2
Operations	3 – 17	15
Reclamation and Closure	18 – 19	2
Post-Closure	20 – 34	15

The temporal characteristics of noise and vibration are expected to change throughout phases of the Project, thus changes in the predicted noise and vibration effects at nearby receptors are also expected throughout the life of the Project. These changes are expected due to changes in operating equipment numbers and locations and the varying pit extents throughout the Project life.

For the purpose of this assessment, the Project phase with the predicted worst-case operating scenario(s) for noise and vibration effects were used. The worst-case operating scenario was determined based on the anticipated operating equipment counts, types, and proximity to the receptor VCs. In addition, the active pit extents of the Project were factored into this decision process. Through investigating these parameters for all Project phases, it was determined that operational Year 10 of the Project is the worst-case year for noise and vibration effects from the Project on surrounding sensitive receptors (excluding aquatic receptor AQR1, which was assessed against Year 4 Blasting Operations; further details on this are provided in Section 7.5). Year 10 will have the greatest counts and operating hours for mobile equipment of all Project Years, and the equipment will be located closer to several receptors than in other Project Years. Applying a conservative approach (i.e., assessing the year[s] with the expected greatest impacts from noise and vibration) ensures Project-related noise and vibration levels during other Project phases, along with the resulting environmental effects, are not underestimated.

7.2.3.3 Administrative Boundaries

Administrative boundaries represent limitations imposed on the assessment due to political, economic, and social constraints (EAO, 2013). Applicable international, federal, provincial, and municipal legislation and guidance documents related to noise and vibration summarized in Section 7.1.1 were used to determine the administrative boundaries for this assessment.

Noise impacts were determined at nearby receptors and throughout the Acoustic LSA for daytime and nighttime periods (0700 – 2200 and 2200 – 0700, respectively) during summertime weather conditions, as per the British Columbia Noise Control Best Practices Guideline (B.C. OCG Guideline; B.C. OCG, 2018).

7.2.3.4 Technical Boundaries

Technical boundaries represent constraints imposed on the assessment due to limitations in the ability to predict the effects of the Project (EAO, 2013). Noise propagation modelling is a tool that is used for determining noise effects from the Project. The modelling is based on ISO standards, and similar to other prediction and modelling methods, there are inherent uncertainties associated with this prediction

methodology for noise. For the purposes of this assessment, notable levels of conservatism are built into the assessment methodology to minimize/eliminate under-prediction. Full details on modelling can be found in Section 5.1 of the Crown Mountain Coking Coal Project Noise and Vibration Assessment (the Noise and Vibration Assessment) (Appendix 7-A; Dillon, 2021).

For calculations of ground vibration and air overpressure associated with the Blasting Operations, site-specific parameters are used, which have inherent variability. Similar to the above, conservative assumptions are incorporated in the analysis to ensure that potential effects are not underestimated. Additional details for parameters and assumptions used for calculations can be found in Section 5.1 of the Noise and Vibration Assessment (Appendix 7-A; Dillon, 2021).

7.3 Regional and Local Overview

The area near and surrounding the Project is mainly used for recreational purposes, with the exception of a small number of seasonal dwellings around Grave Lake and a residential area on the Lower Elk Valley Road. Within the vicinity of the Project, current land uses include: residential; recreational (e.g., hunting, all-terrain vehicle [ATV] trails, fishing, hiking, etc.); exploration; resource; industrial; rangeland; agriculture; and forestry. Recreational fishers and campers were observed in the area at the time of undertaking the ambient noise monitoring program. Additional information on past and present land uses is provided Chapter 1, Section 1.3.2.

The acoustic environment in the area near the Project and surrounding the Acoustic LSA comprises natural noise sources (e.g., wind, birds, insects), and anthropogenic sources (e.g., residential; recreational; mining; forestry; transportation). Natural sources of ground vibration include volcanic occurrences and seismic events caused by movements along the edges of tectonic plates. The Project location occurs in a medium relative hazard zone for seismic activity (Natural Resources Canada, 2015), but earthquakes do occur in the area (Natural Resources Canada, 2020). The Project is a greenfield site in the East Kootenay, and is a combination of the Montane Spruce and Engelmann Spruce (Subalpine Fir) geoclimatic zones. Anthropogenic sources of background vibration may include seismic exploration for mining and oil and gas developments; quarrying and resource extraction; large trucks and earth-moving equipment; and timber harvesting and hauling.

Mining in the East Kootenay has been ongoing for well over a century, with coal being the dominant resource extracted in the area. There are several existing metallurgical coal mines in the Elk Valley and Crowsnest coal fields, including Teck's Elkview Operations at approximately 8 km southwest of the Project and the Line Creek Operations, at approximately 12 km north of the Project. Additionally, the Canadian Pacific (CP) mainline and the Sparwood/Elk Valley Airport are within the Acoustic LSA, which affect the acoustic environment near the Project. None of the above activities currently occur within the Project footprint or Acoustic LSA; however, these activities are present within the greater region in which the Project is located.

7.4 Existing Conditions

This section describes the existing conditions for the acoustic environment in and near the Acoustic LSA in sufficient detail to enable potential effects of Project related noise and vibration on the acoustic environment to be identified, understood, and assessed.

7.4.1 Existing Regional and Local Information

Existing local and regional noise and vibration data were compiled by conducting a desktop assessment of background information in the Project. Data sources included:

- Noise monitoring data from existing operations in the Project study areas (e.g., Teck's Elkview Operations); and
- Other baseline studies completed for projects in the region.

Noise monitoring was completed at six representative receptors in the vicinity of Teck's Elkview Operations in 2013 and 2015 by RWDI AIR Inc. (RWDI). The general acoustic environment at these receptors was made up of local residential activities, industrial activities associated with Elkview Operations, road and rail traffic, and sounds of nature (RWDI, 2015). Measured nighttime equivalent sound pressure levels (Leq) at these six receptors ranged from 36 to 53 A-weighted decibels (dBA), and measured baseline sound levels at all receptors were elevated above the anticipated B.C. OGC average ambient sound level (ASLs). Four of the six receptors were within 3 dBA of the average ASLs (RWDI, 2015), which is considered within the normal degree of variation in the outdoor environment (B.C. OGC, 2018).

RWDI also monitored vibration levels in Sparwood in spring 2014 during active blasting periods at the Elkview Operations. The minimum ground vibration level of 0.30 peak particle velocity (millimetres per second [mm/s]) recorded at the monitoring location along Michel Creek Road in Sparwood was above the ANSI S2.71-1983 standard whole-body vibration comfort level of 0.2 mm/s (RWDI, 2015). The maximum ground vibration level of 1.43 mm/s was well below the Ontario Ministry of Environment NPC-119 cautionary limit of 10 mm/s where vibration is expected to be noticed (RWDI, 2015). Existing vibration levels in 2014 may have been noticeable to humans present in the area, but were below levels where a high degree of annoyance or structural damage to homes would be expected to occur (RWDI, 2015).

Teck conducted vibration monitoring at two locations in Sparwood between October 2008 and June 2009. Vibration levels ranged from 0.03 mm/s to 1.47 mm/s with an average of 0.13 mm/s, also below the Ontario Ministry of Environment limit of 10 mm/s for human comfort. The vibration levels ranged from imperceptible to vibration levels that could trigger a human response, dependent on frequency and duration of the blast (RWDI, 2015). In 2018, Teck conducted vibration monitoring at three seismograph locations in Sparwood, all of which were below the U.S. Bureau of Mines limit for ground vibrations of 12.7 mm/sec and limit for air overpressure of 133 dBL (unweighted sound pressure level; Teck, 2019).

7.4.2 Baseline Program

7.4.2.1 Ambient (Baseline) Noise

Ambient baseline noise monitoring was performed for the Project in 2017 to determine current ambient noise levels at representative human receptors in the Acoustic LSA, as stipulated by the AIR and EIS Guidelines. The details of the ambient noise monitoring study and the results are outlined below. Further details on the ambient noise monitoring campaign can be found in Appendix A of the Noise and Vibration Assessment (Appendix 7-A; Dillon, 2021).

7.4.2.1.1 Monitoring Methodology

An ambient noise monitoring program was undertaken to establish ambient noise levels at selected representative receptors, including terrestrial wildlife receptor VCs. The program consisted of gathering hourly A-weighted sound level equivalents (i.e., Leq(A)) on a continuous basis at the nearest representative receptors. A-weighted decibels are defined as "the sound level as measured on a sound level meter using a setting that emphasized the middle frequency components similar to the frequency response of the human ear at levels typical of rural backgrounds in mid frequencies" (B.C. OCG, 2018). Six receptors locations were chosen, near residences, cabins, and campsites. The noise monitoring was conducted continuously for an eight-day period between August 21 and 28, 2017 (inclusive). Hourly equivalent sound pressure levels (i.e., 1-hour Leqs) were recorded.

The ambient noise monitoring program was completed by Dillon personnel using six Rion NL-22 Type II noise level meters. Measurement methodology was based on CAN/CSA-ISO 1996-1 and the Ontario Ministry of the Environment noise publication document NPC-103 (1978). The NL-22 noise meters were equipped with an environmental enclosure (i.e., inside a locked Pelican case), an external battery, an external microphone, and a wind screen to protect the microphone from wind and precipitation. The noise meters were either on the ground locked to a tree or hanging from a tree using a chain and lock, with the microphone hanging from a branch to prevent an animal from being able to reach the microphone. The typical set-up of the sound meters is shown in the photograph log in Appendix A of Appendix 7-A (Dillon, 2018). Each unit was laboratory calibrated prior to the monitoring period.

The noise meters were set up to log hourly Leq, as well as other statistical values of measured levels such as peak, minimum/maximum, and 90th percentiles (L90). Each monitoring period was at least 60 hours, with the shortest monitoring period being 66 hours (Receptors ML4 and ML6) and the longest monitoring period being 86 hours (Receptor ML5). The following information was recorded in the field when the equipment was set up, checked, and disassembled:

- Noise meter identifier;
- Start time;
- Location of the receptor placement including global positioning system (GPS) points;
- Record of conversations with residents;
- Explanation of selected receptor location;
- Audible sources observed nearby;
- Battery status and length of time recording (when checking and disassembling the meters);
- State of microphone and meter (dry or wet); and
- Stop time.

It is assumed that coal mining operations at Teck's Elkview Operations located 8 km southwest of the Project and Line Creek located 12 km north of the Project were ongoing during the ambient noise monitoring.

7.4.2.1.2 Monitoring Locations

The locations of the six ambient noise monitoring locations (ML1 to ML6) are presented in Figure 7.4-1. Descriptions of the monitoring locations are provided below.

Crown Mountain Coking Coal Project

Figure 7.4-1
Noise Receptor Locations

LEGEND

- Human Receptor Location
- Monitoring Location
- Acoustic Local Study Area
- Project Footprint
- Highway
- Arterial/Collector Road
- Local/Resource Road
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- British Columbia/Alberta Border

0 1.5 3
Kilometres

Scale 1:80,000

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 Landsat 8 (Aug 2018), and GeoBC Ortho Imagery (Aug 2016). Reference data from Province of British Columbia, GeoBC Open Data, Dillon Consulting Limited, Consultation.

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

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Project: 12-6231
Status: FINAL
Date: 2021-03-02

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Receptor 1 – Podrasky Cabin (ML1)

The noise meter was chained to the base of a tree, with the microphone hanging from a tree branch above. Due to occupants in the Podrasky Cabin at the time of the noise measurements, the meter was set up approximately 200 m from the cabin in order to minimize the noise interference from the cabin. This location was selected since it is the closest permanent residence to the proposed Project.

Receptor 2 – Elk Valley Mountaineers Snowmobile Cabin (ML2)

The noise meter was chained to the base of a tree, with the microphone hanging from a tree branch above. This location was selected since the snowmobile cabin is the only residence (seasonal or permanent) in the area and is in close proximity to the proposed Project.

Receptor 3 – Unofficial Campsite (ML3)

The noise meter was chained to the mid-section of a tree with the microphone sticking horizontally outside of the Pelican case. This location was selected to capture the ambient noise in the campsite area, which is adjacent to the proposed haul road (i.e., Grave Creek Road). There were no campers at the campsite during the noise meter set up or take-down, as well as when the meter was checked throughout the monitoring period.

Receptor 4 – Grave Lake Seasonal Dwellings (ML4)

The noise meter was chained to the base of a tree, with the microphone hanging from a tree branch above. This location was selected to capture the ambient noise near the Grave Lake Campground and Boat Launch, as well as it being in close proximity to the seasonal dwellings on the western side of Grave Lake. Attempts were made to set up the meter in the yard of one of the seasonal dwellings on the west side of Grave Lake; however, residents were either not home or did not give permission to set up the meter on their property. The Grave Lake Campground and Boat Launch was very busy at the time of the noise monitoring and there was a risk of tampering with the equipment if it was set up in the campground. Therefore, a discrete location in the forest across Grave Lake Road was chosen.

Receptor 5 – 5568 Lower Elk Valley Road (ML5)

The noise meter was chained to the mid-section of a tree in the backyard of 5568 Elk Valley Road, with the microphone hanging from a tree branch above. The microphone was hung from a branch higher up the tree to avoid the dog living at the residence from reaching it. There was a dog kennel on the adjacent property approximately 50 m east of the receptor. Attempts were made to find another yard in which to set up the meter (farther away from the kennel); however, residents were either not home or did not give permission to set up the meter on their property. This location was selected to capture the ambient noise in the residential area on Lower Elk Valley Road.

Receptor 6 – 8882 Hidden Springs Road (ML6)

The noise meter was chained to the base of a tree, in the backyard of 8882 Hidden Springs Road, with the microphone hanging from a tree branch above. The microphone was hung from a branch higher up the tree to avoid the dog living at the residence from reaching it. This location was selected to capture the ambient noise in the residential area on Hidden Springs Road and Lower Elk Valley Road.

7.4.2.1.3 Additional Representative Human Receptors (Receptor 7 – Receptor 12)

A total of six additional representative human receptors (R7 through R12) were brought to the attention of Dillon after the initial ambient noise monitoring campaign was completed. These receptors include an unofficial campsite, a trapline cabin, private cabins, and representative locations for possible Indigenous seasonal dwellings as identified by the Ktunaxa Nation Council (KNC).

As these receptors were not identified during the initial (2017) ambient noise monitoring campaign, background sound level measurements at these locations were not taken. It was assumed that the results from the closest ambient monitoring locations to the new receptor locations would be applicable. The associated monitoring locations (ML1 to ML6) and additional representative human receptors (R7 to R12) are shown in Table 7.4-1 and Figure 7.4-1.

Table 7.4-1: Associated Noise Monitoring Locations with New Receptors

Monitoring Location ID	Associated Human Receptor ID(s)
ML1	R1, R10
ML2	R2, R9, R11, R12
ML3	R3, R8
ML4	R4
ML5	R5, R7
ML6	R6

7.4.2.1.4 Ambient Noise Monitoring Results

The gathered noise data during the initial ambient noise monitoring campaign conducted at receptors ML1 to ML6 in August 2017 were analyzed for average, maximum, and minimum A-weighted equivalent sound level (Leq(A)) and A-weighted sound level exceeded 90% of the time (L90, generally representing background noise), for both daytime hours (0700 to 2200) and nighttime hours (2200 to 0700). These results are summarized in Table 7.4-2 and Table 7.4-3. No relevant data gaps were identified based on the ambient noise monitoring results. The monitoring location IDs (ML1 to ML6) presented in these tables align with the additional receptor IDs presented in Table 7.4-3 for receptors R1 through R6. For the additional receptor IDs R7 through R12 in Table 7.4-3, the ambient noise monitoring results of the closest monitoring location were assumed to be applicable for these receptors.

Table 7.4-2: Average Measured Leq Levels (dBA)

Monitoring Location ID	Associated Human Receptor ID(s)[3]	Measured Hourly Sound Pressure Levels (dBA)[4]	
		Daytime[1]	Nighttime[2]
		Leq avg	Leq avg
ML1	R1, R10	38	37
ML2	R2, R9, R11, R12	47	47
ML3	R3, R8	47	46
ML4	R4	36	29
ML5	R5, R7	49	40

Monitoring Location ID	Associated Human Receptor ID(s)[3]	Measured Hourly Sound Pressure Levels (dBA)[4]	
		Daytime[1]	Nighttime[2]
		Leq avg	Leq avg
ML6	R6	46	44

Notes:
[1] Daytime hours are between 0700 and 2200.
[2] Nighttime hours are between 2200 and 0700.
[3] Receptor IDs R7 – R12 were assumed to have similar acoustic environments to the nearest ML.
[4] Sound pressure levels have been rounded to the nearest whole number. dBA = A-weighted decibels; Leq = equivalent sound level.

Table 7.4-3: Representative Human Receptor Descriptions

Receptor ID	Location (UTM Coordinates)	Description of Receptor
R1	11 U, 5514686 mN, 664397 mE	Podrasky Cabin – Approximately 145 m east of the Alexander Creek Forest Service Road.
R2	11 U, 5521812 mN, 664578 mE	Snowmobile Cabin – Located off a small unnamed road which splits from the Alexander Creek Forest Service Road at a helipad.
R3	11 U, 5522250 mN, 656550 mE	Unofficial Campsite – A small campsite which is located approximately 85 m southwest of the Grave Creek Road/clean coal haul road.
R4	11 U, 5524777 mN, 655247mE	Grave Lake Seasonal Dwellings – Approximately 15 m west of Grave Lake Road.
R5	11 U, 5523283 mN, 652077mE	5568 Lower Elk Valley Road – Approximately 1.7 km west of the CN line and 600 m northwest of the end of the runway at the nearby Sparwood/Elk Valley Airport.
R6	11 U, 5518610 mN, 652190 mE	8882 Hidden Springs Road - Approximately 250 m northwest of the CN line and 3.15 km southwest of the runway at the nearby Sparwood/Elk Valley Airport.
R7	11 U, 5523456 mN, 653565 mE	KNC Crown Human Health Risk Assessment (HHRA) and Sensory Receptor 4 – A representative location of a possible Indigenous seasonal dwelling. Located approximately 35 m west of the section of Clean Coal Haul Road that runs south to the rail loadout area.
R8	11 U, 5521874 mN, 657441 mE	Unofficial Campsite – A small campsite located approximately 1 km southeast of R3 and 65 m southwest of the Grave Creek Road/clean coal haul road.
R9	11 U, 5524619 mN, 661584 mE	Trapline Cabin – A private cabin located approximately 740 m northwest of the explosives storage facility of the Project.
R10	11 U, 5515971 mN, 664191 mE	KNC Crown HHRA and Sensory Receptor 10 – A representative location of a possible Indigenous seasonal dwelling. Located approximately 550 m south of the southernmost extent of the Project.
R11	11 U, 5521454 mN, 664764 mE	Cabin – A cabin located approximately 760 m east of the eastern extent of the Project and 400 m southeast of R2. Receptor location was identified by Sparwood Fish and Wildlife.

Receptor ID	Location (UTM Coordinates)	Description of Receptor
R12	11 U, 5521139 mN, 664863 mE	Cabin – A cabin located approximately 780 m east of the eastern extent of the Project and 730 m southeast of R2. Receptor location was identified by with Sparwood Fish and Wildlife.

7.4.2.1.5 Permissible Sound Level Determination

The permissible sound level (PSL) was calculated for each representative human receptor locations ML1 to ML6. The cumulative noise impact at each representative human receptor from regular operations associated with the Project will be logarithmically summed with the ASL to determine the Application Case Sound Level (i.e., background or baseline noise levels in addition to the noise levels arising from the Project), which will then be compared against the PSLs presented in Table 7.4-4 to determine compliance or the need for implementation of noise mitigation measures.

Table 7.4-4: Daytime and Nighttime Ambient Sound Levels (ASLs) and Permissible Sound Levels (PSLs) (dBA) for Representative Human Receptors in the Acoustic LSA

Monitoring Location ID	Associated Representative Human Receptor ID(s)[3]	Daytime[1] ASL (dBA)	Daytime[1] PSL (dBA)	Nighttime[2] ASL (dBA)	Nighttime[2] PSL (dBA)
ML1	R1, R10	45	50	35	40
ML2	R2, R9, R11, R12	55	60	45	50
ML3	R3, R8	55	60	45	50
ML4	R4	39	44	29	34
ML5	R5, R7	48	53	38	43
ML6	R6	53	58	43	48

Notes:
[1] Daytime hours are between 0700 and 2200.
[2] Nighttime hours are between 2200 and 0700.
[3] Receptor IDs R7 – R12 were assumed to have similar acoustic environments to the nearest ML.

7.4.2.2 Vibration

Baseline vibration levels were not assessed as there are no known sources of vibration within the Project footprint and the Project is located in an area of moderate seismic activity.

7.5 Project Effects Assessment

The assessment of the environmental effects of the Project on the acoustic environment (as characterized by changes in ambient noise levels and vibration levels) is discussed in the sections below.

7.5.1 Thresholds for Determining Significance of Residual Effects

For the purposes of this assessment, the thresholds for effects resulting from the Project that may result in changes to noise and vibration levels for human and wildlife receptors in the acoustic environment are derived from a combination of provincial and federal guidelines/standards including:

- British Columbia Oil and Gas Commission Noise Control Best Practices Guideline (B.C. OGC, 2018);

- Health Canada Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise (Health Canada, 2017);
- Ontario Ministry of the Environment Noise Pollution Control (NPC) – 119 (Ontario Ministry of Environment, 1985);
- Environment Canada Environmental Code of Practice for Metal Mines (ECPMM; Environment Canada, 2009),
- Effects of Simulated Jet Aircraft Noise on Heart Rate and Behaviour of Desert Ungulates (Weisenbeger et al., 1996); and
- The Department of Fisheries and Oceans (DFO) Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters (Wright and Hopky, 1998).

Of note, noise and vibration impact criteria for wildlife receptors are less thorough than those for representative human receptors.

In consideration of the above, a significant adverse residual environmental effect on the acoustic environment arising from noise and vibration caused by the Project is one that exceeds the human receptor thresholds listed in Table 7.5-1 and/or the wildlife receptor thresholds in Table 7.5-2, as follows:

Table 7.5-1: Human Receptor Thresholds

Criteria	Description	Source	Threshold
Permissible Sound Level (PSL)	A sound level that is expected not to disturb normal sleep patterns; takes into account the existing noise environment at the receptor.	B.C. OCG Guideline (2018)	Unique to each receptor[1]
Δ % HA	Indicator of change in human annoyance level to noise impacts.	Health Canada (2017)	6.5%
L_{dn}	Day-night sound level from Project that demands mitigation requirements.	Health Canada (2017)	75 dBA
Daytime Noise Emissions	Daytime sound level from Project that is not expected to cause disturbances for residences near mine site.	ECPMM (2009)	55 dBA
Nighttime Noise Emissions	Nighttime sound level from Project that is not expected to cause disturbances for residences near mine site.	ECPMM (2009)	45 dBA
Ground Vibration Limit - Receptor	Vibration level from blasting, in terms of peak particle velocity, which is expected to be noticeable.	Ontario Ministry of the Environment (1985)	10 mm/s
Air Overpressure	Noise level from blasting, in terms of air overpressure, which is expected to cause annoyance.	Ontario Ministry of the Environment (1985)	120 dBL

Note:
[1] Additional details on the determination of the PSLs for the representative human receptors are provided in Section 7.4.2.1.5.

Table 7.5-2: Wildlife Receptor Thresholds

Criteria	Description	Source	Threshold
Daytime Noise Emissions	Daytime sound level from Project that is not expected to cause disturbances for wildlife.	ECPMM (2009)	55 dBA
Nighttime Noise Emissions	Nighttime sound level from Project that is not expected to cause disturbances for wildlife.	ECPMM (2009)	45 dBA
Offsite Peak Noise Level, L_{peak} – At Wildlife Receptor	Threshold for peak noise level (L_{peak}) from blasting at wildlife receptors that is expected to cause disturbed habitat.	Weisenberger et al. (1996)	108 dB
Overpressure – At Aquatic Receptor	Threshold for overpressure (kilopascal/ pounds per square inch [kPa/psi]) level that can cause damage to fish.	Wright and Hopky (1998)	100 kPa/14.5 psi
Vibration Limit - At Aquatic Receptor	Maximum vibration level from blasting, in terms of peak particle velocity, which should not be exceeded at fish spawning bed.	Wright and Hopky (1998)	13 mm/s

7.5.2 Project Effects Assessment

Activities and components associated with the Project, specifically Continuous Operations and Blasting Operations, have the potential to cause adverse changes to the acoustic environment from Project related noise and vibration at both human and wildlife receptors nearby, as defined in Section 7.2.3. This assessment focuses only on planned activities within the designed scope of the Project. Effects related to unplanned events (e.g., spills, equipment malfunctions, or accidents) are presented in Chapter 21.

7.5.2.1 Project Interactions

Project activities during the Construction and Pre-Production, Operations, Reclamation and Closure, and Post-Closure phases have the potential to result in noise and/or vibration that may lead to adverse effects on human and wildlife receptors. Key Project activities that are expected to result in noise and vibration, with the potential for adverse effects on receptors, are presented in Table 7.5-3. For further details on Project activities and components, refer to Chapter 3.

Table 7.5-3: Project-Acoustic Environment Interaction Matrix and Ranking

Project Phase	Project Component	Description of Activities	Acoustic Environment
Construction and Pre-Production	Transportation	Use of Highway 43, Line Creek Mine Road, Valley Road, and Grave Creek Road by highway transport trucks, light duty vehicles, and crew busses to transport personnel, materials, and consumable items	II
	Logging of Merchantable Timber	Merchantable timber will be logged from the infrastructure and pre-production development footprint	II
	Clearing and Grubbing	After the merchantable timber has been removed, the remaining vegetation will be cleared and grubbed from the infrastructure and pre-production development footprint	II

Project Phase	Project Component	Description of Activities	Acoustic Environment
	Stockpiling Wood Waste	Wood waste will be stockpiled on site and used for reclamation as a source of coarse woody debris	I
	Quarry for Construction Materials	Excavation of road bed materials from the North Pit footprint for use on Grave Creek Road	II
	Water Management or Water Management Structures	Water management structures to support initial construction activities will be built prior to soil being salvaged from the run of mine (ROM) and plant site	II
		Interim Sediment Pond will be built prior to the soil removal and stockpiling from the pit access road and initial phase of the North Pit	I
		Grave Creek Reservoir will be constructed to act as a back-up source of process water	II
	Soil Salvage	Soil will be salvaged from the footprint of the infrastructure	I
	Road Upgrading and Construction	Branch C Road will be widened and upgraded to facilitate construction and mine traffic to plant site area	II
		Grave Creek Road will be widened to facilitate the clean coal haul	II
		A new road will be constructed off the Valley Road to access the rail loadout for construction and operation	II
	Linear Infrastructure	Installation of the powerline	II
		Installation of the natural gas line	II
	Overland Conveyor	Clearing, grubbing, and construction of overland conveyor from the plant site to Grave Creek Road	II
		Excavating and pouring of foundation	II
	Coal Handling Process Plant Construction	Transportation of materials and personnel to site	I
		Constructing of the Coal Handling Process Plant (CHPP)	I
		Commissioning of the CHPP	I
		Excavating and pouring of foundations	II
	Workshop / Mine Dry Construction	Transportation of materials to site	I
		Construction of workshop / mine dry	I
		Equipment wash bay and heavy equipment parking	I
		Administration, first aid, and mine dry building	I
		Diesel tank farm	I
		Warehouse	I

Project Phase	Project Component	Description of Activities	Acoustic Environment
		Potable water system	I
		Septic system	I
		Water supply pipelines from Grave Creek and West Alexander Creek	I
		Commissioning of the facilities	I
	Explosives Factory Construction	Construction of the explosives factory	I
	Rail Loadout Construction	Excavation and preparation of the rail bed	II
		Excavation and preparation of foundation stockpiling and coal handling systems	I
		Transportation of materials and personnel to site	I
		Construction of rail loadout	I
		Connection to the CP Fording Sub-line	I
		Commissioning of the rail loadout	I
	Labour	Hiring of personnel for the mine, CHPP operations, administration, and coal haul	I
		Training of personnel	I
	Construction Waste Materials	Collection and transfer to a recycling facility or other approved facility	I
Operations	Transportation	Use of Highway 43, Line Creek Mine Road, Valley Road, and Grave Creek Road by highway transport trucks, light duty vehicles, and crew busses to transport personnel, materials, and consumable items	II
	Explosives Factory	Ammonium nitrate / emulsion storage facilities which have the ability to load explosive agents into delivery trucks	I
		Wash facility to decontaminate the bulk explosive delivery trucks	I
		Storage of explosives (detonators and boosters)	I
	Fuel Storage	Receiving bulk fuel deliveries	I
		On-site storage of fuel	I
		Dispensing fuel	I
		Transferring fuel to on-site delivery trucks	I
	Mine Roads Development	Building roads from material sourced on-site	I
		Progressive clearing	I
	Mining	Removal of unconsolidated material	I
		Loading, hauling, and stockpiling of soil	I
		Drilling and loading of blastholes	I

Project Phase	Project Component	Description of Activities	Acoustic Environment
		Detonating the explosives	II
		Loading, hauling, and dumping of mine rock	II
		Loading, hauling, and stockpiling of coal	II
	Site Water Requirements	Using contact water as the primary process make-up water from Interim Sediment Pond (Year 1 to 5)	I
		Using contact water as the primary process make-up water from the North Pit (Year 5 to 15)	I
	Coal Processing	Backup reservoir in Grave Creek as a secondary source of process make-up water	I
		Run of mine coal sizing	I
		Washing coal	I
		Mechanical and thermal drying of coal	I
		Coal reject disposal (part of loading, hauling, and dumping of mine rock activities)	II
		Conveying clean coal	I
	Sewage Treatment	Sewage will be treated by a septic system constructed at the plant site which will support the administration, mine dry, and CHPP facilities	I
	Main Sediment Pond	Construction of Main Sediment Pond in Year 4	I
		Management of the Main Sediment Pond discharge	I
	Reclamation	Reclaiming available areas as soon as possible to achieve reclamation objectives	I
Reclamation and Closure	Transportation	Use of Highway 43, Line Creek Mine Road, Valley Road, and Grave Creek Road by highway transport trucks, light duty vehicles, and crew busses to transport personnel, materials, and consumable items	II
	Dismantling Infrastructure and Buildings	Dismantling of the CHPP, maintenance facilities, administration, and other facilities	I
		Dismantling, salvaging, collecting, and transferring materials to a recycling facility or other approved facility	I
	Removal of Linear Infrastructure	Removal of the powerline	I
		Removal of the natural gas line	I
	Reclamation	Reclaiming available areas as soon as possible to achieve reclamation objectives	I
	Monitoring	Reclamation monitoring	I
		Geotechnical monitoring	I
		Aquatic effects monitoring	I

Project Phase	Project Component	Description of Activities	Acoustic Environment
	Water Management	Management of the Main Sediment Pond discharge	I
Post-Closure	Water Management	Decommissioning the Main Sediment Pond once water quality objectives have been met	I
	Road Use	Branch C Road will remain as a permanent access road for future commercial and recreational use	I
	Rail Line	The rail line will remain as a permanent feature	I
	Monitoring	Reclamation monitoring	I
		Geotechnical monitoring	I
		Aquatic effects monitoring	I

Notes (after EAO, 2013):
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.

In general, the Project has the potential to affect the acoustic environment, including the increased levels for noise and vibration, from equipment and mining activities that can result in potential sensory disturbance to noise receptors for human and wildlife receptors.

Specifically, the Project has the potential to adversely affect the acoustic environment, including noise and vibration levels, through various activities and the heavy equipment associated with each including:

- Logging merchantable timber as well as clearing and grubbing the infrastructure and pre-production development footprint;
  Construction of site specific components including wastewater management structures and the Grave Creek Reservoir, new roads, and upgrades to existing roads (i.e., Branch C Road and Grave Creek Road);
- Excavation and foundation work for site specific components including the workshop/mine dry, CHPP, and the rail bed;
- Transportation of personnel, materials, and consumable items using transport trucks, light duty vehicles, and crew busses; and
- Mining activities including the detonation of explosives and the loading, hauling, dumping, and stockpiling of mine rock and coal.

Potential effects on the acoustic environment as a result of the Project that are carried forward in the effects assessment for human and wildlife receptors are presented in Table 7.5-4. As noted in Table 7.5-3, potential effects on the acoustic environment, including noise and vibration, during the Reclamation and Closure and Post-Closure phases, were not carried through in the assessment due to limited activities in those phases affecting noise and vibration levels, and as such are not discussed further.

Table 7.5-4: Potential Effects of Noise and Vibration on the Acoustic Environment

Potential Effect	Rationale for Selection of Environmental Effect
Change to Acoustic Environment, including Noise and Vibration Levels, due to Construction and Pre-Production Activities	Potential for noise and vibration levels to be affected as a result of site clearing, excavation, and construction for infrastructure and pre-production development for the Project and the various equipment being used (i.e., transport trucks, coal haul trucks, dump trucks, etc.) and their predicted sound powers and mechanics.
Change to Acoustic Environment, including Noise and Vibration Levels, due to Operations Activities	Potential for noise and vibration levels to be affected as a result of transportation and mining activities including detonation of explosives, loading, hauling, dumping, and stockpiling mine rock and coal and the various equipment being used (i.e., transport trucks, coal haul trucks, dump trucks, etc.) and their predicted sound powers and mechanics.

7.5.2.2 Discussion of Potential Effects

The potential effects identified in Table 7.5-4 are discussed in the context of the Construction and Pre-Production and Operations phases in the following subsections.

7.5.2.2.1 Change to Acoustic Environment, including Noise and Vibration Levels, due to Construction and Pre-Production Activities

The initial Project phase will involve site preparation including logging merchantable timber and clearing and grubbing remaining vegetation for infrastructure and pre-production development for the Project. In addition, excavation of materials for the Grave Creek Road and the rail bed for the rail loadout (RLO) will be completed. Following site preparation, construction of site specific components, including the construction of water management structures, the Grave Creek Reservoir, and the excavation and pouring of foundation for the CHPP and workshop/mine dry will proceed. The inherent nature of the site preparation and construction activities listed above will affect the acoustic environment, including noise and vibration levels, in addition to the heavy equipment involved (i.e., backhoe, cement trucks, transport trucks, etc.) which emit additional noise and vibration based on their various predicted sound powers and mechanics. Note that transportation, including transportation of personnel, materials, and consumable items, will be discussed in the next section.

7.5.2.2.2 Change to Acoustic Environment, including Noise and Vibration Levels, due to Operations Activities

Mining operations including the detonation of explosives, and the loading, hauling, stockpiling, and dumping of coal and mine rock affect the acoustic environment, including noise and vibration levels due to the nature of the activities as well as the transportation of personnel, materials, and consumable items on various roads in and around the Project (i.e., Highway 43, Line Creek Mine Road, Valley Road, and Grave Creek Road).

7.5.2.3 Transboundary Effects

The Project is located approximately 5 km west from the Alberta border and 85 km north from the Montana border in the U.S. As discussed in Chapter 1, Section 1.3.3, the nearest federal lands to the proposed Project are the ?aq'am First Nation Bummer's Flat 1 Reserve (approximately 69 km southwest),

Stoney Nakoda Edan Valley 216 Reserve (approximately 70 km northeast), Tobacco Plains 2 (approximately 80 south), Piikani Nation Peigan Timber Limit 147B (approximately 52 km east in Alberta), and Parcels 73 and 82 of the Dominion Coal Blocks (approximately 20 and 40 km southwest, respectively). Federal land is not required to facilitate the Project and the Project does not overlap with any federal land.

Due to their distance from the Project and associated Project activities and components affecting noise and vibration, and since noise and vibration levels attenuate with increasing distance from their source such that they are not normally distinguishable from background within 2 to 3 km from the source, noise and vibration levels arising from the Project are not expected to be distinguishable from background levels in either the bordering province of Alberta, the bordering State of Montana, or on federal lands. As such, transboundary effects on the acoustic environment arising from noise and vibration from the Project are not expected to occur in either province or state or on federal lands.

7.5.3 Mitigation Measures

To reduce potential noise and vibration impacts, a range of site-specific Best Management Practices (BMPs) will be implemented over the course of the Project. Mitigation and BMPs to be implemented over the course of the Project will reduce the potential for noise-related disturbance, and include but are not limited to:

- Limit construction activities, especially those with high noise impact, to daytime hours;
- Appropriately time construction activities to minimize cumulative noise levels;
- Select equipment for construction activities that is appropriate for the task;
- Construction equipment, at a minimum, is fitted with standard noise-damping devices such as mufflers or enclosures, where possible;
- Discourage unnecessary idling of construction equipment;
- Perform regular vehicle maintenance and inspections on all Project equipment, including replacement of old and worn parts;
- Inform employees of noise impacts and potential mitigation/control measures through appropriate training;
- Install and maintain noise mitigation measures, where possible, on and around Project infrastructure. They may include silencers, acoustic louvers, and barriers;
- Notify nearby residents prior to construction activities that may generate significant noise for which mitigation may not be feasible. Appropriate scheduling and notification of nearby residents will help to minimise disruption. Residents will be notified prior to any activities that may cause disturbance. This will also be done for Blasting Operations;
- Collaborate with Indigenous land users. Develop a plan prior to construction to target measures that will reduce disruptions due to noise and vibration; and
- Implement the Noise Monitoring Program at representative nearby receptors to compare against the already established background noise levels and to confirm modelled noise level predictions at the receptor locations (see below for noise and vibration monitoring program).

The key sources of ground vibration are rail and Blasting Operations. Given the setback distances to nearby representative human receptors, rail operations are not expected to result in a notable ground vibration impact. Additionally, rail-induced ground vibration is not expected to have a significant impact on wildlife. For Blasting Operations, the following operational mitigation measures will be undertaken:

- Blasting will be conducted in batches when needed, a few times a week, rather than smaller, more frequent blasts;
- Blasting Operations will be conducted only by qualified explosives technicians that are trained and licensed to do so;
- The quantity of charge used per delay will not exceed 2,300 kilograms (kg) throughout the Project and the time delay will not be less than 25 milliseconds (ms); and
- NWP will coordinate with neighbouring mining operations to ensure that Blasting Operations do not coincide.

Mitigation measures proposed to reduce adverse effects to the acoustic environment are generally accepted, understood, and proven to effectively reduce adverse effects on the acoustic environment. Additional measures are outlined in the Noise and Vibration Management Plan (Chapter 33, Section 33.4.1.7). Given that changes in noise and vibration levels cannot be completely avoided, the overall effectiveness of the proposed mitigations to address changes to the acoustic environment, including noise and vibration levels, due to Construction and Pre-Production activities and Operations activities, are rated as moderate. Where mitigation measures do not or may not mitigate all effects or if there is a low level of confidence in their effectiveness, the effect was carried forward for further analysis of residual effects.

If monitoring indicates that the effectiveness of mitigation measures is lower than predicted, further mitigation may be required as per adaptive management strategies outlined in the Noise and Vibration Management Plan (Chapter 33, Section 33.4.1.7).

The key mitigation measures proposed to mitigate potential effects on the acoustic environment are summarized in Table 7.5-5. Anticipated residual effects that will be carried forward in the characterization of residual effects, significance, and likelihood and confidence are also outlined in Table 7.5-5.

7.5.4 Characterization of Residual Effects, Significance, Likelihood, and Confidence

The assessment of Project effects on the acoustic environment (as characterized by noise and vibration), was conducted by Dillon's qualified acoustics practitioners, and investigated potential noise and vibration impacts from the Project on nearby receptor VCs, including human and wildlife (both aquatic and terrestrial) receptors as required by the AIR. The characterization of residual effects presented below is based on the Noise and Vibration Assessment carried out by Dillon (Appendix 7-A; Dillon, 2021). A high level summary of the information presented in the modeling report is provided below. The results presented in the assessment are reflective of anticipated predicted worst-case noise emissions and vibration levels for the Project, and were compared against the relative federal and provincial guidelines/standards as well as baseline information and assessments conducted in 2017, refer to Section 7.4.2.

Table 7.5-5: Summary of Proposed Mitigation Measures related to the Acoustic Environment

Potential Effect	Key Mitigation Measures	Rationale	Applicable Project Phases	Effectiveness	Residual Effect
Change to Acoustic Environment, including Noise and Vibration Levels, due to Construction and Pre-Production Activities.	• Limit construction activities, especially those with high noise impact, to daytime hours; • Select equipment for construction activities that is appropriate for the task; • Regularly inspect and repair equipment as needed; • Utilize standard noise-dampening devices on construction equipment; • Discourage unnecessary idling of construction equipment; • Perform regular vehicle maintenance and inspections on all Project equipment, including, replacement of old and worn parts; • Inform employees of noise impacts and potential mitigation/control measures through appropriate training; • Install and maintain noise mitigation measures, where possible, on and around Project infrastructure; and • Notify near-by residents prior to construction activities that may generate significant noise for which mitigation may not be feasible.	• Timing construction activities for daytime hours where possible will reduce the period of disturbance, and minimize cumulative noise levels; • Regular inspection of vehicles and other combustion equipment allows for timely repairs and adjustments as required; and • Using noise mitigation measures on equipment and Project infrastructure reduces noise levels.	• Construction and Pre-Production	Moderate	Yes

Potential Effect	Key Mitigation Measures	Rationale	Applicable Project Phases	Effectiveness	Residual Effect
Change to Acoustic Environment, including Noise and Vibration Levels, due to Operations Activities.	• Regularly inspect and repair equipment as needed including the replacement of old and worn parts; • Utilize standard noise-dampening devices on construction equipment; • Install and maintain noise mitigation measures, such as silencers, acoustic louvers, and barriers where possible, on and around Project infrastructure; • Conduct blasting in batches to reduce frequency rather than in smaller, more frequent blasts; and • The quantity of charge used per delay will not exceed 2,300 kilograms (kg) throughout the Project and the time delay will not be less than 25 milliseconds (ms).	• Regular inspection of vehicles and other combustion equipment allows for timely repairs and adjustments as required; • Using noise mitigation measures on equipment and Project infrastructure reduces noise levels; and • Conducting blasting in batches will reduce disturbance due to frequency.	• Operations	Moderate	Yes

7.5.4.1 Summary of Noise and Vibration Modelling Results

Substantial noise and vibration sources associated with the Project potentially affecting nearby receptor VCs were split into two primary categories: Continuous Operations and Blasting Operations. Continuous Operations sources of noise and vibration associated with the Project include both fixed and mobile equipment associated with the CHPP, all equipment in the pit/mine rock areas/roads, the RLO area, and all coal transportation sources; refer to Section 6.0 of the Noise and Vibration Assessment (Appendix 7-A; Dillon, 2021) for full details (refer to Figure 7.5-1, Figure 7.5-2, and Figure 7.5-3). Blasting Operations sources of noise and vibration associated with the Project include the actual mining operation and detonation of explosives; refer to Section 6.0 of Appendix 7-A.

The changes in noise and vibration levels were assessed by quantifying predicted sound levels of the various Project components and activities and equipment involved, as well as computer-based modelling for baseline and Project interaction predictions; refer to Section 5.1 of Appendix 7-A for full details.

7.5.4.1.1 Representative Human Receptors

A total of 12 representative human receptors were identified for the assessment (Figure 7.4-1). These receptors are spread out across the Acoustic LSA and were chosen based on their proximity to the Project and its anticipated noise/vibration generating activities. Receptors R1 through R6 were identified in 2017 as part of the baseline noise monitoring program that was carried out by Dillon for the Project (Section 7.4.2). Receptors R7 through R12 were subsequently identified through consultation with Sparwood Fish and Wildlife, the KNC as part of the Human Health Risk Assessment (HHRA), and through land use/socio-economic studies and were therefore included in the assessment. Additional information can be found in Section 3.0 of Appendix 7-A.

Human Receptor Impacts from Continuous Operations

Noise impacts from Continuous Operations on human receptors were compared against various provincial and federal guidelines, as described in Sections 7.1.1 and 7.5.1. The first criterion against which these predicted noise impacts from the Project were compared was the B.C. OCG's PSLs (B.C. OGC, 2018), which is explained further in Section 7.4.2.1.5 and Appendix A of Appendix 7-A. This criterion, which is calculated based on the existing ambient noise environment of a given receptor and adjusted according to the B.C. OCG Guideline, is split into daytime and nighttime categories, with a greater emphasis on nighttime noise impacts.

Table 7.5-6 and Figure 7.5-4 provide the predicted sound levels at each of the 12 human receptor for daytime and nighttime periods. Additionally, sound level contours at a height of 1.5 m are provided for daytime and nighttime Continuous Operations in Figure 7.5-5 and Figure 7.5-6, respectively. As can be seen from the presented sound levels, there is little variation in the daytime and nighttime impacts at each receptor. This is because most Continuous Operations associated with the Project operate continuously during both daytime and nighttime hours, with the exception of certain clean coal haul road (Source IDs: DELIV_EX and DELIV_T) sources, which operate during daytime only.

662000

Overland Conveyor
CV_801
BN_801
CHPP Pad
AC_901
AC_601
AC_601_D
AC_602
AC_602_D
TB_920
PF_601
TH_601
EF_1
EF_2
TH_701
CHPP Building
CY_401
SV_401
SV_402
SC_401
FE_401
SC_402
SC_401
CF_402
CF_401
CV_102
EF_3
RB_101
SC_101
CV_101
Plant Feed Conveyor
Raw Coal Conveyor
Breaker Rejects Conveyor
FB_101
L_992K
Office
Rejects Conveyor
CV_701
Light Vehicle Shop
FL_TRK
FL_TRK

662000

Crown Mountain Coking Coal Project

Figure 7.5-1
Fixed Equipment Locations: CHPP Pad

LEGEND

- Point Source Location
- Building
- CHPP Pad
- Project Footprint
- Clean Coal Haul Road\Site Access
- Service Corridor
- Coal Process Plant Conveyor
- Coal Process Plant Duct
- Waste Dump
- Soil Stockpile Area
- Plant Site\ROM Stockpile Area
- Wetland

0 50 100
Metres

N W E S

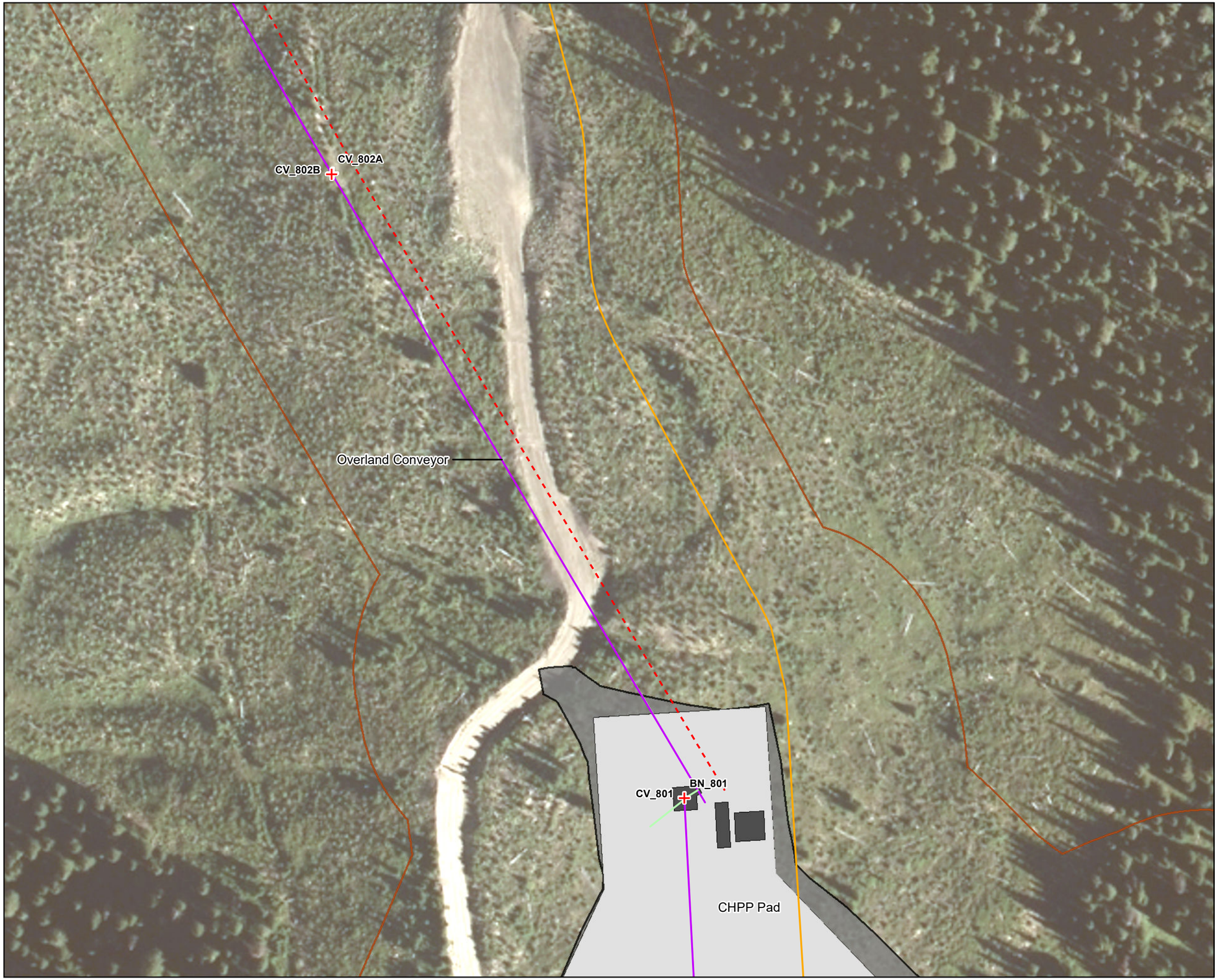
Scale 1:2,000

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: PR
Map Checked By: HEB
Map Coordinate System: NAD 1983 UTM Zone 11N

NWP Coal Canada Ltd

Project: 12-6231
Status: FINAL
Date: 2021-04-15



Crown Mountain Coking Coal Project

Figure 7.5-2
Fixed Equipment Locations: North of CHPP Pad

LEGEND

- Point Source Location
- Building
- CHPP Pad
- Project Footprint
- Clean Coal Haul Road\Site Access
- Service Corridor
- Coal Process Plant Conveyor
- Coal Process Plant Duct
- Plant Site\ROM Stockpile Area

0 10 20 30 40 50
Metres

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Scale 1:1,000

Map Drawing Information:
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Crown Mountain Coking Coal Project

Figure 7.5-3
Fixed Equipment Locations: Rail Loadout

LEGEND

- Point Source Location
- Building
- Rail Loadout\Stockpile Pad
- Project Footprint
- Rail Loadout Road
- Rail Loop
- Service Corridor
- Train Loadout Conveyor
- Clean Coal Stockpile and Truck Dump
- Loading Bin
- Additional Area
- Railway
- Watercourse
- Wetland

0 50 100 150 200
Metres

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Scale 1:5,000

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Crown Mountain Coking Coal Project

Figure 7.5-4
Human Receptor Noise Impacts: Continuous Operations

R7
Daytime: 47.7 dBA
Nighttime: 47.7 dBA

R5
Daytime: 36.3 dBA
Nighttime: 36.3 dBA

R6
Daytime: 23.8 dBA
Nighttime: 23.9 dBA

R4
Daytime: 32.2 dBA
Nighttime: 31.7 dBA

R3
Daytime: 45.6 dBA
Nighttime: 44.5 dBA

R8
Daytime: 45.0 dBA
Nighttime: 43.9 dBA

R9
Daytime: 43.3 dBA
Nighttime: 42.9 dBA

R2
Daytime: 29.1 dBA
Nighttime: 29.1 dBA

R11
Daytime: 31.5 dBA
Nighttime: 31.5 dBA

R12
Daytime: 34.1 dBA
Nighttime: 34.1 dBA

R10
Daytime: 40.8 dBA
Nighttime: 40.8 dBA

R1
Daytime: 36.6 dBA
Nighttime: 36.6 dBA

Musil Road
Lower Elk Valley Road
Grave Lake
Harriet Lake
Grave Creek Road
Grave Creek
Dalzell Creek
Elk River
43
Hammer Creek
West Alexander Creek
Alexander Creek
Holley Road
SPARWOOD

652000 654000 656000 658000 660000 662000 664000 666000
5526000 5524000 5522000 5520000 5518000 5516000 5514000

LEGEND

- Human Receptor Location
- Project Footprint
- Channel to Ultimate Pond
- Clean Coal Haul Road\Site Access
- Explosive Storage Access\Facility Road
- Rail Loadout Road
- Rail Loop
- Service Corridor
- Coal Process Plant Conveyor
- Coal Process Plant Duct
- Train Loadout Conveyor
- Waste Dump
- Mined Area
- Clean Coal Stockpile and Truck Dump
- Overflow Coal Stockpile
- Soil Stockpile Area
- Explosive Storage Facility\Pad
- Loading Bin
- Plant Site\ROM Stockpile Area
- Powerline-Site Power
- Water Reservoir
- Main Sediment Pond
- Dam
- Spillway
- Diversion Ditch
- Clearing
- Additional Area
- Contingency Area
- Highway
- Arterial/Collector Road
- Local/Resource Road
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- British Columbia/Alberta Border

0 1 2
Kilometres

N W E S

Scale 1:50,000

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Crown Mountain Coking Coal Project

Figure 7.5-5
Daytime Noise Contours: Continuous Operations
Grid Height = 1.5 m

LEGEND

- Human Receptor Location

Nighttime Noise Contours

- 35 ≤ ... < 40 dBA
- 40 ≤ ... < 45 dBA
- 45 ≤ ... < 50 dBA
- 50 ≤ ... < 55 dBA
- 55 ≤ ... < 60 dBA
- 60 ≤ ... < 65 dBA
- 65 ≤ ... < 70 dBA
- 70 ≤ ... < 75 dBA
- 75 ≤ ... < 80 dBA
- 80 ≤ ... < 85 dBA
- 85 ≤ ... < 90 dBA
- 90 ≤ ... < 95 dBA

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

0 1 2 3
Kilometres

N W E S

Scale 1:55,000

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Crown Mountain Coking Coal Project

Figure 7.5-6
Nighttime Noise Contours: Continuous Operations
Grid Height = 1.5 m

LEGEND

- Human Receptor Location

Nighttime Noise Contours

- 35 ≤ ... < 40 dBA
- 40 ≤ ... < 45 dBA
- 45 ≤ ... < 50 dBA
- 50 ≤ ... < 55 dBA
- 55 ≤ ... < 60 dBA
- 60 ≤ ... < 65 dBA
- 65 ≤ ... < 70 dBA
- 70 ≤ ... < 75 dBA
- 75 ≤ ... < 80 dBA
- 80 ≤ ... < 85 dBA
- 85 ≤ ... < 90 dBA
- 90 ≤ ... < 95 dBA

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

0 1 2 3
Kilometres

N W E S

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Table 7.5-6: Receptor Sound Levels (dBA) and Application Case Sound Levels (dBA) Compared to PSLs from Continuous Operations

Receptor ID	Point of Reception Description	Time of Day [1], [2]	Predicted Sound Level at Receptor (dBA) (L_{eq})	Application Case Sound Level (dBA) (L_{eq})[3]	PSL (dBA)	Application Case Less than PSL?
R1	Cabin	Daytime	36.6	45.6	50	Yes
		Nighttime	36.6	38.9	40	Yes
R2	Cabin	Daytime	29.1	55	60	Yes
		Nighttime	29.1	45.1	50	Yes
R3	Unofficial Campsite	Daytime	45.6	55.5	60	Yes
		Nighttime	44.5	47.8	50	Yes
R4	Seasonal Dwelling	Daytime	32.2	39.8	44	Yes
		Nighttime	31.7	33.6	34	Yes
R5	Residence	Daytime	36.3	48.3	53	Yes
		Nighttime	36.3	40.2	43	Yes
R6	Residence	Daytime	23.8	53	58	Yes
		Nighttime	23.9	43.1	48	Yes
R7	Representative location of a possible Indigenous seasonal dwelling	Daytime	47.7	51.4	53	Yes
		Nighttime	47.7	48.2	43	No
R8	Unofficial Campsite	Daytime	45	55.4	60	Yes
		Nighttime	43.9	47.5	50	Yes
R9	Cabin	Daytime	43.3	55.3	60	Yes
		Nighttime	42.9	47.1	50	Yes
R10	Representative location of a possible Indigenous seasonal dwelling	Daytime	40.8	46.4	50	Yes
		Nighttime	40.8	41.8	40	No
R11	Cabin	Daytime	31.5	55	60	Yes
		Nighttime	31.5	45.2	50	Yes
R12	Cabin	Daytime	34.1	55	60	Yes
		Nighttime	34.1	45.3	50	Yes

Notes:

[1] Daytime hours are between 0700 and 2200.

[2] Nighttime hours are between 2200 and 0700.

[3] Application Case Sound Levels represent the logarithmic sum of the PSL and the ASL (see Section 7.4.2.1.5) (B.C. OGC, 2018).

For the 12 representative human receptors investigated for the assessment, the predicted sound levels from Continuous Operations during daytime hours are less than their respective PSLs. The receptor with the greatest daytime predicted sound level from Continuous Operations is R7 with a daytime predicted sound level of 47.7 dBA from the Project alone (Table 7.5-6). This resulted in an Application Case (baseline in addition to Project noise level, refer to Section 7.4.2.1.5) daytime sound level of 51.4 dBA, which is less than the daytime PSL of 53 dBA. This receptor is located northwest of the RLO and approximately 37 m west of the clean coal haul road. The primary noise sources that impact this receptor are the coal haul trucks (Source IDs: HT_F and HT_E), and secondarily are various equipment associated with the RLO. Despite this being the human receptor with the highest predicted daytime sound level from Continuous Operations, this sound level is comparable to being 1 m away from a household refrigerator (FCM/RAC, 2013).

With respect to nighttime impacts from Continuous Operations, the Application Case predicted sound levels at R7 and R10 were determined to be greater than their respective PSLs. The Application Case nighttime sound levels at R7 and R10 were calculated to be 48.2 dBA (5.2 dBA in excess of the PSL of 43 dBA) for R7 and 41.8 dBA (1.8 dBA in excess of the PSL of 40 dBA) for R10, respectively. As previously mentioned, for R7, the primary noise sources that impact this receptor are the coal haul trucks. At R10, which is located approximately 565 m south of the eastern side of the Project footprint, the primary contributors to noise impacts are dump trucks (Source IDs: EDT_830E5), specifically, the Komatsu 830E5 electric dump trucks located northwest of the Main Sediment Pond, as shown by Figure 1.2-2 in Chapter 1, Section 1.2.

As described in the B.C. OCG guideline (B.C. OGC, 2018), "If a well or facility operation is found to exceed the PSL, the permit holder should provide both a detailed noise control mitigation plan and a timeline as to when adherence to the PSL will be achieved." Based on this, noise mitigation measures for these two receptors are required. However, receptors R7 and R10 are both considered "a representative location of a possible Indigenous seasonal dwelling". As such, there are currently no dwellings at these two locations.

NWP will remain in communication with Indigenous land-users to better understand their potential use of these locations and what, if any, mitigations might be appropriate in the future. It is recommended to postpone developing specific mitigation measures for each of these receptors until such time as these locations, or locations in the vicinity of the receptors, become occupied. This will allow for the development of a location-specific mitigation plan which will effectively target problem noise sources if they occur and provide sufficient mitigation to meet the applicable criteria. Development of mitigation measures (if required) post-occupancy also eliminates the possibility of creating access issues for the subject lands (e.g., barriers or berms reducing/block access to the areas).

In addition to the criteria for noise impacts prepared by the B.C. OCG, Health Canada (2017) has two metrics for quantifying noise impacts and determining if mitigation is required: the change in percent highly annoyed (Δ HA %) and the equivalent day-night sound level (L_{dn}). Further details on the determination of these two metrics are provided in Appendix B of the Noise and Vibration Assessment (Appendix 7-A; Dillon, 2021).

The results presented in Table 7.5-7 indicate that the Health Canada (2017) criteria for noise impacts at human receptors from Project-related noise are met at all receptors identified in the Assessment. The human receptor R10 was determined to have the closest Δ% HA and L_{dn} to the respective criteria. This is associated with the proximity of this receptor to the operations in the South Pit and the fact that this receptor is otherwise located in a rural setting (i.e., low ambient noise levels), and therefore the determination of its Δ% HA and L_{dn} required a rural area adjustment, as shown in Appendix B of Appendix 7-A.

Table 7.5-7: Change in % Highly Annoyed (**Δ**% HA) and Daily-Night Sound Levels (Ldn) Compared Against Applicable Health Canada Criteria

Receptor ID	**Δ**% HA	**Δ**% HA > 6.5%?	L_{dn} (dBA)[1]	L_{dn} > 75 dBA?
R1	2.8	No	63.0	No
R2	0.1	No	59.7	No

Receptor ID	Δ% HA	Δ% HA > 6.5%?	L_{dn} (dBA)[1]	L_{dn} > 75 dBA?
R3	2.4	No	61.8	No
R4	1.4	No	59.6	No
R5	0.3	No	61	No
R6	0.0	No	58.1	No
R7	3.4	No	63.6	No
R8	2.2	No	61.6	No
R9	1.5	No	61.2	No
R10	6.1	No	65.3	No
R11	0.1	No	59.8	No
R12	0.2	No	59.9	No

The Environment Canada Environmental Code of Practice for Metal Mines (ECPMM, 2009) also provides guidance for noise impacts from facility noise on nearby receptors. Specifically, the ECPMM recommends that daytime and nighttime noise impacts from residences not exceed 55 dBA and 45 dBA, respectively. As can be seen from the predicted sound levels presented in Table 7.5-6 and Figure 7.5-4, no receptors are expected to experience daytime sound levels from the Project above 55 dBA from Continuous Operations. For nighttime impacts, R7 is expected to exceed the ECPMM noise criterion of 45 dBA. This would result in a trigger for implementing noise mitigation measures; however, as previously discussed, this receptor is a representative location of a possible dwelling and it is recommended that mitigation options be deferred for the time being and investigated if/when a residence is established in this location or the surrounding area.

Human Receptor Impacts from Blasting Operations

Two parameters are used for quantifying vibration impacts from blasting on representative human receptors: ground vibration level (typically reported in mm/s) and air overpressure (in linear dBL). Table 7.5-8 presents the results for the Blasting Operations noise and vibration impacts on human receptors. The calculations used to determine these impacts are provided in Appendix C of the Noise and Vibration Assessment (Appendix 7-A; Dillon, 2021).

Table 7.5-8: Human Receptor Blasting Operations Impacts Compared to Applicable Criteria

Receptor ID	Distance Between Receptor and Blast (m)	Max Charge per Delay (kg)	Ground Vibration Level - PPV (mm/s)	Vibration level > 10 mm/s?	Air Overpressure (dB)	Air Overpressure > 120 dBL?
R1	2738	2300	0.8	No	101	No
R2	1711	2300	1.58	No	106	No
R3	7192	2300	0.2	No	92	No
R4	9535	2300	0.13	No	90	No
R5	11735	2300	0.1	No	88	No
R6	10877	2300	0.11	No	89	No
R7	10416	2300	0.11	No	89	No

Receptor ID	Distance Between Receptor and Blast (m)	Max Charge per Delay (kg)	Ground Vibration Level - PPV (mm/s)	Vibration level > 10 mm/s?	Air Overpressure (dB)	Air Overpressure > 120 dBL?
R8	6229	2300	0.24	No	94	No
R9	4884	2300	0.35	No	96	No
R10	1435	2300	2.04	No	108	No
R11	1498	2300	1.92	No	107	No
R12	1400	2300	2.11	No	108	No

As the results indicate, with the upper limit of 2,300 kg (maximum charge per delay), the representative human receptors identified in the assessment are in compliance with the respective criteria for both ground vibration and air overpressure.

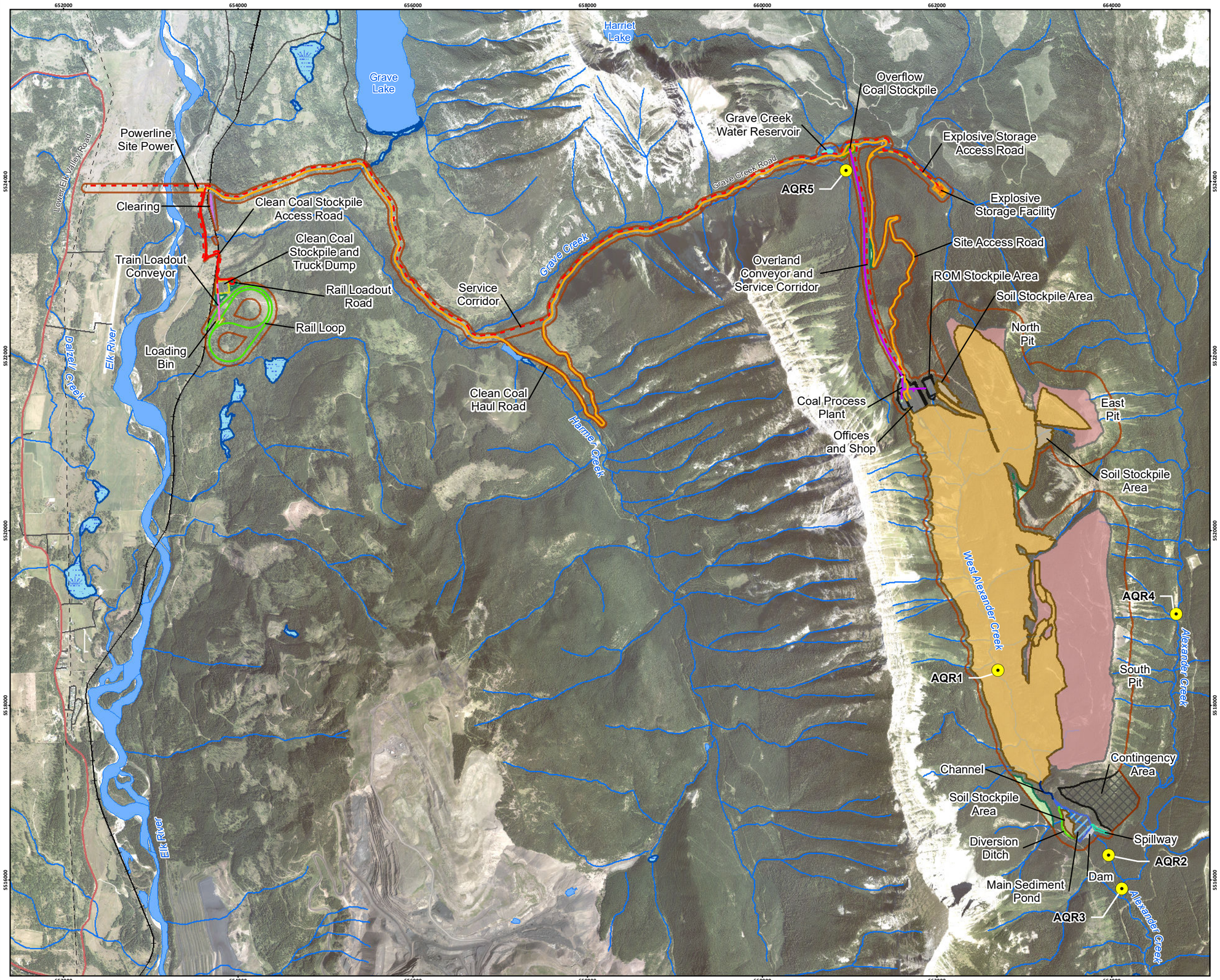
Although the predicted levels are well below the applicable criteria for ground vibration and overpressure, the loud instantaneous blast noise will likely be audible at the representative human receptors. Also, the ground vibration will likely be felt at the receptors. As such, steps outlined in the Noise and Vibration Management Plan (Chapter 33, Section 33.4.1.7) will be undertaken by NWP to notify residences and manage potential complaints from nearby receptors.

7.5.4.1.2 Wildlife Receptors

There are numerous species of terrestrial wildlife that exist in the areas surrounding the Project that could be affected by Project-related noise and vibration arising from Continuous Operations, as identified by the receptor VC list in Table 7 of the AIR (EAO, 2013). Several of the terrestrial wildlife receptor VCs (i.e., small amphibians to large mammals) are expected to have seasonal movement patterns throughout the area surrounding the Project. As such, an area-based approach for determining noise impacts of Continuous Operations on terrestrial wildlife receptors was undertaken for this assessment since specific point locations is not feasible, unlike in the case of human receptors (i.e., at residences, seasonal dwellings, campground, cabins, etc.). The area-based approach consisted of developing noise level contours in the areas surrounding the Project, with areas between contours depicting certain ranges of noise levels associated with the Project operations.

For determining noise (air overpressure) and ground vibration effects on terrestrial wildlife receptors due to the Blasting Operations, levels are calculated at incremental setback distances from the pit (i.e., blast face), conservatively assuming no attenuation due to topography and pit depth. The incremental setback distances from the blast face range from 100 m to 2 km, in 100 m intervals up to 1 km from the blast face and at intervals of 500 m between 1 and 2 km from the blast face.

In addition to the terrestrial wildlife receptors presented above, impacts from Blasting Operations were also assessed at aquatic receptors in the areas surrounding the Project. These locations are all representative of possible fish spawning locations, and they are also located in the areas surrounding the pits associated with the Project (i.e., where significant amounts of blasting shall occur); refer to Figure 7.5-7.



Crown Mountain Coking Coal Project

Figure 7.5-7
Aquatic Receptor Locations

LEGEND

- Aquatic Receptor Location
- Project Footprint
- Channel to Ultimate Pond
- Clean Coal Haul Road\Site Access
- Explosive Storage Access\Facility Road
- Rail Loadout Road
- Rail Loop
- Service Corridor
- Coal Process Plant Conveyor
- Coal Process Plant Duct
- Train Loadout Conveyor
- Waste Dump
- Mined Area
- Clean Coal Stockpile and Truck Dump
- Overflow Coal Stockpile
- Soil Stockpile Area
- Explosive Storage Facility\Pad
- Loading Bin
- Plant Site\ROM Stockpile Area
- Powerline-Site Power
- Water Reservoir
- Main Sediment Pond
- Dam
- Spillway
- Diversion Ditch
- Clearing
- Additional Area
- Contingency Area
- Arterial/Collector Road
- Local/Resource Road
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- British Columbia/Alberta Border

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Additional information can be found in Section 3.0 of the Noise and Vibration Assessment (Appendix 7-A; Dillon, 2021).

Wildlife Receptor Impacts from Continuous Operations

Noise impacts across wildlife habitat areas surrounding the Project are presented in the form of noise level contours in Figure 7.5-8 and Figure 7.5-9 for daytime and nighttime, respectively. These contours represent expected noise impacts at a height of 1.5 m from the Continuous Operations in the surrounding areas of the Project. Following applicable legislation and guidelines, off-site daytime sound levels of 55 dBA and nighttime sound levels of 45 dBA will be targeted to reduce the likelihood of negatively affecting wildlife.

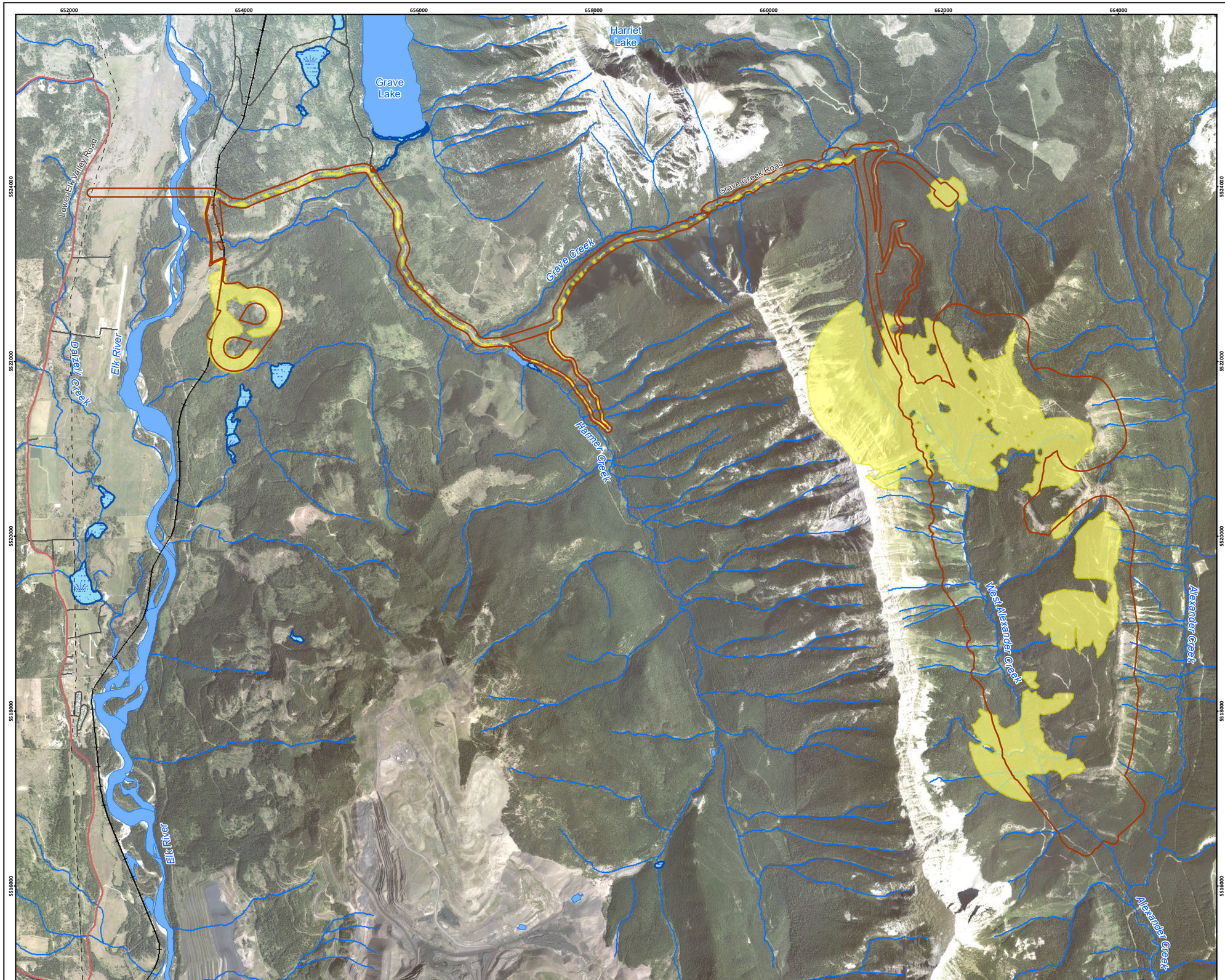
In Figure 7.5-8 (daytime impacts), the areas with sound levels of 55 dBA or greater are shown in light green. These results demonstrate that noise levels outside of the Project footprint greater than 55 dBA are primarily expected west of the CHPP and the southern end of the Mine Rock Storage Facility. Additionally, some smaller areas surrounding the RLO, the explosives storage facility, and south of the East Pit are expected to have sound levels of up to 55 dBA. In Figure 7.5-8 (nighttime impacts), the areas with sound levels of 45 dBA or greater are shown in purple. This figure demonstrates that a large area west of the CHPP/Mine Rock Storage Facility will experience nighttime sound levels greater than 45 dBA. Additionally, areas surrounding the RLO and the explosives storage facility, as well as between the East and South Pits, will have sound levels of 45 dBA or greater.

Wildlife Receptor Impacts from Blasting Operations

The determination of noise (air overpressure) and ground vibration on wildlife receptors associated with Blasting Operations was done through establishing peak levels at incremental distances from the blast face (pit area). Table 7.5-9 outlines the expected Blasting Operations impacts, in terms of L_{peak} (air overpressure, dBL) and vibration level (mm/s), at various setback distances from the pit extent (blast face).

Table 7.5-9: Terrestrial Wildlife Habitat Impacts from Blasting Operations

Receptor IDs	Distance to Blast Site in Pit (m)	Peak Noise Levels (L_{peak}, dB)	L_{peak} (Air Overpressure) > 108 dB?	Ground Vibration Level - PPV (mm/s)	Vibration level > 10 mm/s?
TR1	100	139	Yes	97.33	Yes
TR2	200	130	Yes	35.6	Yes
TR3	300	125	Yes	19.77	Yes
TR4	400	121	Yes	13.02	Yes
TR5	500	119	Yes	9.42	No
TR6	600	117	Yes	7.23	No
TR7	700	115	Yes	5.78	No
TR8	800	114	Yes	4.76	No
TR9	900	112	Yes	4.02	No
TR10	1000	111	Yes	3.45	No
TR11	1500	107	No	1.92	No
TR12	2000	104	No	1.26	No



Crown Mountain Coking Coal Project

Figure 7.5-8
Daytime Noise 55 dBA Contours: Continuous Operations
Grid Height = 1.5 m

LEGEND

- Daytime Noise Contour (55 ≤ ...dBA)
- Project Footprint
- Arterial/Collector Road
- Local/Resource Road
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- British Columbia/Alberta Border

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Kilometres

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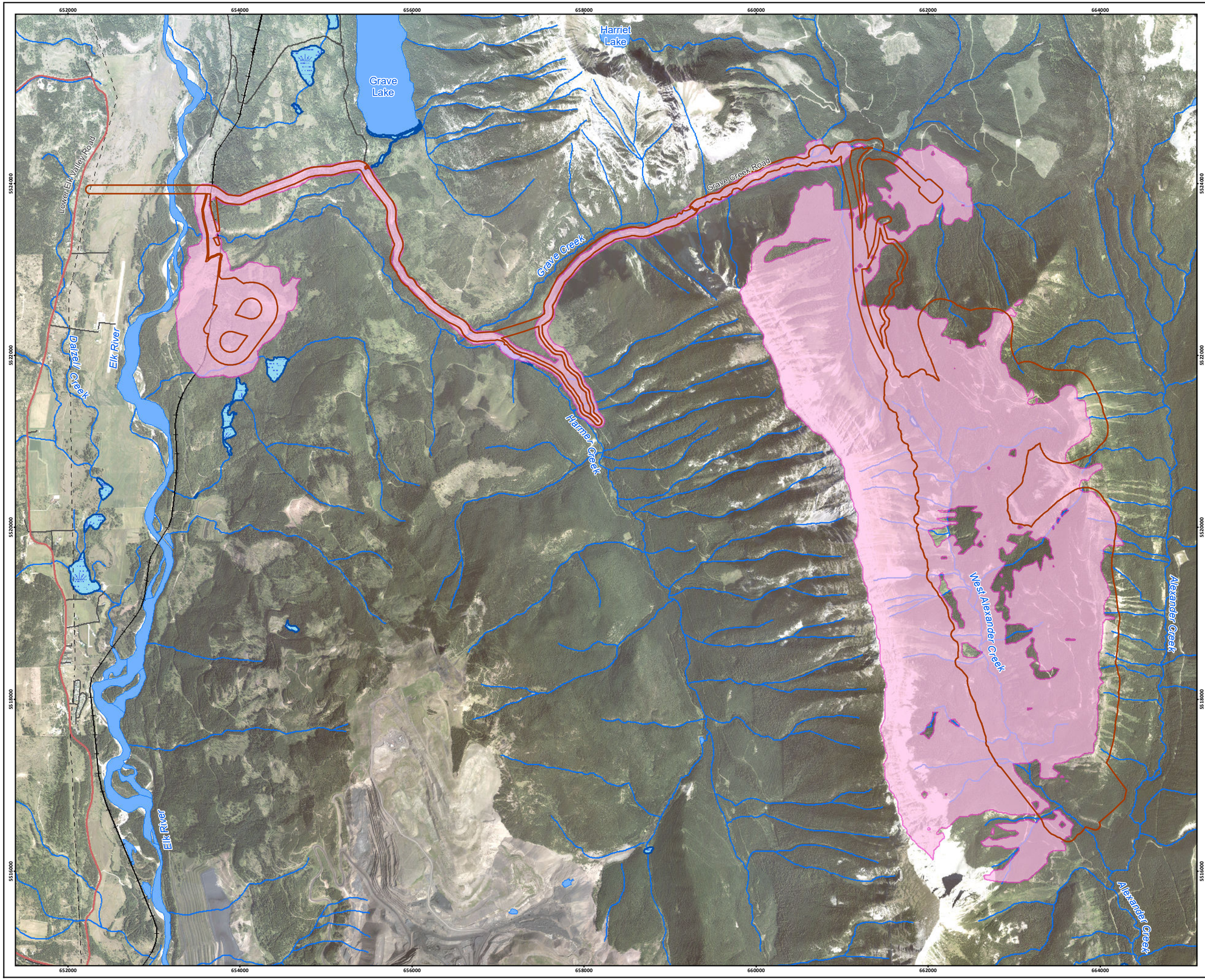

Crown Mountain Coking Coal Project

Figure 7.5-9
Nighttime Noise 45 dBA Contours: Continuous Operations
Grid Height = 1.5 m

LEGEND

- Nighttime Noise Contour (45 ≤ ...dBA)
- Project Footprint
- Arterial/Collector Road
- Local/Resource Road
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- British Columbia/Alberta Border

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The results indicate that the L_{peak} values surpass the 108 dB threshold for wildlife receptors at a distance of up to approximately 1,500 m from the pit. There is not a specific criterion for vibration levels at wildlife receptors. However, for context, the vibration levels at the terrestrial wildlife receptors were compared against the human receptor vibration impact criterion of 10 mm/s. It was determined that vibration levels at a distance of less than approximately 0.5 km from blast site will exceed the 10 mm/s criterion. The impacts at aquatic receptors from Blasting Operations are presented in Table 7.5-10. The calculations of Blasting Operations impacts on aquatic receptors was done such that the DFO Guideline criteria (1998) for blasting impacts were not exceeded (Wright and Hopky, 1998). As expected based on its proximity to the Blasting Operations, aquatic receptor AQR4 was determined to be most affected. The expected substrate vibration level at this receptor is equivalent to the 13 mm/s criterion (as set out by the DFO Guideline) and this impact corresponds to a maximum charge per delay of 2,300 kg (with delay time not to be less than 25 ms). Although impacts are not substantial outside of the Project site, there is a potential for effects to be felt by wildlife within the Project site itself. The maximum charge quantity per delay of 2,300 kg was applied to calculate peak impact for terrestrial wildlife and human receptors, as presented above. Additional details on the calculations used to determine these results are presented in Appendix C of the Noise and Vibration Assessment (Appendix 7-A; Dillon, 2021).

Table 7.5-10: Aquatic Receptor Blasting Operation Impacts Compared to Applicable Criteria

Receptor IDs	Closest Distance between Pit and Water Body (m)	Max Charge per Delay (kg)	Induced Pressure in Water (kPa)	Induced Pressure > 100 kPa?	Substrate Vibration Level – PPV (mm/s)	Vibration Level > 13 mm/s?
AQR1[1]	2461	2300	2.4	No	2	No
AQR2	1080	2300	9.1	No	7	No
AQR3	1490	2300	5.4	No	4	No
AQR4	735	2300	16.8	No	13	No
AQR5	4785	2300	0.8	No	1	No

Note:
[1] AQR1 was assessed against blasting impacts from the North Pit of Year 4 of the Project. Further details on this are provided in Section 6.0 of the Noise and Vibration Assessment (Appendix 7-A; Dillon, 2021). All other aquatic receptors were assessed against blasting impacts from the South Pit for Year 10 of the Project.

7.5.4.2 Characterization of Residual Effects

The assessment of residual effects on the acoustic environment, including noise and vibration levels, 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 are defined in Chapter 5, Section 5.3.4.5 and include duration, magnitude, geographic extent, frequency, reversibility, and context.

7.5.4.2.1 Change to Acoustic Environment, including Noise and Vibration Levels, due to Construction and Pre-Production Activities

The residual effects on the acoustic environment, including noise and vibration levels, due to site Construction and Pre-Production activities are characterized as follows:

- Duration: Short-term, noise and vibration levels will generally be limited to the Construction and Pre-Production phase of the Project (approximately 19 months).
- Magnitude: Low, noise and vibration levels are not anticipated to have a measureable affect above baseline conditions.

- Geographic Extent: Local, noise and vibration levels will be restricted to the Project footprint and Acoustic LSA.
- Frequency: Intermittent, sources of noise and vibration will occur as part of Construction and Pre-Production activities including timber harvesting, clearing and grubbing, and construction of mine site roads and facilities.
- Reversibility: Reversible short-term, noise and vibration levels resulting from Construction and Pre-Production activities are anticipated to return to levels similar to baseline concentration and be readily reversible as the activity is completed.
- Context: High, the acoustic environment has high resilience to disruptions above baseline and it is anticipated that human and wildlife receptors can adapt to the effect.

7.5.4.2.2 Change to Acoustic Environment, including Noise and Vibration Levels, due to Operations Activities

The residual effects on the acoustic environment, including noise and vibration levels, due to site Operations activities are characterized as follows:

- Duration: Long-term, noise and vibration levels will generally last greater than 19 months and less than 34 years over the course of the Operations phase of the Project.
- Magnitude: Moderate, noise and vibration levels have the potential to exceed baseline conditions during the Operations phase of the Project.
- Geographic Extent: Local, noise and vibration levels will be restricted to the Project footprint and Acoustic LSA.
- Frequency: Continuous, noise and vibration will occur during the Project Operations phase, including activities such as detonating explosives, loading, hauling, dumping, and stockpiling coal and mine rock, and transportation of personnel, materials, and consumable items.
- Reversibility: Reversible long-term, noise and vibration will occur as a result of activities conducted throughout the Operations phase; however, are anticipated to be readily reversible when the activity is completed.
- Context: High, the acoustic environment has high resilience to disruptions above baseline and it is anticipated that human and wildlife receptors can adapt to the effect.

The results of the Noise and Vibration Assessment indicate that the Project phases, as they relate to the acoustic environment, comply with all applicable provincial and federal guidelines/standards pertaining to noise and vibration with the implementation of operational mitigation measures and BMPs (Appendix 7-A; Dillon, 2021). Exceptions include two receptor locations, R7 and R10 that indicated PSLs from Continuous Operations that surpassed applicable guidelines. The receptors represent locations of a "representative location of a possible Indigenous seasonal dwelling". As such, there are currently no dwellings at these two locations.

The results for terrestrial wildlife receptors indicated that the threshold peak sound level from blasting of 108 dB would be surpassed at a distance of up to approximately 1,500 m from the pit. Additionally, vibration levels greater than 10 mm/s will be achieved at distances of up to 400 m to 500 m from the pit. As such, terrestrial wildlife could be adversely affected by noise and vibration within the Project site itself;

however, due to Project activities and applicable mitigation (i.e., fencing and proper waste disposal), terrestrial wildlife are not anticipated to be present on-site during Operations.

For aquatic receptors, which are only expected to be affected by Blasting Operations, predicted impacts are not expected to exceed the DFO Guideline criteria. At AQR4, however, predicted vibration levels are expected to be equal to the DFO Guideline criteria of 13 mm/s. Therefore, it is imperative that the maximum charge per delay of 2,300 kg not be surpassed as this would put the expected vibration level at this receptor out of compliance.

7.5.4.3 Determination of Significance

This assessment estimated noise and vibration impacts at various types of nearby receptors (i.e., human, terrestrial wildlife, and aquatic wildlife) using worst-case noise emissions scenarios for the Project based on the applicable international, federal, provincial, and municipal legislation and guidelines for noise and vibration. Of all representative human receptors assessed, two receptors indicated PSLs from Continuous Operations that surpassed applicable guidelines. These receptors are two representative locations of a possible Indigenous seasonal dwelling; however, there are currently no permanent dwellings at these locations. NWP is committing to implement necessary site-specific noise and vibration mitigation measures meeting applicable criteria at these receptors once (if) their location and status are confirmed by the KNC and they are confirmed to be occupied, or if permanent dwellings are established. For all other representative human receptors for both Continuous Operations and Blasting Operations, results were in compliance with the respective criteria and applicable guidelines as outlined in Section 7.5.1.

The results for terrestrial wildlife receptors indicated that noise and vibration levels have the potential to be adversely affected by noise and vibration within the Project site itself; however, due to Project activities and applicable mitigation (i.e., fencing and proper waste disposal), terrestrial wildlife are not anticipated to be present on-site during Operations.

For aquatic receptors, which are only expected to be affected by Blasting Operations, predicted impacts are be equal to the DFO Guideline criteria of 13 mm/s, but not exceed them at AQR4. Therefore, it is imperative that the maximum charge per delay of 2,300 kg not be surpassed as this would put the expected vibration level at this receptor out of compliance.

In consideration of the above, and with the application of mitigation measures and BMPs outlined in Section 7.5.3, the residual effects of the Project on the acoustic environment (as characterized by Project-related noise and vibration levels) during all phases of the Project are predicted to be not significant.

7.5.4.4 Likelihood and Confidence

Effects that are determined to be not significant do not require a characterization of likelihood.

The assessment of noise and vibration levels as a result of the Project components and activities was conducted based on industry standards and best available data. With the exception of two representative human receptors as discussed in the previous section, noise and vibration levels are predicted to be within the acceptable threshold guidelines as described in Section 7.5.1. With the application of mitigation and BMPs outlined in Section 7.5.3, the residual Project effects of noise and vibration on the acoustic environment have been predicted to be not significant with a high likelihood of occurrence of this

outcome. However, the prediction confidence is ascribed a moderate level of confidence due to the inherent uncertainties associated with the prediction methodology by noise and vibration modelling, which, like other modelling techniques, have some inherent uncertainty associated with a relatively simplistic representation by a model of what are in reality complex physical processes that affect noise and vibration propagation. As such, because of this moderate level of confidence in assessing changes in the acoustic environment over the course of the Project, a follow-up program in the form of site-specific monitoring will be implemented in order to verify the effects prediction and to verify the effectiveness of mitigation. This proposed follow-up program for noise and vibration is described in detail in the Noise and Vibration Monitoring Program in Section 7.7.

7.5.4.5 Summary of Residual Effects Assessment

Residual effects and the selected mitigation measures, characterization criteria, likelihood, significance determination, and confidence are summarized in Table 7.5-11. As indicated, there are no significant residual effects on the acoustic environment, including noise and vibration levels, anticipated as a result of the Project.

Table 7.5-11: Summary of Residual Effects on the Acoustic Environment

Residual Effect	Project Phase(s)	Mitigation Measures	Summary of Residual Effects Characterization	Significance (Significant, Not Significant)	Confidence (High, Moderate, Low)
Change to Acoustic Environment, including Noise and Vibration Levels, due to Construction and Pre-Production Activities	• Construction and Pre-Production	General mitigation, BMPs, and Noise and Vibration Monitoring Program	Duration: Short-term Magnitude: Low Geographic Extent: Local Frequency: Intermittent Reversibility: Reversible short-term Context: High	Not Significant	Moderate
Change to Acoustic Environment, including Noise and Vibration Levels, due to Operations Activities	• Operations	General mitigation, BMPs, and Noise and Vibration Monitoring Program, Continuous Operations Noise Management, and Blasting Operations Noise and Vibration Management	Duration: Long-term Magnitude: Moderate Geographic Extent: Local Frequency: Continuous Reversibility: Reversible long-term Context: High	Not Significant	Moderate

7.6 Cumulative Effects Assessment

As discussed in Section 7.3, there are other existing metallurgical coal mines in the Elk Valley and Crowsnest coal fields, the closest being the Teck's Elkview Operations at approximately 8 km southwest of the Project. Based on the general characteristics of noise and vibration and their associated natural attenuation with increasing distance from their source, this operation is beyond the 3 km criteria being used for this assessment as required under the cumulative effects in the B.C. OGC guidelines (2018), which requires a minimum of 1.5 km. The fact that the nearest existing industrial operation that could potentially overlap spatially with the Project is over 8 km away from the Project would result in no spatial overlap with noise and vibration resulting from the Project. In addition, given that noise and vibration do not linger in the environment once they are emitted and attenuated, as past operations are not applicable to this VC and future operations are not currently planned within the same area, there is no known temporal overlap between the Project and other past, present, and reasonably foreseeable future projects and activities. Given that there is no anticipated spatial and temporal overlap between the noise and vibration levels associated with the Project and other past, present, and reasonably foreseeable future projects and activities, it follows that cumulative effects are not likely to occur. Therefore, cumulative effects are not likely to occur in combination of all factors considered and a cumulative effects assessment for the acoustic environment noise and vibration is not warranted.

During the assessment, for due diligence, Teck's Elkview Operations were investigated for cumulative effects on noise and vibration impacts on identified receptors. Based on the predicted noise emissions contours presented in the noise and vibration assessment for Teck's Elkview Operations, it is not expected that the receptors in the assessment will experience noticeable compounding cumulative noise effects from the Teck's Elkview Operations and the Project. In terms of vibration impacts, the distances between Teck's Elkview Operations and the receptors in the assessment are expected to be sufficient enough to reduce or negate cumulative ground vibration impacts associated with the Blasting Operations; however, as indicated in the Noise and Vibration Management Plan (Chapter 33, Section 33.4.1.7), the operational mitigation measures include NWP making all efforts to minimize potential cumulative effects by coordinating with the neighbouring mining operations so that the Blasting Operations do not coincide.

As such, in consideration of the above, the residual cumulative effects of Project-related noise and vibration in combination with that of other past, present, and reasonably foreseeable future projects and activities on the acoustic environment during all phases of the Project is rated to be not significant, with a high level of confidence.

7.7 Follow-up Strategy

7.7.1 Noise and Vibration Monitoring Program

To assess changes in the acoustic environment over the course of the Project, site-specific monitoring will be implemented as part of the Noise and Vibration Monitoring Program. The monitoring program details specific actions to be taken during the Project phases (Construction and Pre-Production, Operations, and Reclamation and Closure) to monitor the changes in noise and vibration levels. The objectives of the Noise and Vibration Monitoring Program are outlined in Chapter 33, Section 33.4.1.7.

Monitoring is important to the Project as it provides feedback on the effectiveness of mitigation measures and management strategies. More specifically, monitoring as part of the Noise and Vibration Management Plan will be used to:

- Confirm regulatory compliance for the duration of the Project;
- Set out monitoring protocols such as monitoring station locations, collection procedures, frequency, and triggers for action;
- Assist in evaluating the accuracy and adequacy of predictions made as part of baseline studies; and
- Provide information to develop appropriate adaptive management strategies in a timely manner to maintain noise levels and reduce the potential for impacts on the acoustic and natural environment (including humans and wildlife).

This Noise and Vibration Monitoring Program is designed to provide comparable and consistent data for which to assess changes in the acoustic environment as a result of the Project. The monitoring program will be reviewed regularly to confirm it is consistent with current legislation and to assess its effectiveness over time.

7.7.2 Noise and Vibration Monitoring

Periodic noise and vibration monitoring at three sensitive receptors surrounding the Project will be performed during all phases of the Project to validate the results presented in the assessment and evaluate if compliance with applicable criteria is achieved. Monitoring locations will vary throughout the life of the Project to reflect changes in the pit sizes, locations, and operations. Presented below in Table 7.7-1 is a description of the expected monitoring locations as they vary throughout the life of the Project. Further details on the receptor locations are provided in Sections 7.4 and 7.5. The receptor locations are selected to capture noise and vibration emissions from various stages of the Project. Receptors R1, R2, R9, and R12 were selected to capture noise and vibration emissions from the CHPP and the pits. These monitoring locations change throughout the life of the Project to reflect the changes in pit operations. Receptor R5, which is the only location that will undergo noise and vibration monitoring throughout the entire life of the Project, was selected to capture noise and vibration emissions from the RLO area.

Table 7.7-1: Noise, Vibration, and Air Overpressure Monitoring Locations

Project Year	Proposed Monitoring Location by Receptor ID
1 – 5	R2, R5, R9
5 – 10	R1, R2, R5
10 – 15	R1, R5, R12

As described in Section 7.5, receptors R7 and R10 are representative locations of possible Indigenous seasonal dwellings. There are currently no seasonal or permanent dwellings at these two locations and therefore, noise and vibration monitoring at these locations is not proposed to be performed at this time. However, if an Indigenous dwelling were to be established at, or in the vicinity of, either of these locations in the future, they could be selected to undergo noise and vibration monitoring.

7.7.2.1 Monitoring Equipment

The equipment used to perform the noise and vibration monitoring must be selected such that they capture sound levels, vibration levels, and air overpressure. This may require the implementation of multiple pieces of equipment at each location or use of an integrated monitoring system. The monitoring equipment is to have valid calibration documentations and be field calibrated (where required) before and after each use, as necessary.

7.7.2.2 Reporting

Following each noise and vibration monitoring campaign, a formal report will be completed. The reports will, at a minimum, include the following components:

- Measurement locations;
- Dates of measurements;
- Instrumentation used and proof of valid calibration;
- Detailed notes on the observable sound environment at each monitoring location (i.e., audible sounds, tones, residual sounds, noticeable vibrations, etc.);
- Weather conditions during measurements (i.e., wind direction and speed, temperature, cloud conditions, etc.);
- Figures illustrating monitoring setup;
- Applicable compliance criteria at each location;
- Recorded sound, overpressure, and vibration levels; and
- Statement of compliance or non-compliance.

If an exceedance at a monitoring location is observed, appropriate NWP personnel will be notified immediately so that appropriate steps can be taken, including an investigation to identify the potential cause(s) of the exceedance. The investigation may include a review of Project operations and atmospheric conditions at the time of the exceedance. Once the cause for the exceedance is identified, mitigation measures for the source(s) will be developed as an adaptive management measure. Subsequent monitoring at the location where exceedance was observed will be performed to confirm that the mitigation measures are effective. Records of the exceedance and all subsequent mitigation and monitoring will be kept at the site for future reference and review by regulators as required. Relevant stakeholders (i.e., residences) who could be affected by the observed exceedances will be notified of the exceedance and all corrective measures that NWP has taken or will be taking.

7.7.3 Continuous Operations Noise Management

For the Continuous Operations as part of the Project, the two primary groups of noise sources (fixed equipment and mobile equipment) each require source specific management recommendations to reduce noise emissions. These recommendations are presented in the following sections by source type.

7.7.3.1 Fixed Equipment

For the fixed equipment associated with the Project, adhering to the following recommendations should aid in controlling noise and vibration emissions:

- Operate equipment as described in manufacturing instructions;
- Equipment maintenance is kept up to date; and
- Equipment is not overloaded.

7.7.3.2 Mobile Equipment

For the mobile equipment associated with the Project, adhering to the following recommendations should help reduce noise and vibration emissions:

- Equipment maintenance is kept up to date;
- Grease the rail tracks of the RLO to reduce wheel squeal;
- Equipment is not overloaded;
- Clean coal haul road posted speed limits are followed; and
- Whenever possible, reduce the frequency and duration of reversing equipment to reduce the use of tonal backup beepers.

7.7.4 Blasting Operations Noise and Vibration Management

For the Blasting Operations associated with the Project, noise and vibrations emissions can be effectively controlled through the implementation of the following recommendations:

- Keep blasting charge delay greater than 25 ms to reduce the likelihood of blasting sound wave addition;
- When possible, arrange blasting hole configuration to utilize pit walls for shielding; and
- Keep maximum charge quantity per blast to 2,300 kg or less.

7.8 Summary and Conclusions

The Crown Mountain Coking Coal Project (the Project) will result in increased local noise and vibration levels due to the various Project components and activities, including but not limited to blasting, mining, hauling, and dumping. An increase in noise and vibration has the potential to result in sensory disturbance to humans and wildlife living in the area, and potential disruptions to recreational and commercial land uses such as hiking, hunting and trapping, and fishing, as well as result in changes to human and wildlife health and behaviour patterns.

Human and wildlife (terrestrial and aquatic) receptors were selected as discussed in the AIR (EAO, 2013). The effects assessment above is reflective of worst-case noise emissions and vibration levels for the Project and were compared against the relative federal and provincial guidelines/standards, as well as baseline information and assessments conducted in 2017. Receptors were assessed against Continuous Operations and Blasting Operations, as they were identified as significant noise and vibration sources associated with the Project.

Of the receptors, only two human receptors (locations of possible, but not occupied, Indigenous dwellings) showed some noise levels in exceedance of guidelines; wildlife receptors were most affected within the Project site itself up to a distance of 1,500 m for noise and up to 400 m to 500 m for vibration levels. All other receptors results were in compliance with the respective criteria and applicable guidelines. In addition, cumulative noise and vibration effects are negligible as other operations in the area are beyond the 1.5 km criteria being used for this assessment as required under the cumulative effects in the B.C. OGC guidelines (2018) as well as beyond the 3 km where noise and vibration are no longer distinguishable from background conditions.

Although the Project will result in increased local noise and vibration levels, the intensity of those levels will be more or less equal to those expected for general construction and operation activities and will not exceed applicable guidelines based on the predictions and modelling of the effects assessment and the application of BMPs and mitigation.

In consideration of the above, and with the application of mitigation measures and BMPs, the residual effects of Project-related noise and vibration levels on the acoustic environment during all phases of the Project, are predicted to be not significant, with a moderate level of confidence. Given that there is no anticipated spatial and temporal overlap between the noise and vibration levels associated with the Project and other past, present, and reasonably foreseeable future projects and activities, it follows that cumulative effects are not likely to occur. The implementation of a Project-specific follow-up program to verify the effects predictions and the effectiveness of mitigation will improve this level of confidence and provide information for the development of adaptive management measures, should they be required.

7.9 References

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