Fort Knox Mine

Pedro Creek Waste Rock Dump

Noise Impact Investigation

Report Prepared for:

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List of Acronyms

amsl	above mean sea level
CFR	Code of Federal Regulations
dB	decibel
dBA	A-weighted decibel
DOT&PF	Department of Transportation & Public Facilities
E	East
EPA	U.S. Environmental Protection Agency
FGMI	Fairbanks Gold Mining Inc.
FHWA	Federal Highway Administration
G	ground factor
ISO	International Organization for Standardization
KOP	key observation point
Leq	hourly equivalent sound level
Lp	sound pressure level
Lw	sound power level
Project	Fort Knox Mine
N	North
NAC	noise abatement criteria
NOAA	National Oceanic and Atmospheric Administration
PCWRD	Pedro Creek Waste Rock Dump
Project	Fort Knox Mine
R	Range
RH	relative humidity
SRK	SRK Consulting (U.S.), Inc.
T	Township
WCHL	Walter Creek Heap Leach
WRD	waste rock dump

1 Introduction

Fairbanks Gold Mining Inc. (FGMI) contracted with SRK Consulting (U.S.), Inc. (SRK) to investigate potential impacts to noise receptors related to the development of the Pedro Creek Waste Rock Dump (PCWRD) at the Fort Knox Mine (Project). The Project is located approximately 15 air miles northeast of Fairbanks, Alaska in portions of Sections 4-5, 7-23, and 26-29, Township (T) 2 North (N), Range (R) 2 East (E) and Sections 7-8 and 17-19, T2N, R3E, Fairbanks Meridian. FGMI is proposing to develop the PCWRD as part of the ongoing operations at the Fort Knox Mine. The PCWRD will be constructed to the northeast of existing facilities at the head of the Pedro Creek watershed at elevations ranging from 1,650 to 2,430 feet above mean sea level (amsl).

2 Sound and Noise

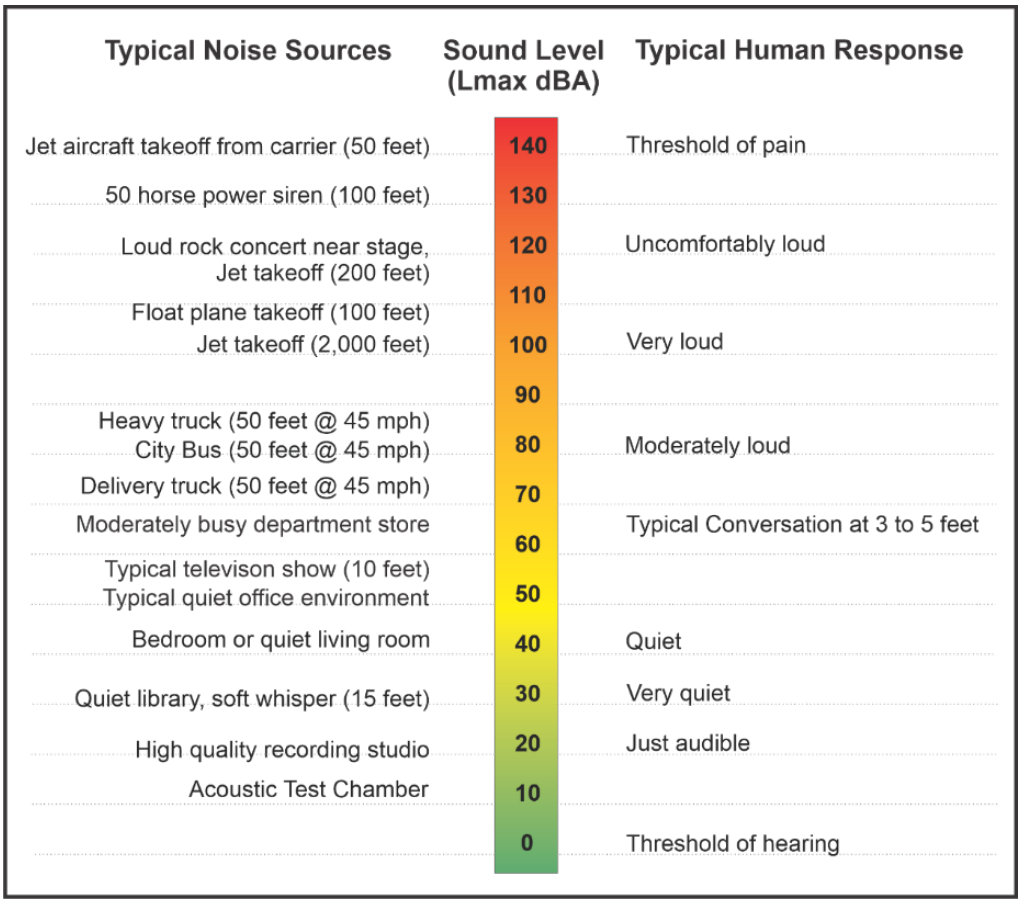
Sound is energy transferred through the air that our ears detect as changes in air pressure, while noise is generally considered unwanted sound. The unit used to measure the intensity of sound is the decibel (dB). The decibel measures sound intensity on a logarithmic scale, proportional to the square of sound pressure. To account for differences in how people respond to sound, the "A-weighted" scale (dBA) is also used. This scale most closely approximates the relative loudness of sounds, as perceived by the human ear, by focusing on those parts of the frequency spectrum where humans hear most (FAA, 2022).

The following information is helpful for understanding sound and how humans perceive changes in sound (Minor, 2021):

- Normal conversation ranges between 44 and 65 dBA when speakers are 3 to 6 feet apart;
- Noise levels in a very quiet rural area at night are typically between 30 and 35 dBA, while noise levels in some of the quietest parts of Alaska can range from 20 to 30 dBA;
- Quiet urban nighttime noise levels range from 40 to 50 dBA. Noise levels during the day in noisy urban areas, like Fairbanks, are frequently as high as 70 to 80 dBA;
- Noise levels above 110 dBA become intolerable and then painful, while levels higher than 80 dBA over continuous periods can result in hearing impairment;
- The smallest broad band (e.g., traffic noise) noise-level change that can be detected by the human ear is approximately 3 dB;
- A 5 dB change in noise levels is typically noticeable to most people; and
- An increase or decrease of 10 dB is roughly equivalent to a doubling or halving in the perceived sound level. This relation holds true for loud and quiet sounds.

A chart of typical noise sources and related sound levels is provided as **Image 1**.

Image 1: Typical Noise Sources



Sound travels and reduces over a distance as influenced by many factors. Under ideal conditions, a noise generated by a point source will attenuate (decrease) in accordance with the inverse square law, which states that sound levels attenuate proportionally to the square of the distance from the source. This means that each doubling of distance from the source results in a reduction of 6 dB. As the sound travels from the source, levels attenuate to become equal to, or below, ambient sound levels.

Other important factors, such as existing structures, topography, vegetation, ground cover, atmospheric conditions, wind, temperature, relative humidity (RH), and other features in the landscape, may increase or decrease the rate of attenuation, block, or otherwise redirect sound pressures in the landscape. These factors may either increase or decrease sound levels at a given receiver. For this investigation, ground cover has been considered using a range of conditions, and changes resulting from topography are addressed using a simple barrier model. Air attenuation is also addressed using parameters representing an average August day in Fairbanks, the month during which reference level data was collected in 2021, as discussed in **Section 4.2**.

Because dB values are logarithmic, dB values cannot be added together like standard numbers. To add dB values together, they must first be converted back into their non-logarithmic pressure values, added, and then converted back into decibels. In general, adding two sound levels together of equal values results in an increase of 3 dB. Also, when dBA values are added or manipulated, the results are reported in dB.

3 Noise Standards

The following sections provide a summary of noise-related regulations and ordinances which may be applicable to the Project or which may provide reference values for discussion purposes.

3.1 Federal and Alaska Highway Regulations

The Federal Highway Administration (FHWA) traffic noise abatement criteria (NAC) are provided in Title 23 Code of Federal Regulations (CFR) Part 772, Procedures for Abatement of Highway Traffic Noise and Construction Noise. These criteria have been set for highways, but are included here for comparison purposes. The criterion applicable for residences, churches, schools, recreational areas, and similar areas is an exterior hourly equivalent sound level (Leq) that approaches or exceeds 67 dBA. The criterion applicable for other developed lands, such as commercial and industrial uses, is an exterior Leq that approaches or exceeds 72 dBA. There are no criteria for undeveloped lands or construction noise. The criteria are provided in **Table 3-1**.

The Alaska Department of Transportation & Public Facilities (DOT&PF) Noise Policy, (Alaska Environmental Procedures Manual, June 2023), considers a traffic noise impact to occur when predicted project traffic noise levels approach, within one dBA, the NAC for a given land use category, or substantially exceed existing levels. Therefore, residential impacts (Category B property) occur at 67 dBA. In addition, DOT&PF considers a 15 dB increase over the existing noise levels a substantial noise increase, and therefore an impact for highway traffic noise.

Table 3-1: Noise Abatement by Land Use Category

Activity Category	Activity Criteria in hourly Leq (dBA)		Evaluation Location	Activity Description
	FHWA NAC	DOT&PF NAC		
A	57	57	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose
B	67	67	Exterior	Residential (single- and multi-family units)
C	67	67	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings
D	52	52	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios
E	72	72	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F
F	--	--	--	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing
G	--	--	--	Undeveloped lands that are not permitted

3.2 Environmental Protection Agency Noise Control

The U.S. Environmental Protection Agency (EPA) was in charge of the Noise Control Act of 1972, which established a national policy to promote an environment for all Americans free from noise that jeopardizes their health and welfare. The Noise Control Act also set out limits for noise emissions from new and in-use vehicles. However, in 1981 it was concluded that noise issues were best handled at the state and local level. As a result, the primary responsibility of addressing noise issues was transferred to state and local governments. Even with this change, the EPA still has information which can be used to assist in developing a criterion for areas where none exist. **Table 3-2** contains the EPA standards which may be used as a guideline for an expected community reaction to a noise increases above existing ambient levels.

Table 3-2: EPA Guidelines for Expected Noise Impact

Increase in Noise over Existing Level	Expected Community Reaction
0 - 5 dBA	Few complaints, if gradual increase
5 - 10 dBA	More complaints, especially if conflicts with sleeping hours
Over 10 dBA	Substantial number of complaints

3.3 Alaska State Noise Control

Many states have noise control for new and in-use vehicles that are operated on public roadways. Some also regulate noise from personal use vehicles, including snow machines, watercraft and motorcycles, and all-terrain vehicles. However, the State of Alaska has no formal vehicle noise regulations and allows local jurisdictions to regulate noise. The state does require that all vehicles are equipped with a muffler per the Alaska Administrative Code (AAC), Chapter 13, Section 04.215. The code requires all vehicles, including equipment proposed for use at the PCWRD, to be equipped with mufflers or other noise-suppressing system in good working order.

Several other airport-related noise codes were identified, but none were applicable to the Project. No other noise specific regulatory requirement was identified under the AAC.

3.4 Fairbanks

The City of Fairbanks Administrative Code was also examined for noise specific regulations potentially applicable to the Project. Although the Fairbanks Administrative Code has several noise-related subjects, including Airport Noise Sensitive Area Standards, military noise standards, and ordinances regarding “loud sound”, there were no noise regulations or ordinances applicable to the Project at the given location approximately 15 miles away.

3.5 Summary of Standards Applicable to Fort Knox Operations

For this investigation, changes to sound levels resulting from operations on the PCWRD were compared to the following criteria:

- The FHWA and Alaska DOT&PF criteria of 67 dBA Leq at residential receivers;
- The FHWA and Alaska DOT&PF consider a 15 dB increase over the existing noise levels a substantial noise increase at residential receivers; and
- Comparison to the EPA guidelines.

4 Receptors and Baseline Noise Levels

4.1 Land Use and Receptors

Sensitive human noise receptors and baseline data locations are shown on **Figure 1.** Land use along the Steese Highway consists of a mixture of single-family residences, mixed use properties, commercial uses, and industrial uses including mining (Minor, 2021). The National Oceanic and Atmospheric Administration (NOAA) Fairbanks Command and Data Acquisition Station is located along the Steese Highway on Eiesle Road, referred to herein as the NOAA Area.

North of the Fort Knox Access Road, land use is mainly undeveloped with the exception of two mines. Just north of the Fort Knox entrance is a small residential area that includes the Aurora Borealis Lodge and Cleary Summit Cabins along the Pedro Dome Road and Ridge Run Road. This area is referred to in this report as the Cleary Summit / Pedro Dome Area. The Ski Land Ski and Snowboard Area is located northeast of the Fort Knox entrance along with a few residences located along Fish Creek Road. This area is referred to in this report as the Ski Land/Fish Creek Road Area.

4.2 Baseline Sound Values

A noise study was conducted for the Manh Choh Project in 2021. This study included an analysis of noise impacts resulting from ore haulage from Manh Choh to Fort Knox for final processing via the Alaska Highway, the Steese Highway, and the Fort Knox Access Road. The study included baseline noise data collection, as well as impact modeling (Minor, 2021).

The baseline noise levels indicated in that report, plus the modeled impacts resulting from haulage from Manh Choh, have been used as the reference level noise data for this investigation. Reference noise levels are summarized in **Table 4-1**. These results are representative of the noise resulting from:

- Background noise and noise from traffic and mining operations in 2021, which included material placement on the Walter Creek Heap Leach (WCHL) (discussed further in Section 5.5); and
- Modeled traffic noise resulting from haulage from the Manh Choh Project along the Steese Highway and up the Fort Knox Access Road.

Table 4-1: Baseline Noise

Receptor Areas / Locations	Approximate Distance from Source (feet)	Time of Day / Location Details	Reference Level (dB)[1]
Cleary Summit/Pedro Dome Area (N1-N6)	11,783	2:00	39
		14:00	41
Ski Land / Fish Creek Road Area (N7- N9)	8,256	2:00	32
		14:00	37
NOAA	28,390	2:00, 50 feet off roadway	60
		2:00, 750 feet off roadway	39
		14:00, 50 feet off roadway	64
		14:00, 750 feet off roadway	41

Data Source: Minor, 2021
[1]dBs have been averaged for groups of receptors

5 Potential Impacts

5.1 Inverse Square Law for Attenuation

To determine sound attenuation over a distance using the inverse square law, an idealisation needs to be made in which there are no reflective surfaces or barriers between the source and the location at which the sound level is being determined. In general, attenuation occurs at approximately 6 dB per doubling of distance. The inverse square law for sound attenuation is as follows:

$$Lp(R2) = Lp(R1) - 20 \cdot Log_{10}(R2/R1)$$

Where:
Lp(R1) = Known sound pressure level at the first location (typically measured data or equipment vendor data)
Lp(R2) = Unknown sound pressure level at the second location
R1 = Distance from the noise source to location of known sound pressure level
R2 = Distance from noise source to the second location

Potential sound impacts from operations at the PCWRD have been investigated with the assumption that all listed equipment has the potential to be working on the WRD at the same time and in the same area. The equipment numbers and reference sound levels were entered into a multiple-source sound attenuation model which calculates the sound (in dB) created by the noise sources at a certain distance or distances. The equipment used in the model includes:

- Nine CAT 797 haul trucks, each with a reference exterior sound pressure of 119 dBA at 50 feet (AVS, 2026);
- Two CAT D11 dozers, each with a reference exterior sound pressure of 115 dBA at 50 feet (CAT, 2026a);
- Two CAT 16M graders, each with a reference exterior sound pressure of 109 dBA at 50 feet (CAT, 2026b).

When multiple source point sources of sound are operating in the vicinity of each other, in this case multiple haul trucks and dozers, the resulting sound level is calculated by converting the known sound pressures at each known distance back to the source sound power, adding the source sound power values together, and then converting them back to sound pressure values in dB. A summary of basic attenuation results at various receptors is provided in **Table 5-1**. Calculations and results are included as **Appendix A**.

Table 5-1: Sound Pressures at Receptors Using Inverse Square Law for Attenuation

Receptor Areas / Locations	Time of Day / Location Details	Reference Level (dB)[1,2]	dB at Receptor [2,3]	Change in dB at Receptor[2]
Cleary Summit/Pedro Dome Area (N1-N6)	2:00	39	82	+43
	14:00	41	82	+40
Ski Land / Fish Creek Road Area (N7- N9)	2:00	32	84	+52
	14:00	37	84	+47
NOAA	2:00, 50 feet off roadway	60	74	+14
	2:00, 750 feet off roadway	39	74	+35

Receptor Areas / Locations	Time of Day / Location Details	Reference Level (dB)[1,2]	dB at Receptor [2,3]	Change in dB at Receptor[2]
	14:00, 50 feet off roadway	64	74	+10
	14:00, 750 feet off roadway	41	74	+33

[1]Data Source: Minor, 2021
[2]dBs have been averaged for groups of receptors
[3] Baseline and modeled sound pressures have been added together (logarithmic)

5.2 Ground Cover Factors

The inverse square law for sound attenuation does not consider the attenuation effect of various ground covers. As sound travels along the ground, absorption may occur depending on the overall porosity of the ground with a more compact surface being more reflective and a porous surface being more absorbent. A correctional factor can be used to account for ground cover attenuation using the ground factor, as follows:

$$Lp(R2) = Lp(R1) - 20 \cdot Log_{10}(R2/R1) - G \cdot 10 \cdot Log_{10}(R2/R1)$$

Where:
Lp(R1) = Known sound pressure level at the first location (typically measured data or equipment vendor data)
Lp(R2) = Unknown sound pressure level at the second location
R1 = Distance from the noise source to location of known sound pressure level
R2 = Distance from noise source to the second location
G = ground factor, 1 = soft field grass with dense foliage, 0.66 = soft grass or light snow, 0 = pavement or water

Note: The first part of the equation "- $20 \cdot Log_{10}(R2/R1)$" is the standard formula for attenuation and the second part "- $G \cdot 10 \cdot Log_{10}(R2/R1)$" is the standard formula for ground cover attenuation.

Because a range of ground covers may be present throughout the year near the PCWRD, ranging from ice to soft snow, frozen ground, and forest foliage, a range of ground attenuation factors have been used to show potential seasonal variations in attenuation. A ground factor of 1 is representative of very soft snow, moss, and forest floors while a ground factor of 0 is representative of hard surfaces such as concrete, water, and asphalt (CNOSSOS-EU, 2012). A factor of 0.66 was used in the 2021 analysis to represent soft grass or light snow (Minor, 2021). Noise level results are summarized in **Table 5-2** and are provided in **Appendix A**.

Table 5-2: Sound Pressures at Receptors Using Inverse Square Law for Attenuation and Ground Factors

Receptor Areas / Locations	Time of Day/ Location Details	Reference Level (dB)[1]	dB at Receptor [2]			Change in dB at Receptor with Ground Attenuation 0.66[3]	Change in dB at Receptor with Ground Attenuation 1.0[3]
			Ground Attenuation 0.0	Ground Attenuation 0.66	Ground Attenuation 1.0		
Cleary Summit/Pedro Dome Area (N1-N6)	2:00	39	82	66	58	+28	+19
	14:00	41				+25	+17
	2:00	32	84	69	61	+37	+30

Receptor Areas / Locations	Time of Day/ Location Details	Reference Level (dB)[1]	dB at Receptor [2]			Change in dB at Receptor with Ground Attenuation 0.66[3]	Change in dB at Receptor with Ground Attenuation 1.0[3]
			Ground Attenuation 0.0	Ground Attenuation 0.66	Ground Attenuation 1.0		
Ski Land / Fish Creek Road Area (N7- N9)	14:00	37				+32	+24
NOAA	2:00, 50 feet off roadway	60	74	56	46	No change	No change
	2:00, 750 feet off roadway	39				+17	+8
	14:00, 50 feet off roadway	64				No change	No change
	14:00, 750 feet off roadway	41				+15	+7

[1]Data Source: Minor, 2021
[2]dBs have been averaged for groups of receptors
[3]Change in dB is calculated from the logarithmic addition of the baseline and modeled sound pressures. Complete results are presented in **Appendix A**.

5.3 Topographical Barrier Factors

A sound propagation level calculator (Noise Tools, 2026) was used to provide information about the potential barrier effect created by topography between the proposed PCWRD and the closest noise receptors. The calculator uses the International Organization for Standardization (ISO) 9613-2:2024 calculation method.

The proposed PCWRD is located at the head of the Pedro Creek watershed, with an elevation ranging from 1,650 feet amsl at the toe to 2,430 feet amsl at the crest. Two shallow shoulder spurs and the Fish Creek Road Ridge are located to the northwest, between the proposed WRD and the closest noise receptors, as shown on **Image 2**. The two spurs are referred to in this report as the Deadwood Creek Spur and the Fish Creek Road Spur. A ridge, referred to in this report as the Gilmore Creek Ridge, is located between the PCWRD and the NOAA Area as shown on **Image 2** and **Image 3**. Reference point elevations and distances are included in **Appendix A**.

Image 2: Overview of Topographic Barriers to the Northwest

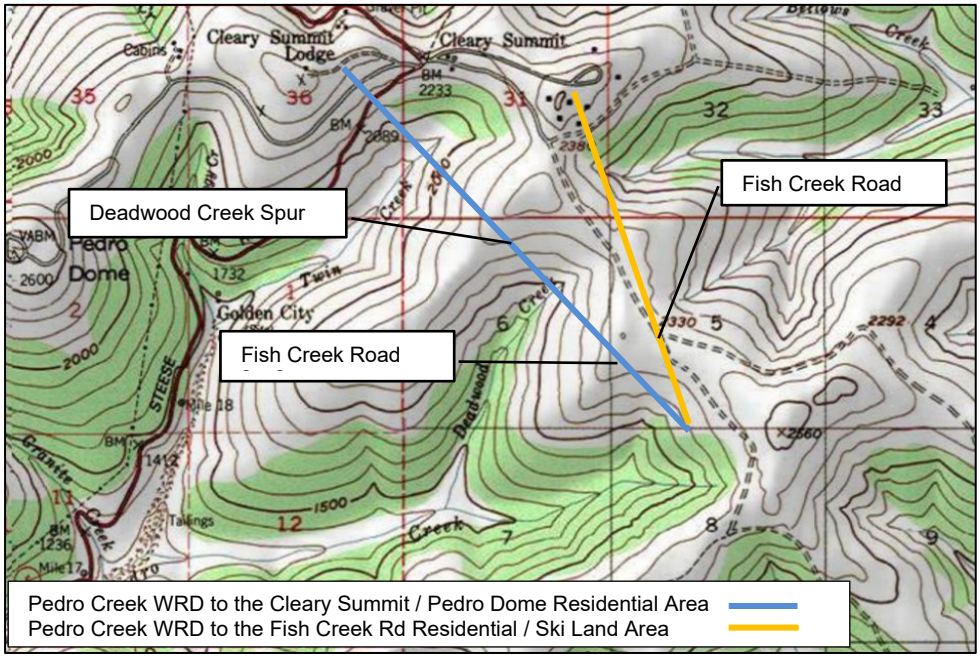
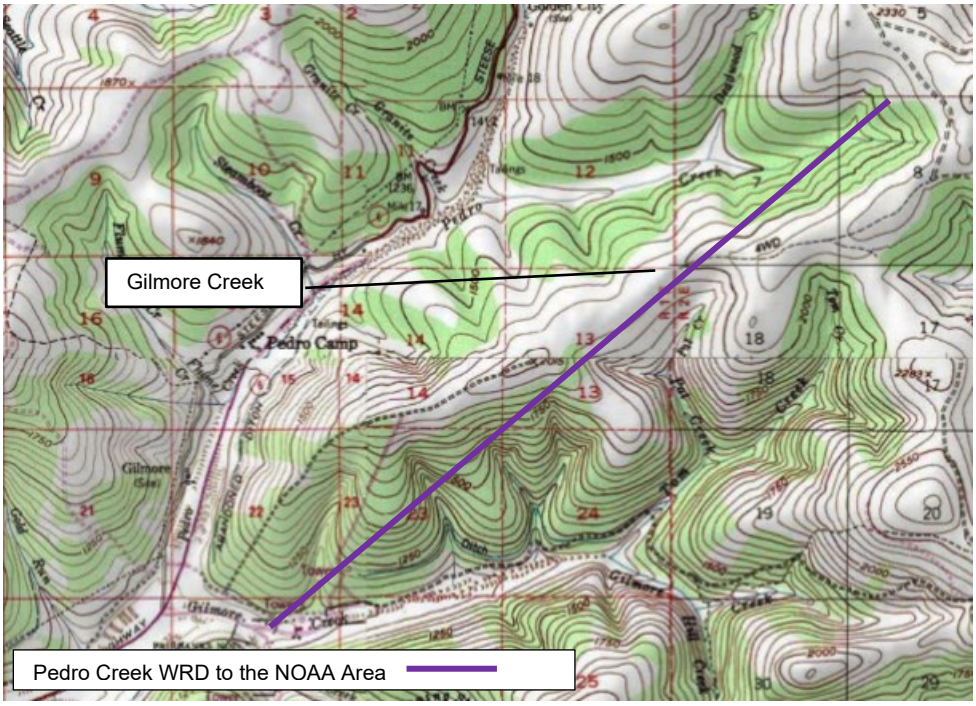


Image 3: Overview of Topographic Barriers to the Southwest



Sound level meters measure a sound pressure level (Lp), which is a decibel value for the sound level experienced at a location or specified distance away from the source. Most often, standard sound pressures are given at a distance of 50 feet from the source. The source of sound itself is calculated as a sound power level (Lw). Lp and Lw both contain frequency and amplitude information, but Lw does not include distance information (Noise Tools, 2026a). The sound propagation level calculator requires the Lw value of the noise source. In this case, the source sound power level of all the noise sources discussed in **Section 5.1** is 163.7 dB (Noise Tools, 2026a).

Barrier effect results (which are reductions to the noise generated by a source) obtained from the sound propagation level calculator are summarized below (Noise Tools, 2026b). Sound propagation level calculator output images are included in **Appendix B**:

- The maximum barrier effect for the Cleary Summit / Pedro Dome Area may result in a noise reduction of around 22 dB. As the facility is built up from the toe, the barrier effect will decrease, and then be eliminated when the facility reaches an approximate elevation of between 1,770 and 2,070 feet amsl;
- The maximum barrier effect for the Ski Land / Fish Creek Road Area may result in a noise reduction of around 2 dB. As the facility is built up from the toe, the barrier effect will decrease, and then be eliminated when the facility reaches an approximate elevation of 1,780 feet amsl; and
- The maximum barrier effect for the NOAA area may result in a noise reduction of around 9 dB. As the facility is built up from the toe, the barrier effect will decrease, and then be eliminated when the facility reaches its final elevation of 2,430 feet amsl.

5.4 Air Absorption

Air absorption increases the further the receiver is away from the source and varies by temperature and RH. In general, colder temperatures and higher humidity result in greater air absorption. A general summary of how temperature and humidity may affect air absorption is presented below, by receptor area. February was chosen as the historically coldest month, July as the warmest month, May as having the lowest RH, November for having the highest RH, and August as the 2021 reference level month. Values may also vary due to temperature inversions, wind, and atmospheric pressure.

Table 5-3: Summary of Air Absorption (Reduction in dB at a Receptor)

Selected Month	February Coldest	May Lowest RH	July Warmest	August Reference level month	November Highest RH
Temperature	**-8°F (-13.3°C)**	**50°F (10°C)**	**63°F (17.2°C)**	**57°F (13.8°C)**	**4°F (-15.5°C)**
RH	**66%**	**50%**	**64%**	**71%**	**73%**
Cleary Summit / Pedro Dome Area	-8	-7	-9	-8	-14
Ski Land / Fish Creek Road Area	-6	-5	-7	-6	-11
NOAA Area	-19	-16	-22	-18	-33

Data source: Electronics Teacher, 2026 using an air pressure value of 101325 Pascals and 500 Hertz

5.5 Past Impacts from the Walter Creek Heap Leach Operations

The WCHL is a built-out facility located to the west of the proposed PCWRD, as shown on **Figure 1**. Placement of heap leach material was completed at this facility in 2021, the same year that background noise levels were collected for the Manh Choh Project. While it is unknown if the equipment was operating during the baseline noise sampling event and contributed to background levels, it is known that the Cleary Summit / Pedro Dome Area and the Ski Land Area would have experienced noise impacts related to heap leach material placement at the WCHL. Modeling results

for the WCHL, assuming the same types and quantities of equipment were in use, as proposed for the PCWRD, are summarized in **Table 5-4**.

The background noise levels used for other areas of this report are the modeled noise levels resulting from the Manh Choh Project noise evaluation. Considering that, in general, rural parts of Alaska experience noise levels ranging from 30-35 dBA, a pre-mining baseline level of 31 dB has been assigned to represent a sound level predating both the Manh Choh Project as well as operations at the WCHL. The pre-Manh Choh references levels have also been included for comparison.

The resulting dB at each receptor (accounting for a ground attenuation factor of 0.66, average air attenuation factors for the month of August, and maximum barrier effects) are higher than the levels recorded in 2021 by about 6 to 15 dB. It may be that the pre-Manh Choh levels measured in 2021 occurred when operations at the WCHL were minimal, the equipment in use was quieter than what is proposed for Pedro Creek, and/or the model results are conservative and are not accounting for other attenuation variables which may be occurring. Other uncaptured variables may include site-specific topography and/or specific atmospheric effects which occurred during the 2021 monitoring event.

Table 5-4: Summary of Results for the WCHL

Receptor Area	**Pre-Mine Baseline Level dB**	**dB at Receptor**	**dB at Receptor**	***Change in dB from Baseline with Ground Attenuation of 0.66***	**Air Attenuation Effect**	**dB at Receptor**	***Change in dB from Baseline with Ground Attenuation of 0.66 and Air Attenuation***	**Maximum Barrier Effect**	**dB at Receptor**	***Change in dB from Baseline with Ground Attenuation of 0.66, Air Attenuation, and Max Barrier Effect***	**Pre-Manh Choh Level dB Daytime Values**	***Difference between Modeled dB with Ground Attenuation of 0.66, Air Attenuation, and Max Barrier Effect and Pre-Manh Choh Level dB***
Details / References	**Minor, 2021 and Mennit, 2015**	**Inverse Law Attenuation Only**	**With Ground Attenuation of 0.66**		**Reduction in dB for Average August**	**With Ground Attenuation of 0.66 and Air Attenuation**		**Reduction in dB**	**Modeled with Ground Attenuation of 0.66, Air Attenuation, and Max Barrier Effect**		**Minor, 2021**	
Cleary Summit/Pedro Dome Area (N1-N6)	31	80	64	*+33*	-9	55	+24	-9	**46**	+15	**40**	+6
Ski Land / Fish Creek Road Area (N7- N9)	31	83	68	*+37*	-7	61	+30	-9	**52**	+21	**36**	+16

6 Conclusions

The modeling results summarized in **Table 6-1** indicate a range of noise impacts which may occur at each receptor based on the variables taken into consideration for this investigation. The results indicated in the column labelled “Change in dB from Reference Level with Ground Attenuation of 0.66 and Air Attenuation” present a conservative, but reasonable, estimation of the change in sound which may be expected at each receptor without the barrier effect.

The results indicated in the column labelled “Change in dB from Reference Level with Ground Attenuation of 0.66, Air Attenuation, and Max Barrier Effect” is only applicable when work is being performed at the bottom or toe of the proposed facility. The barrier effect will decrease as the PC WRD height increases, with the barrier effect being eliminated when the facility reaches the following approximate elevations for each respective receptor:

- For the Cleary Summit / Pedro Dome Area, the barrier effect will decrease, and then be eliminated when the facility reaches an approximate elevation of between 1,770 and 2,070 feet amsl;
- For the Ski Land / Fish Creek Road Area, the barrier effect will decrease, and then be eliminated when the facility reaches an approximate elevation of 1,780 feet amsl; and
- For the NOAA Area, the barrier effect will decrease, and then be eliminated when the facility reaches its approximate final elevation of 2,430 feet amsl.

Actual results will vary depending on the ground surface factors discussed in **Section 5.2**, the air absorption factors discussed in **Section 5.4**, and site-specific topographical factors (beyond simple barriers) not accounted for in this investigation.

Modeling results indicate that the FHWA and Alaska DOT&PF criteria of 67 dBA Leq will be met considering a ground attenuation factor of 0.66 or greater (i.e. when the ground is softened by snow or when conditions are softened by dense foliage) and considering average August air attenuation factors. However, this criterion could be exceeded when ground conditions are hard, such as when the snow is icy and reflective, when the ground is hard or frozen, and/or when the air is warmer and dryer than the August average.

Modeling results using a ground factor of 0.66 and average August air attenuation factors indicate that existing noise levels will increase by more than 15 dB at the Cleary Summit / Pedro Dome Area and the Ski Land / Fish Creek Road Area, which is considered a substantial noise increase at residential receivers per the FHWA and Alaska DOT&PF criteria. EPA guidelines also expect a community reaction when sound levels increase over 10 dBA.

Impacts to noise will last for as long as equipment is active on the PCWRD for dumping, regrading, and/or reclamation work. At this time, activity on the WRD is anticipated to last approximately five years. Impacts will decrease slightly as the numbers of equipment in use at one time decrease. Equipment noise impacts will cease once the equipment is removed.

Table 6-1: Summary of Results

Receptor Area	Time of Day / Location Details	Reference Level dB	dB at Receptor	dB at Receptor	*Change in dB from Reference Level with Ground Attenuation of 0.66*	Air Attenuation Values	dB at Receptor	*Change in dB from Reference Level with Ground Attenuation of 0.66 and Air Attenuation*[1]	Maximum Barrier Effect	dB at Receptor	*Change in dB from Reference Level with Ground Attenuation of 0.66, Air Attenuation, and Max Barrier Effect*[1]
Details / References		**Minor, 2021**	**Inverse Law Attenuation Only**	**With Ground Attenuation of 0.66**		**Reduction in dB for Average August**	**Modeled with Ground Attenuation of 0.66 and Air Attenuation**		**Reduction in dB**	**With Ground Attenuation of 0.66, Air Attenuation, and Max Barrier Effect**	
Cleary Summit/Pedro Dome Area (N1-N6)	2:00	39	82	66	*+27*	-8	58	+19	-22	36	No change
	14:00	41	82	66	*+25*	-8	58	+17	-22	36	No change
Ski Land / Fish Creek Road Area (N7- N9)	2:00	32	84	69	*+37*	-6	63	+31	-2	61	+29
	14:00	37	84	69	*+32*	-6	63	+26	-2	61	+24
NOAA	2:00, 50 feet off roadway	60	74	56	*-4*	-18	38	No change		38	No change
	2:00, 750 feet off roadway	39	74	56	*+17*	-18	38	No change	-9	29	No change
	14:00, 50 feet off roadway	64	74	56	*-8*	-18	38	No change	-9	29	No change
	14:00, 750 feet off roadway	41	74	56	*+15*	-18	38	No change	-9	29	No change

Note: Results shown as "No Change" indicate that the dB at the receptor will not be greater than the reference level dB. Therefore, no change in dB will be experienced.

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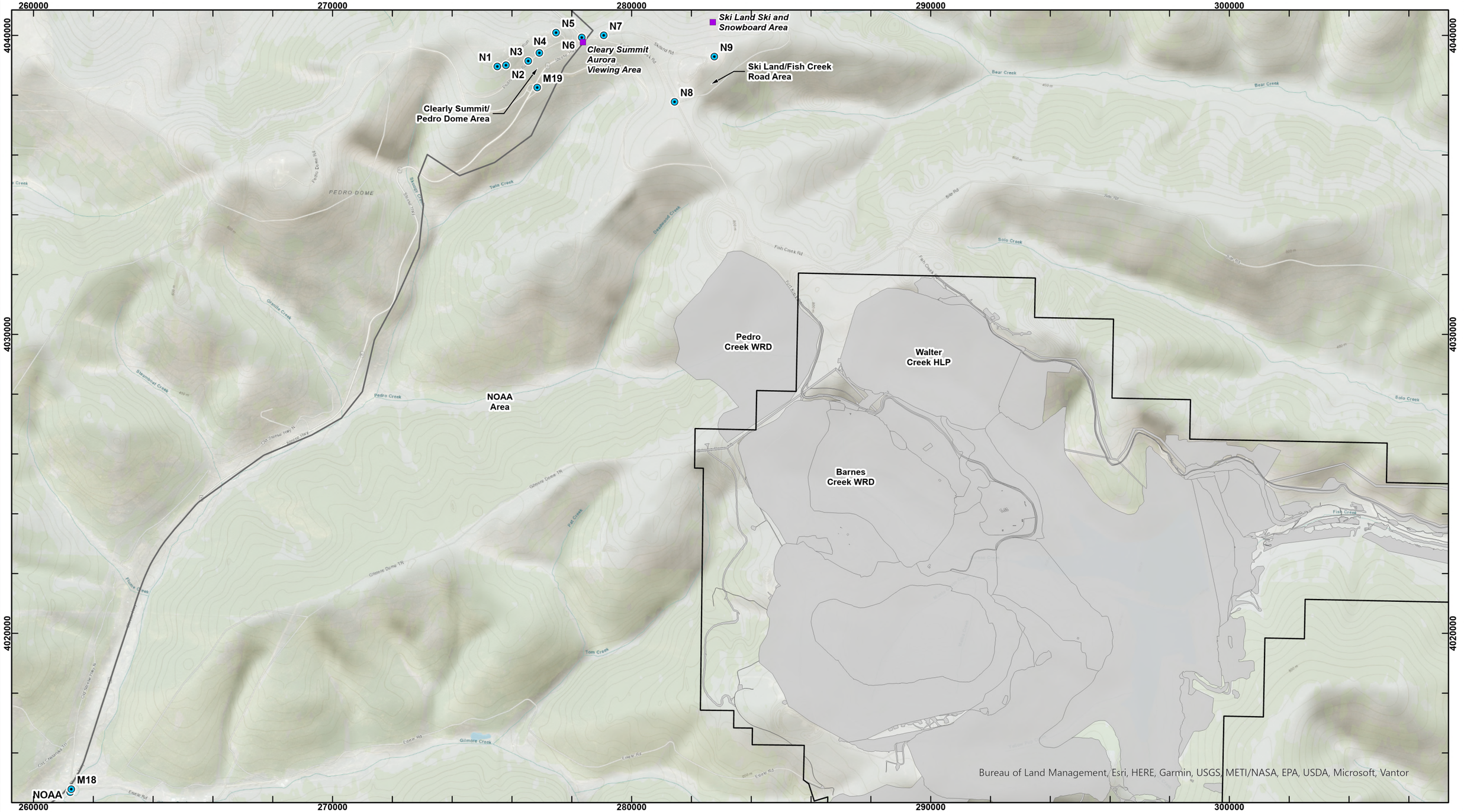


KINROSS Fort Knox

Issued For:
Fort Knox Mine Pedro Creek WRD
Noise Impact Investigation

Noise Receptor Locations

Figure 1

Date: February 2026

LEGEND:

- Noise Receptor Locations
- FGMI
- Fort Knox Facility Disturbance

N

1" = 3,000 feet

0 3000 6000

NAD 1927 StatePlane Alaska 3 FIPS 5003

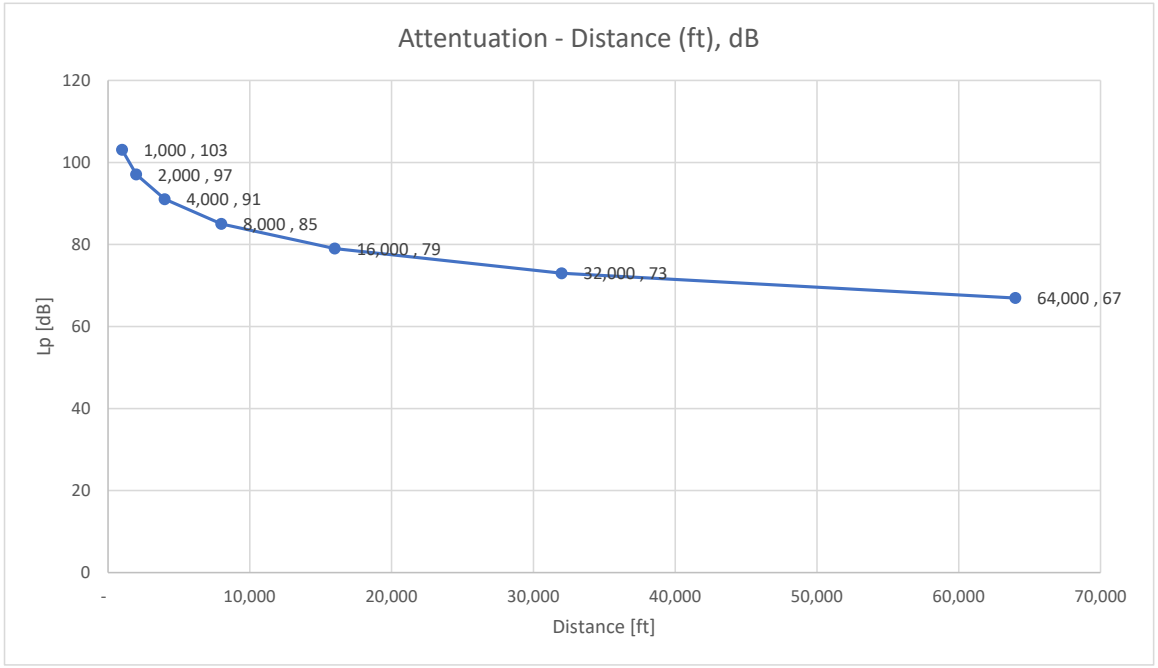
Fort Knox Project Boundary and Facility Disturbance for display purposes only

C:\Users\gklemens\SRK Consulting\NA USPR002319 Fort Knox Pedro Creek Noise and Visual Analysis - Internal\040_Drafting\Task_200_Noise_Assessment\RPT_FIG1_FK_NOISE_RCPT_LOCATIONS.aprx

Appendix A: Calculations and Results

Attenuation Calculation Overview

Sources			Intermediate Calc		P/Po @ R [ft] (for plot)							R2 [ft]
#	Lp1s [dBA]	R1s [ft]	Temp	P/Po @ R1	1,000	2,000	4,000	8,000	16,000	32,000	64,000	50
1	119	50	7.94328E+11	7.94328E+11	1985820587	496455146.7	124113786.7	31028446.67	7757111.667	1939277.917	484819.48	7.94328E+11
2	119	50	7.94328E+11	7.94328E+11	1985820587	496455146.7	124113786.7	31028446.67	7757111.667	1939277.917	484819.48	7.94328E+11
3	119	50	7.94328E+11	7.94328E+11	1985820587	496455146.7	124113786.7	31028446.67	7757111.667	1939277.917	484819.48	7.94328E+11
4	119	50	7.94328E+11	7.94328E+11	1985820587	496455146.7	124113786.7	31028446.67	7757111.667	1939277.917	484819.48	7.94328E+11
5	119	50	7.94328E+11	7.94328E+11	1985820587	496455146.7	124113786.7	31028446.67	7757111.667	1939277.917	484819.48	7.94328E+11
6	119	50	7.94328E+11	7.94328E+11	1985820587	496455146.7	124113786.7	31028446.67	7757111.667	1939277.917	484819.48	7.94328E+11
7	119	51	7.94328E+11	7.94328E+11	2066047739	516511934.6	129127983.7	32281995.91	8070498.979	2017624.745	504406.19	8.26419E+11
8	119	50	7.94328E+11	7.94328E+11	1985820587	496455146.7	124113786.7	31028446.67	7757111.667	1939277.917	484819.48	7.94328E+11
9	119	50	7.94328E+11	7.94328E+11	1985820587	496455146.7	124113786.7	31028446.67	7757111.667	1939277.917	484819.48	7.94328E+11
10	116	50	3.98107E+11	3.98107E+11	995267926.4	248816981.6	62204245.4	15551061.35	3887765.337	971941.3344	242985.33	3.98107E+11
11	116	50	3.98107E+11	3.98107E+11	995267926.4	248816981.6	62204245.4	15551061.35	3887765.337	971941.3344	242985.33	3.98107E+11
12	109	50	79432823472	79432823472	198582058.7	49645514.67	12411378.67	3102844.667	775711.1667	193927.7917	48481.948	79432823472
13	109	50	79432823472	79432823472	198582058.7	49645514.67	12411378.67	3102844.667	775711.1667	193927.7917	48481.948	79432823472
				P/Po Tot =	20340312403	5085078101	1271269525	317817381.3	79454345.32	19863586.33	4965896.6	8.13612E+12
				Lp_tot =	103	97	91	85	79	73	67	129



Receptor Results

Receptor/Location	Baselind Data Collection Date	Distance from Project Center (ft)	Distance from Project Center (meters)	Pre-Manh Choh Baseline dBA Leq (Minor, 2021) and PreMining for WCHL (Mennit, 2015)	Reference Level (with Manh Choh Traffic) Rounded to Nearest Whole (Minor, 2021) and PreMining for WCHL (Mennit, 2015)	dB at Receptor from Multiple Sources	Logarithmic Addition of Sound Pressures	Change in dB at Receptor - Inverse Law Attenuation Only	dB at Receptor with Ground Cover Attenuation 0	dB at Receptor with Ground Cover Attenuation 0.66	dB at Receptor with Ground Cover Attenuation 1	Logarithmic Addition of Sound Pressures (Baseline and G=1)	dB Difference from Baseline - Ground Cover Attenuation 1	Logarithmic Addition of Sound Pressures (Baseline and G=0.66)	dB Difference from Baseline - Ground Cover Attenuation 0.66
N1 Ridge Run (West)	2:00 hour	12,302	3,749	31	37	81	81	44	81	66	57	57	20	66	29
N2 Pedro Dome (West)	2:00 hour	12,117	3,693	36	42	81	81	39	81	81	58	81	81	81	81
N3 Pedro Dome (Center)	2:00 hour	11,687	3,562	28	34	82	82	48	82	66	58	58	24	66	32
N4 Pedro Dome (East)	2:00 hour	11,632	3,545	32	36	82	82	46	82	66	58	58	22	66	30
N5 Ridge Run (East)	2:00 hour	11,798	3,596	35	37	82	82	45	82	66	58	58	21	66	29
N6 Cleary Summit View	2:00 hour	11,161	3,402	45	45	82	82	37	82	67	59	59	14	67	22
Cleary Summit /Pedro Dome Area Average (N1-N6)	**2:00 hour**	**11,783**	**3,591**	**35**	**39**	**82**	**82**	**43**	**82**	**66**	**58**	**58**	**19**	**66**	**28**
N7 Ski Land Road (West)	2:00 hour	10,825	3,299	26	28	82	82	54	82	67	59	59	31	67	39
N8 Fish Creek Road Resident	2:00 hour	7,747	2,361	28	36	85	85	49	85	71	63	63	27	71	35
N9 Ski Land Resort	2:00 hour	8,765	2,671	24	31	84	84	53	84	69	62	62	31	69	38
Ski Land / Fish Creek Road Area Average (N7-N9)	**2:00 hour**	**9,112**	**2,777**	**26**	**32**	**84**	**84**	**52**	**84**	**69**	**61**	**61**	**30**	**69**	**37**
N1 Ridge Run (West)	14:00 hour	12,302	3,749	37	39	81	81	42	81	66	57	57	18	66	27
N2 Pedro Dome (West)	14:00 hour	12,117	3,693	42	44	81	81	37	81	66	58	58	14	66	22
N3 Pedro Dome (Center)	14:00 hour	11,687	3,562	34	36	82	82	46	82	66	58	58	22	66	30
N4 Pedro Dome (East)	14:00 hour	11,632	3,545	36	38	82	82	44	82	66	58	58	20	66	28
N5 Ridge Run (East)	14:00 hour	11,798	3,596	38	39	82	82	43	82	66	58	58	19	66	27
N6 Cleary Summit View	14:00 hour	11,161	3,402	52	52	82	82	30	82	67	59	59	7	67	15
Cleary Summit /Pedro Dome Area Average (N1-N6)	**14:00 hour**	**11,783**	**3,591**	**40**	**41**	**82**	**82**	**40**	**82**	**66**	**58**	**58**	**17**	**66**	**25**
N7 Ski Land Road (West)	14:00 hour	10,825	3,299	35	36	82	82	46	82	67	59	59	23	67	31
N8 Fish Creek Road Resident	14:00 hour	7,747	2,361	40	41	85	85	44	85	71	63	63	22	71	30
N9 Ski Land Resort	14:00 hour	8,765	2,671	32	34	84	84	50	84	69	62	62	28	69	35
Ski Land /Fish Creek Road Area Average (N7-N9)	**14:00 hour**	**9,112**	**2,777**	**36**	**37**	**84**	**84**	**47**	**84**	**69**	**61**	**61**	**24**	**69**	**32**
NOAA	2:00 50 ft	28,391	8,653	53	60	74	74	14	74	56	46	60	0	61	1
NOAA	2:00 750 ft	28,391	8,653	30	39	74	74	35	74	56	46	47	8	56	17
NOAA	14:00 50 ft	28,391	8,653	62	64	74	74	10	74	56	46	64	0	65	1
NOAA	14:00 750 ft	28,391	8,653	38	41	74	74	33	74	56	46	48	7	56	15
WCHL to Cleary Summit/ Pedro Dome Area	daytime	14,435	4,400	31	31	80	80	49	80	64	55	55	24	64	33
WCHL to Ski Land / Fish creek Road Area	daytime	10,176	3,101	31	31	83	83	52	83	68	60	60	29	68	37

FEET	Pedro Creek WRD	Deadwood Creek Spur	Fish Creek Road Spur	Cleary Summit / Pedro Dome Area	Total Distance
High	2,430	2,300	2,300	2,400	
Low	1,650	2,200	2,200	2,200	
Section Dista	-	3,995	4,670	3,118	11,783

METERS	Pedro Creek WRD	Deadwood Creek Spur	Fish Creek Road Spur	Cleary Summit / Pedro Dome Area	Total Distance
High	741	701	701	731	
Low	503	671	671	671	
Section Distar	-	1,218	1,423	950	3,591

-

Barrier Effect	dB
Maximum Barrier Effect	-22.2
Minimum Barrier	0

Barrier Effect Limit Elevation	Meters	Feet
lowest limit elevat	540	1,771.74
highest limit elevat	630	2,067.03

FEET	Pedro Creek WRD	Fish Creek Road	Ski Land/Fish Creek Road Area (East Side)	Total Distance
High	2,430	2,380	2,480	
Low	1,650			
Section Dista	-	5,596	3,516	9,112

METERS	Pedro Creek WRD	Fish Creek Road	Ski Land/Fish Creek Road Area (East Side)	Total Distance
High	741	725	756	
Low	503	-	-	
Section Distar	-	1,706	1,072	2,777

Barrier Effect	dB
Maximum Barrier Effect	-1.8
Minimum Barrier	0

Barrier Effect Limit Elevation	Meters	Feet
lowest limit elevat	543	1,781.58
highest limit elevat	0	-

FEET	Pedro Creek WRD	Gilmore Creek Ridge	NOAA Area	Total Distance
High	2,430	2,200	920	
Low	1,650	-	920	
Section Dista	-	15,840	11,616	27,456

FEET	Pedro Creek WRD	Gilmore Creek Ridge	NOAA Area	Total Distance
High	741	671	280	-
Low	503	-	280	-
Section Distar	-	4,828	3,540	8,368

Barrier Effect	dB
Maximum Barrier Effect	-9.4
Minimum Barrier	-0.1

Barrier Effect Limit Elevation	Meters	Feet
lowest limit elevat	741	2,431.22
highest limit elevat	741	2,431.22

FEET	Walter Creek HLP	Walter Creek Point	Fish Creek Road Point	Cleary Summit / Pedro Dome Area (high point)	Total Distance
High	2,645	2,540	2,480	2,400	
Section Dista	-	1,200	8,450	4,785	14,435

METERS	Walter Creek HLP	Walter Creek Point	Fish Creek Road Point	Cleary Summit / Pedro Dome Area (high point)	Total Distance
High	806	774	756	732	-
Section Distar	-	366	2,576	1,459	4,401

Barrier Effect	dB
Maximum Barrier Effect	
Minimum Barrier	0

Barrier Effect Limit Elevation	Meters	Feet
lowest limit elevat	741	2,431.22
highest limit elevat	741	2,431.22

FEET	Walter Creek HLP	Walter Creek Point	Ski Land/Fish Creek Road Area (East Side)	Total Distance
High	2,645	2,540	2,480	
Section Distance		1,200	8,976	10,176

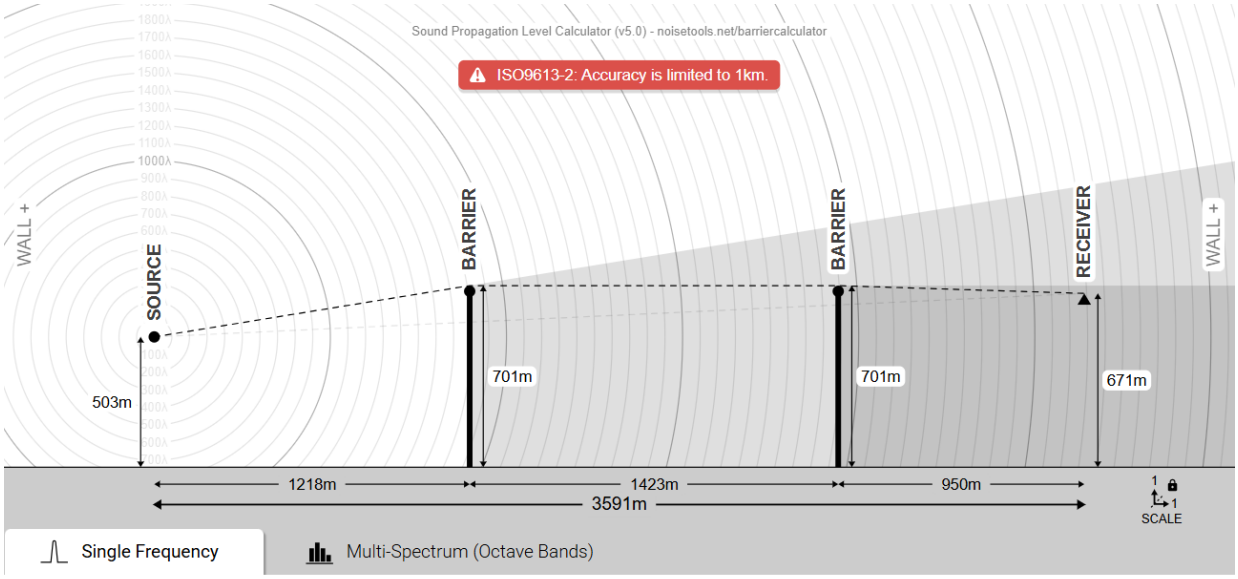
METERS	Walter Creek HLP	Walter Creek Point	Ski Land/Fish Creek Road Area (East Side)	Total Distance
High	806	774	756	-
Section Distar	-	366	2,736	3,101

Barrier Effect	dB
Maximum Barrier Effect	0
Minimum Barrier	0

Barrier Effect Limit Elevation	Meters	Feet
lowest limit elevat	723	2,372.16
highest limit elevat	723	2,372.16

Appendix B: Sound Propagation Level Calculator Results

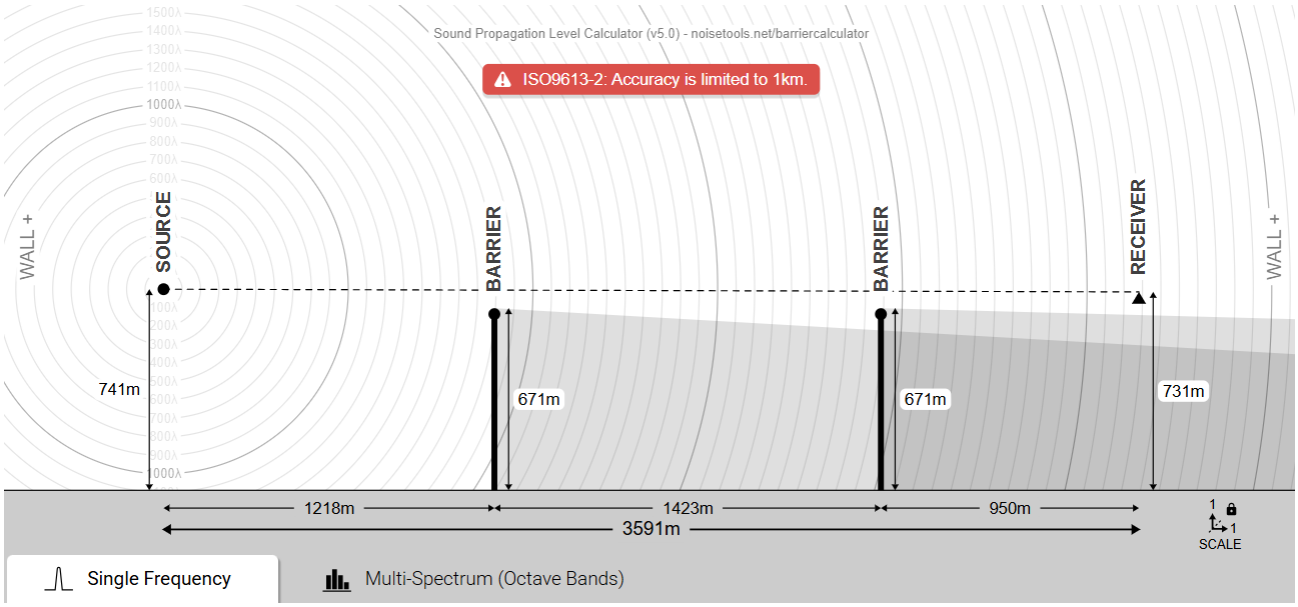
Results for the lower PCWRD reference point across the higher elevation Deadwood Creek spur and Fish Creek Road spur reference points to the lower Cleary Summit / Pedro Dome residential area reference point (Maximum Barrier Effect)



Calculation breakdown

Source Sound Power Level		Distance Attenuation		Barrier Effect		Ground Effect		Air Absorption		Wall Reflections		Resulting Sound Pressure Level
163.7	+	-82.1	+	-22.2	+	0.9	+	-7.8	+	0	=	52.5

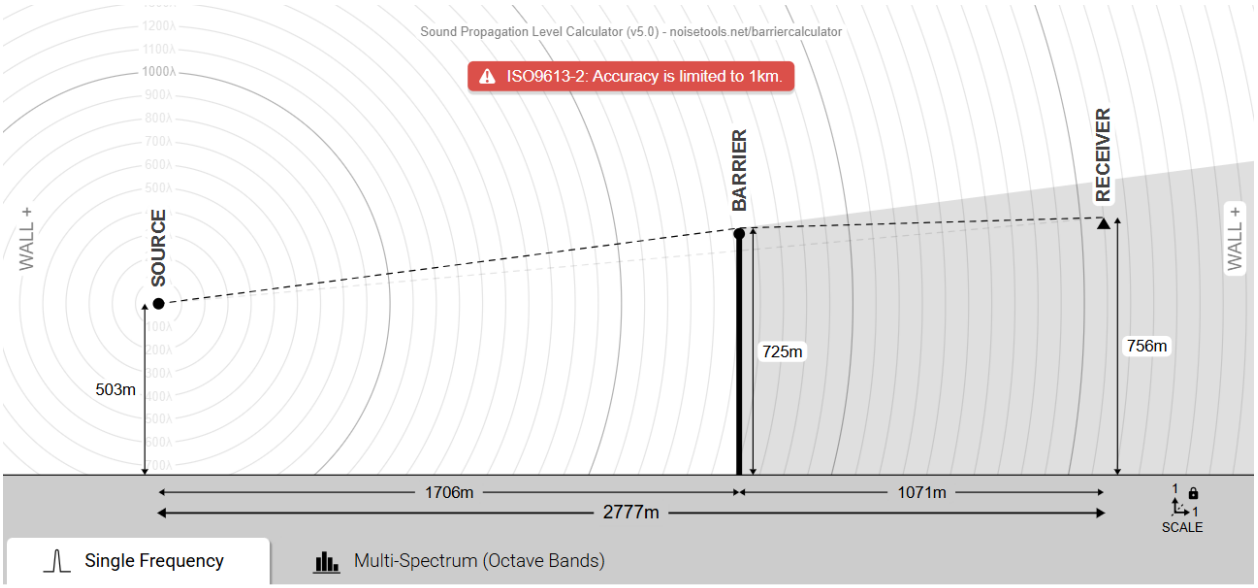
Results of the higher PCWRD reference point across the lower elevation Deadwood Creek spur and Fish Creek Road spur reference points to the higher Cleary Summit / Pedro Dome residential area reference point (Minimum Barrier Effect)



Calculation breakdown

Source Sound Power Level		Distance Attenuation		Barrier Effect		Ground Effect		Air Absorption		Wall Reflections		Resulting Sound Pressure Level
163.7	+	-82.1	+	0	+	0.9	+	-7.8	+	0	=	74.7

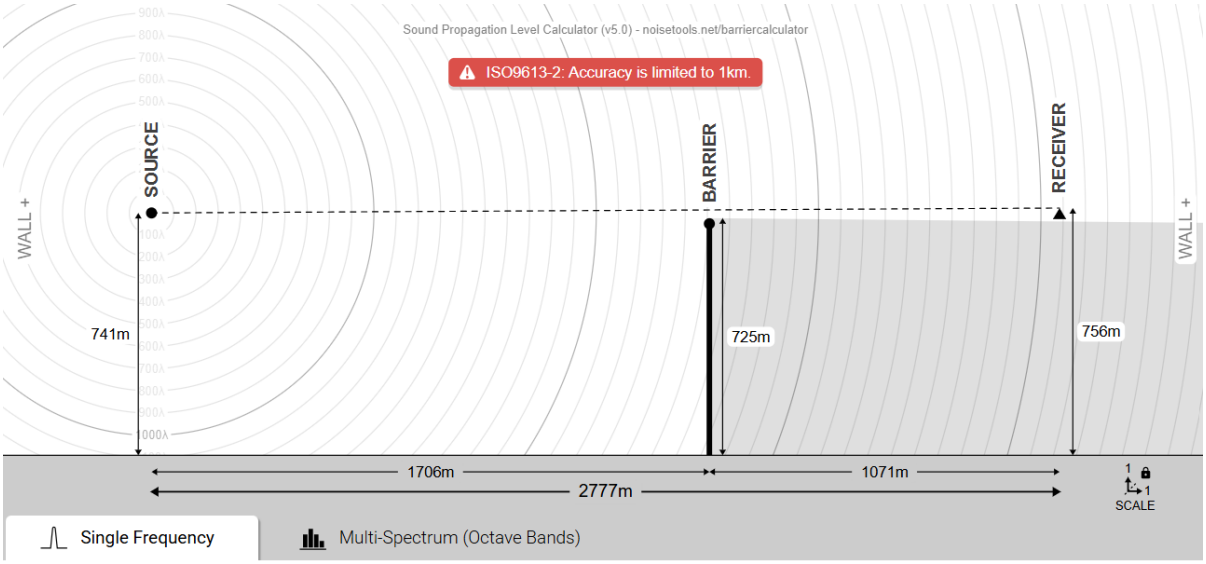
Results for the lower PCWRD reference point across the Fish Creek Road Ridge spur reference point to the Ski Land / Fish Creek Road area reference point (Maximum Barrier Effect)



Calculation breakdown

Source Sound Power Level		Distance Attenuation		Barrier Effect		Ground Effect		Air Absorption		Wall Reflections		Resulting Sound Pressure Level
163.7	+	-79.9	+	-1.8	+	0.9	+	-6	+	0	=	76.8

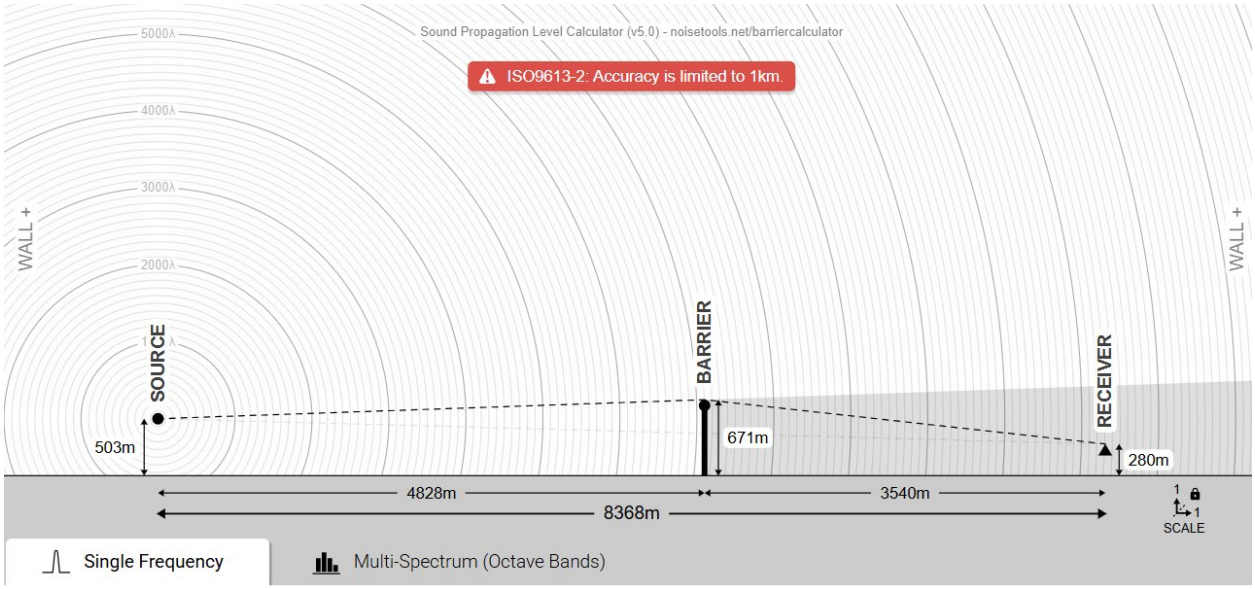
Results for the higher PCWRD reference point across the Fish Creek Road reference point to the Ski Land / Fish Creek Road area reference point (Minimum Barrier Effect)



Calculation breakdown

Source Sound Power Level		Distance Attenuation		Barrier Effect		Ground Effect		Air Absorption		Wall Reflections		Resulting Sound Pressure Level
163.7	+	-79.9	+	0	+	0.8	+	-6	+	0	=	78.6

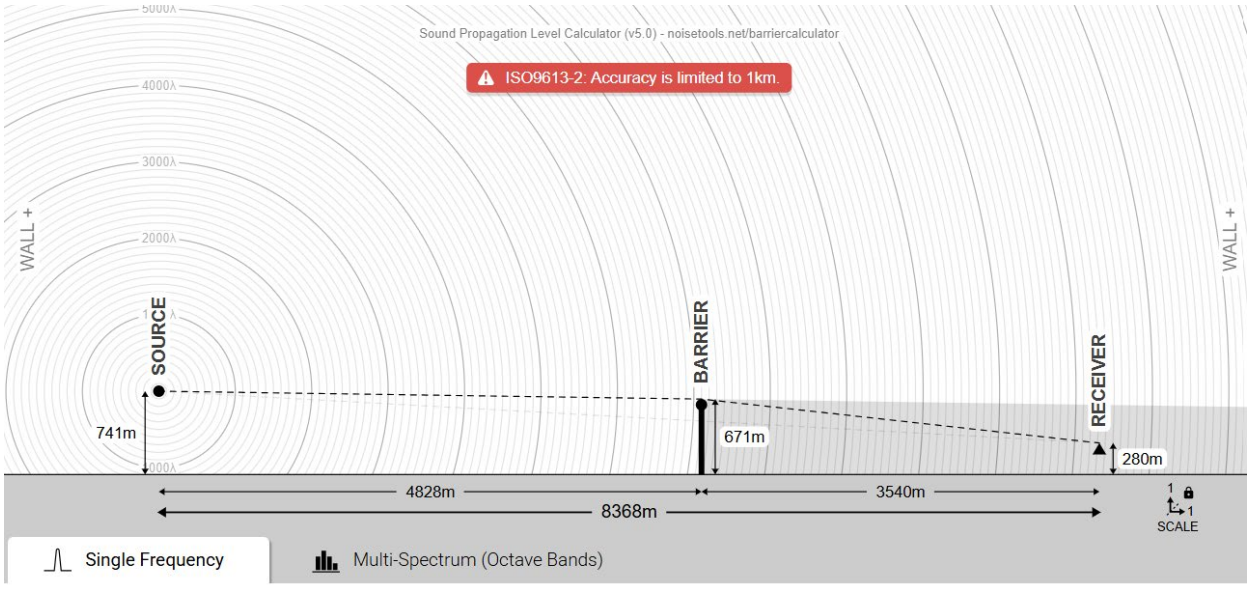
Results for the lower PCWRD reference point across the Gilmore Creek Ridge reference point to the NOAA area reference point (Maximum Barrier Effect)



Calculation breakdown

Source Sound Power Level		Distance Attenuation		Barrier Effect		Ground Effect		Air Absorption		Wall Reflections		Resulting Sound Pressure Level
163.7	+	-89.5	+	-9.4	+	1	+	-18.1	+	0	=	47.7

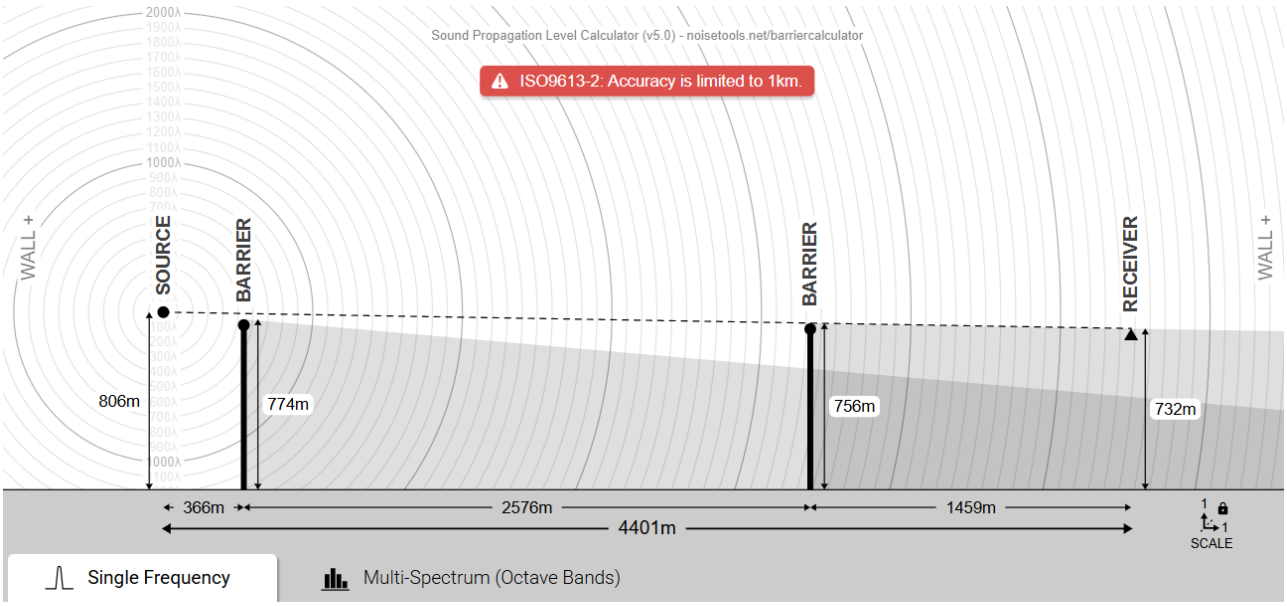
Results for the higher PCWRD reference point across the Gilmore Creek Ridge reference point to the NOAA area reference point (Minimum Barrier Effect)



Calculation breakdown

Source Sound Power Level		Distance Attenuation		Barrier Effect		Ground Effect		Air Absorption		Wall Reflections		Resulting Sound Pressure Level
163.7	+	-89.5	+	-0.1	+	1	+	-18.1	+	0	=	57.1

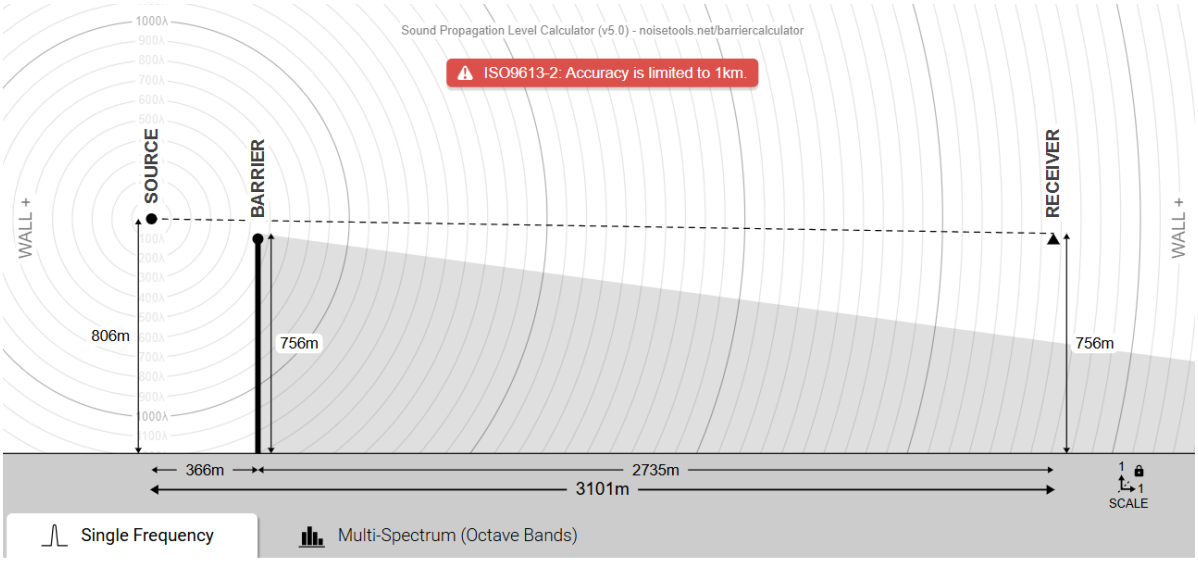
Results for the WCHL reference point across Walter Creek Point and the Fish Creek Road reference points to the Cleary Summit / Pedro Dome area highest reference point



Calculation breakdown

Source Sound Power Level		Distance Attenuation		Barrier Effect		Ground Effect		Air Absorption		Wall Reflections		Resulting Sound Pressure Level
163.7	+	-83.9	+	0	+	0.9	+	-9.5	+	0	=	71.2

Results for the WCHL reference point across Walter Creek Point to the Ski Land / Fish Creed Road area reference point



Calculation breakdown

Source Sound Power Level		Distance Attenuation		Barrier Effect		Ground Effect		Air Absorption		Wall Reflections		Resulting Sound Pressure Level
163.7	+	-80.8	+	0	+	0.8	+	-6.7	+	0	=	77