3.11. NOISE

Noise is generally defined as unwanted sound, and can be intermittent or continuous, stationary or transient. Noise levels heard by humans and animals depend on several variables, including distance and ground cover between the source and receiver and atmospheric conditions. Noise can influence humans or wildlife by interfering with normal activities or diminishing the quality of the environment. Noise levels are quantified using units of decibels (dB). To account for the human ear's sensitivity to low-level noises, decibel levels are corrected using the A-weighted scale (dBA). The dBA scale begins at zero—the sound intensity at which sound becomes audible to a young person with normal hearing. Each 10 dBA increase in sound approximates a doubling in loudness, so that 60 dBA is twice as loud as 50 dBA. People generally have difficulty detecting sound level differences of 3 dBA or less. C-weighted decibels (dBC) are used to describe lower frequency noises, such as the rumble of large fans or the boom of blasting.

Two measurements used to relate the time-varying quality of environmental noise to its known impacts on people are the equivalent sound level (L_{eq}) and the day-night sound level (L_{dn}). L_{eq} is defined as the sound pressure level of a noise fluctuating over a period of time, expressed as the amount of average energy. L_{dn} is defined as the 24-hour average of the equivalent average of the sound levels during the daytime (from 7:00 a.m. to 10:00 p.m.) and the equivalent average of the sound levels during the nighttime (from 10:00 p.m. to 7:00 a.m.). Specifically, in the calculation of the L_{dn}, late night and early morning (10:00 p.m. to 7:00 a.m.) noise exposures are increased by 10 dB to account for people's greater sensitivity to sound during nighttime hours. To measure sounds of short duration but higher intensity, such as blasting, the unweighted instantaneous peak noise level (L_{peak}) is used.

No federal regulations govern noise levels in the proposed Project area; however, the USEPA identifies outdoor noise levels less than or equal to 55 dBA L_{dn} as sufficient to protect public health and welfare in residential areas and other places where quiet is a basis for use (USEPA 1978). DEQ has established general regulations applicable to blasting operations (DEQ 1999), as well as noise regulations applicable to surface blasting activities. The surface blasting noise regulations limit peak sound levels from blasting activities at any dwelling or public, commercial, community, or institutional building, unless the structure is owned by the operator and is not leased to any other person (DEQ 2004). MDT determines that traffic noise impacts occur if predicted 1-hour traffic noise levels are 66 dBA or greater at a residential property during the peak traffic hour, or if the projected traffic noise levels exceed the existing peak hour [$L_{eq}(h)$] by 13 dBA or more (MDT 2016).

In addition, the Federal Transit Administration has established guidelines for assessing short duration (1 hour) and long duration (8 hours) impacts associated with construction noise based on adjacent land uses as shown in **Table 3.11-1** (FTA 2006).

Table 3.11-1
Construction Noise Guidelines

Adjacent Land Use	Daytime L_{eq}	Nighttime L_{eq}
Short Duration Noise Guidelines (1 hour)		
Residential	90 dBA	80 dBA
Commercial	100 dBA	100 dBA
Industrial	100 dBA	100 dBA
Long Duration Noise Guidelines (8 hours)		
Residential	80 dBA	70 dBA
Commercial	85 dBA	85 dBA
Industrial	90 dBA	90 dBA

Source: FTA 2006
dBA = decibels on A-weighted scale; L_{eq} = equivalent sound level

Changes in noise levels are also used to determine audibility and potential impacts associated with noise sources. Comparing the L_{eq} noise levels of a noise source to ambient noise levels exceeded 90 percent of the time (L_{90}) at a location can be used to approximate whether a noise source would be audible, and how significantly the ambient environment would change due to a new noise source (**Table 3.11-2)**.

Table 3.11-2
Anticipated Community Noise Reaction

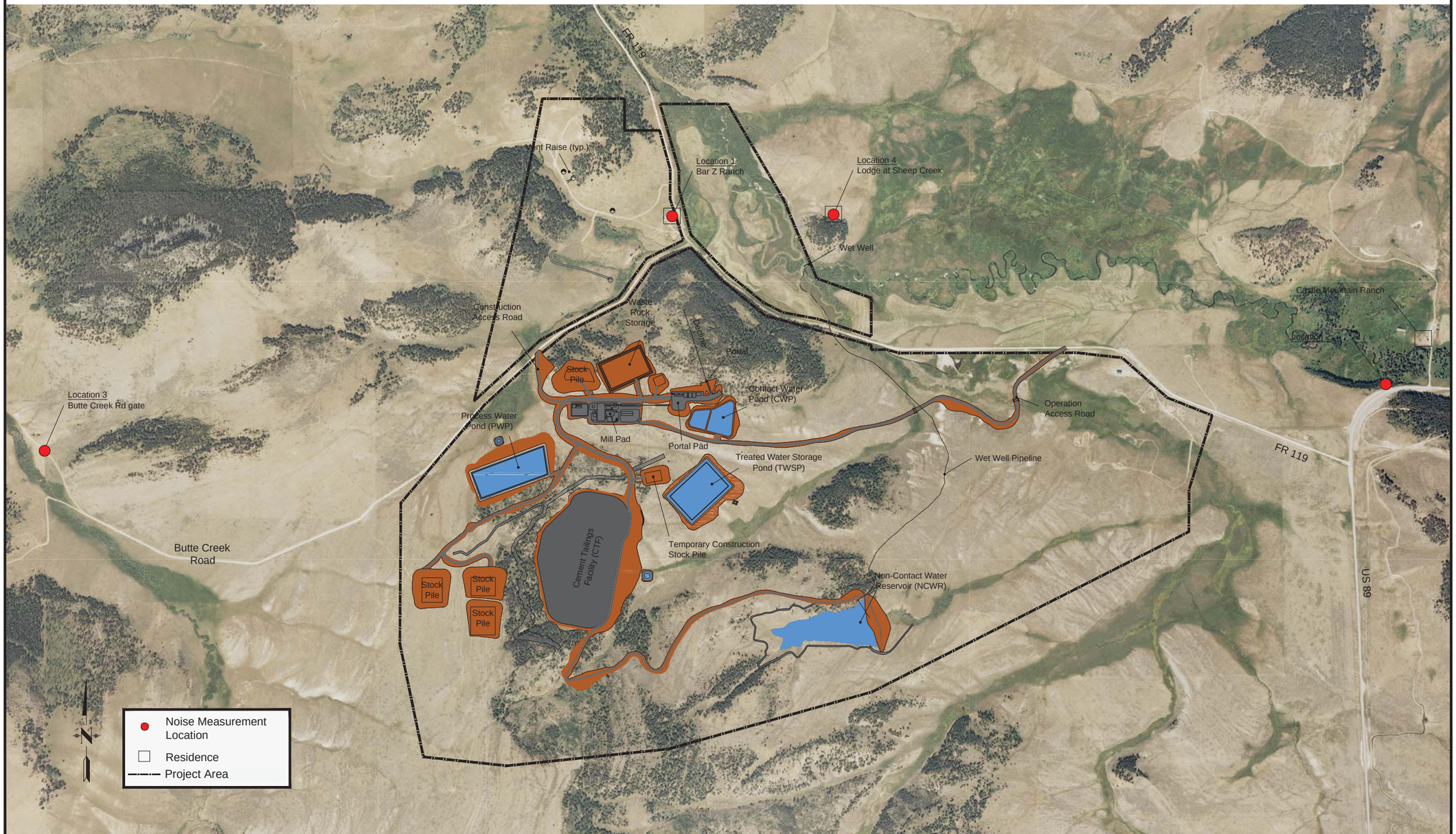
Noise Condition	Description	Anticipated Community Reaction
$L_{eq} \leq L_{90}$	Rarely heard	Minimal
$L_{90} < L_{eq} \leq L_{90} + 10$	Sometimes audible	Moderate
$L_{eq} > L_{90} + 10$	Clearly audible	High

Sources: Menge 2005 and Cavanaugh 2002, as cited in Big Sky Acoustics 2017
L_{90} = ambient noise level; L_{eq} = equivalent noise level

3.11.1. Analysis Methods

The analysis encompasses an area potentially affected by Project facilities along Sheep Creek Road and Butte Creek Road, which includes the Project's mine facilities, aboveground equipment, and access roads.

Big Sky Acoustics, LLC (Big Sky Acoustics), on behalf of the Proponent, collected ambient noise levels at four locations in proximity to the Project area on September 10 and 11, 2013. Big Sky Acoustics completed one, 24-hour noise level measurement at Location 1, and 1-hour daytime (7 a.m. to 7 p.m.) and 15-minute nighttime (7 p.m. to 7 a.m.) noise level measurements at Locations 2 through 4. The noise level measurement locations relative to the Project area are presented on **Figure 3.11-1** (Big Sky Acoustics 2017). Big Sky Acoustics developed predicted noise level contours for the construction and operations phases of the Project using Cadna-A noise prediction software assuming, conservatively, that all equipment applicable to the construction or operations phase is operated simultaneously.



This information is for environmental review purposes only.

Figure 3.11-1
Black Butte Copper Project
Project Facilities and Noise Measurement Locations
Meagher County, Montana

3.11.2. Affected Environment

Existing sound levels in the analysis area are low and characteristic of rural or quiet suburban areas. Nighttime sound levels are 3 to 9 dB lower than daytime levels due to cessation of many human-related activities. Natural sound sources include wind, wildlife, water flow, and wind-induced noise such as the rustling of foliage. Other sound sources include vehicles, such as trucks or airplanes, and human activities.

Two residences or cabins are within 1 mile of the Project area. **Table 3.11-3** summarizes the results of the ambient noise monitoring, including the approximate distance and direction of each noise measurement location from the Project site.

Table 3.11-3
Ambient Noise Levels

Noise Measurement Location	Distance/Direction from Mill Pad	Daytime L_{eq}	Nighttime L_{eq}	Measured L_{dn}
Location 1 Bar Z Ranch [a]	2,950 feet/north-northeast	35-45	22-48	42
Location 2 Castle Mountain Ranch/ U.S. 89	12,360 feet/east	44	41	48
Location 3 Butte Creek Road Gate	9,400 feet/west	33	24	33
Location 4 Lodge at Sheep Creek	4,370 feet/northeast	28	24	31

Source: Big Sky Acoustics 2017
L_{dn} = day-night sound level; L_{eq} = equivalent noise level
[a] Measured range based on 24-hour noise monitoring at Location 1.

3.11.3. Environmental Consequences

3.11.3.1. No Action Alternative

Under the No Action Alternative, the analysis area would continue to have quiet sound levels characteristic of rural areas as described above. Existing noise levels would not change.

3.11.3.2. Proposed Action

Construction Phase

The construction phase of the Project would include building the mill, portal pad, ponds, tailings facilities, wet well, and wet well pipline and is estimated to last 2 to 3 years. During the construction phase, noise would be produced by earth-moving equipment, a rock crusher and screen plant, haul or water trucks, air compressors, and diesel generators. The noise analysis is based on the assumption that most equipment would be operated 20 hours per day, with the exception of air compressors and diesel generators, which would be operated 24 hours per day.

Table 3.11-4 summarizes the predicted construction phase noise levels assuming that all equipment is operating simultaneously.

Table 3.11-4
Predicted Construction Phase Noise Levels (dBA)

Noise Measurement Location	L_{dn} Noise Level		Audibility			
	Calculated Baseline Noise Level (L_{dn})	Predicted Construction Noise Level (L_{dn})	Average Measured Baseline Noise Level (L_{90})	Predicted Construction Noise Level (L_{eq})	Difference $L_{eq} - L_{90}$	Perception of Construction Noise at Locations
Location 1	42	41	24	38	+14	Clearly audible
Location 2	48	32	25	30	+5	Occasionally audible
Location 3	33	33	21	29	+8	Occasionally audible
Location 4	31	31	22	28	+6	Occasionally audible

Source: Big Sky Acoustics 2017
dBA = decibels on the A-weighted scale; L_{90} = ambient noise levels; L_{dn} = day-night sound level; L_{eq} = equivalent sound level

As presented in **Table 3.11-4**, the predicted noise attributable to construction activities would be less than 70 dBA L_{eq} at each of the four noise measurement locations, which is the level recommended in the Federal Transit Administration construction noise guidelines for residential areas. The audibility analysis shows that noise attributable to construction activities would be clearly audible at Location 1, which is in close proximity to the nearest residence to the Project location. Therefore, construction activities would have a moderate impact at the nearest residence; however, construction activities would only be occasionally audible at additional noise sensitive areas farther from the construction site. To further minimize equipment noise, the Proponent would implement the following noise mitigation measures:

- On all diesel-powered construction equipment, replace standard back-up alarms with approved broadband alarms that limit the alarm noise to 5 to 10 dBA above the background noise.
- Install high-grade mufflers on all diesel-powered equipment.
- Restrict the surface and outdoor construction activities to daytime hours (7:00 a.m. to 7:00 p.m.).
- Combine noisy operations to occur for short durations during the same time periods. Turn idling equipment off.

Implementation of these mitigation measures is expected to reduce overall impacts; however, the residual impacts from construction activities are expected to remain moderate at the nearest residence.

During the scoping phase of the Project, DEQ received a comment requesting analysis of the potential impacts associated with the Project on the Little Moose Subdivision located approximately 3 miles from the mill pad. The noise evaluations completed for the Project included noise sensitive areas approximately 2 miles from the mill pad. As noted in **Table 3.11-4**, noise associated with the construction phase of the Project would be equivalent to background sound levels and only occasionally audible within 1 to 2 miles of the Project area. Because sound levels attenuate with distance, noise associated with the construction phase of the Project would likely be less than the noise level presented in **Table 3.11-4** for Location 2, which is approximately 2 miles from the mill pad. Therefore, noise levels associated with the construction phase of the Project would likely be either not perceptible or only occasionally audible at the Little Moose Subdivision.

Construction phase activities would also involve periodic blasting at or near the ground surface. As the Project progresses to the operations phase, blasting would proceed further underground, and blasting noise at the ground surface would decrease. As previously noted, DEQ regulates noise levels associated with blasting at nearby noise sensitive areas. **Table 3.11-5** presents the estimated noise levels associated with blasting for comparison to the DEQ's noise regulation.

Table 3.11-5
Predicted Noise Levels for Blasting at or near the Ground Surface

Noise Measurement Location	Predicted Blast Noise Level (L_{peak} dBC)	DEQ Noise Threshold (dBC)
Location 1	87	105
Location 2	87	105
Location 3	75	105
Location 4	85	105

Source: Big Sky Acoustics 2017
dBC = decibels on the C-weighted scale; L_{peak}= peak noise level

Blasting would be a short-term, temporary impact during the construction phase of the Project. While blasting would be audible for several miles around the Project site, the noise levels associated with blasting at or near the ground surface would be less than the DEQ's noise threshold for noise sensitive areas, as shown in **Table 3.11-5**.

As noted above, blasting during the construction phase of the Project would be audible for several miles around the Project area. Therefore, the potential exists that blasting activities associated with the construction phase may be audible at the Little Moose Subdivision. Blasting would be a short-term, temporary impact during the Project construction phase. As presented above, the noise levels associated with blasting at or near the ground surface would be less than the DEQ's noise threshold at nearby noise sensitive areas, which are located between 0.5 mile and 2 miles from the Project area. As such, any noise associated with blasting activities at the Little Moose Subdivision, if audible, would be below the DEQ's noise threshold for noise sensitive areas.

Operations Phase

The operations phase of the Project would include operation of the indoor mill, operation of the crusher on the portal pad, haul trucks transporting material from the underground mine portal to the crusher, a front-end loader operating at the crusher, and a ventilation fan. The noise analysis is based on the assumption that the indoor mill, haul trucks, and ventilation fan would operate 24 hours per day, and the outdoor crusher and front-end loader would operate 20 hours per day. **Table 3.11-6** summarizes the predicted operations phase noise levels assuming that all equipment is operating simultaneously.

Table 3.11-6
Predicted Operations Phase Noise Levels (dBA)

Noise Measurement Location	L_{dn} Noise Level		Audibility			
	Calculated Baseline Noise Level (L_{dn})	Predicted Operational Noise Level (L_{dn})	Average Measured Baseline Noise Level (L_{90})	Predicted Operational Noise Level (L_{eq})	Difference $L_{eq} - L_{90}$	Perception of Operational Noise at Locations
Location 1	42	40	24	35	+11	Clearly audible
Location 2	48	34	25	30	+5	Occasionally audible
Location 3	33	36	21	31	+10	Clearly audible
Location 4	31	32	22	27	+5	Occasionally audible

Source: Big Sky Acoustics 2017
L_{90} = ambient noise level; L_{dn} = day-night sound level; L_{eq} = equivalent sound level

As presented in **Table 3.11-6**, the predicted noise attributable to mine operations would be less than 55 dBA L_{dn} at each of the four noise measurement locations, which is the level recommended by the USEPA for outdoor noise levels in noise-sensitive areas. The audibility analysis shows that noise attributable to mine operations would be clearly audible at Locations 1 and 3, which are in close proximity to the nearest residences. Therefore, mine operations would have a moderate impact at the nearest residences; however, mine operations would only be occasionally audible at additional noise-sensitive areas farther from the construction site. To minimize equipment noise, the Proponent would implement the following noise mitigation measures:

- Install a ventilation fan designed to meet 85 dBA at 3 feet.
- Install high-grade mufflers on all diesel-powered equipment.
- Restrict the surface operation activities to daytime hours (7:00 a.m. to 7:00 p.m.).
- Reduce the noise of underground haul trucks by enclosing the engine.

Implementation of these mitigation measures is expected to reduce overall impacts; however, the residual operations phase impacts are expected to remain moderate at the nearest residence.

Traffic Noise

Additional noise would be generated by traffic associated with both the construction and operations phases of the Project. Project-related traffic would travel along U.S. 89 and Forest Road (FR) 119 to and from the Project site, both of which are shown on **Figure 3.11-1**. Speed limits are 70 miles per hour (mph) for cars and 65 mph for trucks on U.S. 89, and 35 mph on FR 119.

Big Sky Acoustics estimated traffic for both the construction and operations phases of the Project using the Federal Highway Administration's Traffic Noise Model. Because traffic noise is intermittent, it is evaluated using 1-hour $L_{eq}(h)$ and is evaluated separately from continuous noise sources.

During the construction phase, approximately six trucks per day would be used to transport material, supplies, and water to and from the site, and approximately 75 employee vehicles per day would be expected to travel roundtrip. Construction phase traffic would access the site using U.S. 89, FR 119, Butte Creek Road, and the construction access road on the west side of the site, as shown on **Figure 3.11-1**. To estimate 1-hour traffic volume, Big Sky Acoustic assumed that all 70 employee vehicles would travel the roads in the same hour near a shift change, but that truck traffic would be distributed evenly throughout an 8-hour shift, resulting in approximately 1 truck per hour.

During the operations phase, approximately 40 trucks (i.e., delivery, fuel, and haul trucks) and 280 employee vehicles per day are predicted to travel roundtrip. Operations phase traffic would access the site using U.S. 89, FR 119, and the operation access road east of the site, as shown on **Figure 3.11-1**. Big Sky Acoustics assumed all 1/3 of the employee vehicles (approximately 93 vehicles) would travel the road in the same 1-hour period during a shift change, and the trucks would be distributed evenly throughout a 24-hour period, resulting in approximately 2 trucks per hour.

The predicted traffic noise levels at noise level measurement Locations 1, 3, and 4 are presented in **Table 3.11-7**. The traffic noise levels shown in the table consider the impact of the natural topography in the area. Since Location 2 is adjacent to U.S. 89, it was evaluated along with other predicted noise levels in proximity to U.S. 89 (see **Table 3.11-8**).

Table 3.11-7
Predicted Construction and Operations Phase Traffic Noise Levels Near the Mine Site

Noise Measurement Location	Measured Daytime L_{eq} (dBA)	Construction Phase		Operations Phase	
		Predicted Construction Traffic Noise $L_{eq}(h)$ (dBA)	Difference versus Measured L_{eq}	Predicted Operations Traffic Noise $L_{eq}(h)$ (dBA)	Difference versus Measured L_{eq}
Location 1	38 [a]	43	+5	38	0

Noise Measurement Location	Measured Daytime L_{eq} (dBA)	Construction Phase		Operations Phase	
		Predicted Construction Traffic Noise $L_{eq}(h)$ (dBA)	Difference versus Measured L_{eq}	Predicted Operations Traffic Noise $L_{eq}(h)$ (dBA)	Difference versus Measured L_{eq}
Location 3	33	33	0	33	0
Location 4	28	30	+2	30	+2

Source: Big Sky Acoustics 2018
dBA = decibels on the A-weighted scale; h = hour; L_{eq} = equivalent sound level; $L_{eq}(h)$ = existing peak hour
[a] Represents the average measured daytime $L_{eq}(h)$ obtained during the 24-hour measurement.

As shown in **Table 3.11-7**, the predicted traffic noise levels with the addition of the mine-related traffic are less than the MDT's $L_{eq}(h)$ 66 dBA criterion, and do not exceed the MDT's +13 dBA significant increase criterion at the nearby receptors.

Big Sky Acoustics also estimated traffic noise levels at various distances from U.S. 89. Traffic data for U.S. 89 were obtained from a traffic study completed by Abelin Traffic Services. The traffic data is provided in terms of average annual daily traffic (AADT). Based on the Abelin Traffic Study, the AADT in the year 2016 was 568, which includes approximately 3 percent commercial (heavy) trucks. The predicted traffic noise levels shown assume a direct line of sight exists between the road and a listener. The results of the U.S. 89 traffic noise analysis for the Project's construction and operations phases are presented in **Table 3.11-8**.

Table 3.11-8
Predicted U.S. 89 Traffic Noise Levels

Distance from Centerline of U.S. 89	Existing U.S. 89 Traffic Noise Level $L_{eq}(h)$ (dBA)	Construction Phase		Operations Phase	
		Existing U.S. 89 + Construction Traffic Noise Level $L_{eq}(h)$ (dBA)	Difference vs. Existing U.S. 89 Traffic Noise	Existing U.S. 89 + Operations Traffic Noise Level $L_{eq}(h)$ (dBA)	Difference vs. Existing U.S. 89 Traffic Noise
100 feet	58	61	+3	61	+3
200 feet	51	54	+3	54	+3
300 feet	46	49	+3	49	+3
400 feet	43	45	+2	45	+2
500 feet	41	43	+2	43	+2
750 feet (Location 2)	36	38	+2	38	+2
1,000 feet	34	36	+2	36	+2
5,000 feet	24	26	+2	26	+2
10,000 feet	20	22	+2	22	+2

Source: Big Sky Acoustics 2018
dBA = decibels on the A-weighted scale; $L_{eq}(h)$ = existing peak hour; U.S. = United States highway

As shown **Table 3.11-8**, the traffic noise levels due to the addition of mine-related traffic to the U.S. 89 traffic volume is not predicted to exceed MDT's criterion of $L_{eq}(h)$ 66 dBA, and do not exceed MDT's +13 dBA significant increase criterion.

As previously noted, DEQ received a scoping comment requesting analysis of the potential impacts associated with the Project on the Little Moose Subdivision located approximately 3 miles from the mill pad. The noise evaluations completed for the Project included noise sensitive areas approximately 2 miles from the mill pad. As noted in **Table 3.11-6**, noise associated with the operations phase of the Project would be equivalent to background sound levels and only occasionally audible within 1 to 2 miles of the Project area. Because sound levels attenuate with distance, noise associated with the operations phase of the Project would likely be less than the noise level presented in **Table 3.11-6** for Location 2, which is approximately 2 miles from the mill pad. Therefore, noise levels associated with the operations phase of the Project would likely be either not perceptible or only occasionally audible at the Little Moose Subdivision.

Closure Phase

The noise associated with the closure phase of the Project would be similar in nature to the construction phase of the Project as presented in **Table 3.11-4**; however, blasting activities would not be required. The Proponent has estimated that mine closure activities would last up to 4 years.

Smith River Assessment

Noise associated with the Project would not likely have any direct or secondary impacts on recreational resources in the Smith River area. Based on the analysis provided by Big Sky Acoustics, noise associated with the construction and operations phases of the Project would be equivalent to background sound levels and only occasionally audible within 1 to 2 miles of the Project area. The Smith River is located approximately 12 miles west of the Project area at its closest point; therefore, it is unlikely that noise associated with the construction and operations phases of the Project would be perceived by recreational users of the Smith River.

As noted above, blasting during the construction phase of the Project would be audible for several miles around the Project site. Therefore, the potential exists that blasting activities associated with the construction phase of the Project may be audible to recreational users of the Smith River. Blasting would have a short-term, temporary impact during the construction phase of the Project. As presented in Section 3.11.3.2, the noise levels associated with blasting at or near the ground surface would be less than the DEQ's noise threshold at nearby noise-sensitive areas, which are located between 0.5 and 2 miles from the Project area. As such, any noise associated with blasting activities, if audible to recreational users at the Smith River State Park, would be below the DEQ's noise threshold for noise sensitive areas.

3.11.3.3. Agency Modified Alternative

The impacts of the Agency Modified Alternative on noise levels in the Project area would be similar to those described for the Proposed Action because the modifications would not modify the noise generating activities associated with mine construction, operation, and closure.

Smith River Assessment

The impacts of the Agency Modified Alternative on noise levels in the Smith River area would be similar to those described for the Proposed Action.