3.9 Noise

3.9.1 Introduction

A noise impact analysis was completed for the Proposed South Quarry Project (Kunzman Associates, Inc. 2012; Appendix I). The noise impact analysis contains documentation of existing noise levels as well as analysis of the impacts generated by Project operation and on-site, off-road haul truck and traffic. The analysis was performed to determine whether there would be significant impacts due to noise from the Proposed Action. The analysis components included:

- Documentation of existing noise conditions,
- Discussion of noise modeling methodology and procedures,
- Analysis of noise results due to increased internal haul truck traffic generated by the Proposed Action, and
- Discussion of the effects of Project noise, including blasting, on nearby sensitive receptors.

This section of the EIR/EIS summarizes the noise impact analysis.

3.9.1.1 Noise Terminology

Sound is a pressure wave created by a moving or vibrating source that travels through an elastic medium such as air. Noise is defined as unwanted or objectionable sound. The effects of noise on people can include general annoyance, interference with speech communication, sleep disturbance, and in extreme circumstances, hearing impairment.

The unit of measurement used to describe a noise level is the decibel (dB). The human ear is not equally sensitive to all frequencies within the sound spectrum. Therefore, the A-weighted noise scale, which weights the frequencies to which humans are sensitive, is used for measurements. Noise levels using A-weighted measurements are written dB(A) or dBA. Average noise levels over a period of minutes or hours are usually expressed as dBA Leq, or the equivalent noise level for that period of time. For example, Leq(3) would represent a 3- hour average. When no period is specified, a one-hour average is assumed. L_{max} is the root mean squared (RMS) maximum level of a noise source or environment measured on a sound level meter, during a designated time interval, using fast meter response. L_{min} is the minimum level.

Noise standards for land use compatibility are stated in terms of the Community Noise Equivalent Level (CNEL) and the Day-Night Average Noise Level (Ldn). CNEL is a 24-hour weighted average measure of community noise. CNEL is obtained by adding five decibels to sound levels in the evening (7:00 PM to 10:00 PM), and by adding ten decibels to sound levels at night (10:00 PM to 7:00 AM). This weighting accounts for the increased human sensitivity to noise during the evening and nighttime hours. Ldn is a very similar 24-hour average measure that weights only the nighttime hours.

It is widely accepted that the average healthy ear can barely perceive changes of 3 dBA; that a change of 5 dBA is readily perceptible, and that an increase (decrease) of 10 dBA sounds twice (half) as loud. This definition is recommended by the California Department of Transportation’s

Traffic Noise Analysis Protocol for New Highway and Reconstruction Projects (Kunzman Associates, Inc. 2012).

3.9.1.2 Ground Vibration Terminology

When a blast hole is detonated, the explosion produces a high temperature, high-pressure gas. This gas pressure, known as the detonation pressure, crushes the rock adjacent to the borehole. The detonation pressure rapidly dissipates, consuming approximately ten to fifteen percent of the energy available in the explosive. The remaining energy produces a second, lower pressure gas, known as the explosion pressure. Most of the work done by the explosive is done by the explosion pressure. The explosion pressure expands the cracks made by the detonation pressure, and pushes the fractured rock toward the free face. Once the blasted material is separated from the bedrock, the gas pressure escapes, and no further fracturing of the bedrock can occur. The momentum of the fractured rock continues its movement toward the open pit. This entire process occurs within a few hundredths of a second after the detonation, and takes place within about twenty feet of a typical quarry blast hole (Kunzman Associates, Inc. 2012).

The application of this large force against the bedrock followed by its subsequent release causes the bedrock to vibrate, much like pushing and releasing a swing will cause it to vibrate. When a part of the bedrock is vibrated within the quarry, the vibration is transmitted into the ground surrounding it. This transmission of vibration is called propagation. The propagation of the ground vibration continues away from the blast location in all directions, similar to ripples in a pond, which move away from the initial disturbance. The ripples in the pond, like ground vibration, are examples of elastic vibration. Elastic vibration means that the material never moves very far from its original position while it is vibrating, and once the vibration event is over, the material will be in its original position and condition. Unlike the ripples in the pond, the motion of the ground is so small it cannot be detected visually. Therefore, sensitive scientific equipment is required for its measurement (Kunzman Associates, Inc. 2012).

Outside of a quarry, the ground rarely moves farther than the thickness of a sheet of paper before returning to its original position, and it may do so faster than the eye can sense. Seismographs can measure how the ground moves from its original position; much like a fisherman's bobber can detect how the water surface moves from rest when a ripple passes by. As the ground vibrations propagate further away from the source, the energy is dissipated. When the energy dissipates, ground vibration amplitude decreases, until eventually the ground vibration falls below perceptible levels. The rate at which ground vibration amplitude decreases as it propagates away from the blast location is called seismic attenuation. The rate of attenuation is specific to the location of the mining operation and varies based upon the site conditions (Kunzman Associates, Inc. 2012).

Seismic attenuation has been studied extensively and found to occur geometrically. A geometric reduction in ground vibration means that ground vibration amplitude decreases very quickly near the source, but very slowly far from the source. As a result, almost all of the ground vibration energy is dissipated within the quarry, but the small amount of energy remaining may produce perceptible vibrations at some distance (Kunzman Associates, Inc. 2012).

In response to quarry operator desires to minimize ground vibrations and still operate efficiently, explosive manufacturers developed millisecond delayed blasting caps. Research has shown that several charges detonated only a few thousandths of a second apart would not only produce less ground vibration, but are also more effective at fracturing and moving rock than a simultaneous detonation of all charges. All quarry blasts today consist of many charges detonated several hundredths or thousandths of a second apart (Kunzman Associates, Inc. 2012).

It is important to note that ground vibrations beyond the pit limits from quarry operations result from the detonation of explosive charges and not blast hole drilling. Blast hole drilling activities generate minimal ground vibrations that are imperceptible beyond a few feet from the drilling equipment. Seismographs are used to measure the vibrations, and ensure that any applicable vibration standards and threshold levels are not exceeded. The seismograph may measure how far the ground moves from rest (displacement), how fast it moves (velocity), or how fast the velocity changes (acceleration). These three parameters are related by the frequency of the vibrations. Frequency is a measure of how many times the ground will vibrate through its original position in one second. The seismograph also measures frequency, which is commonly reported in cycles per second or hertz (Hz). Standards typically limit the maximum amount of vibration that can occur at any point, or particle, on the ground surface. The limit can be expressed in terms of peak particle displacement, peak particle velocity, or peak particle acceleration. Most academic or government studies and formal vibration standards for blasting, where such standards have been adopted, express limits in terms of peak particle velocity (PPV) (Kunzman Associates, Inc. 2012).

3.9.1.3 Air Overpressure Terminology

Quarry blasting may also produce airborne vibration. Quarry induced airborne vibrations may occur within the audible range of the human ear (sound), or at frequencies below those humans can hear (infrasonic). Many sources for air vibration exist in a typical blast, but all can be traced back to either the venting of the detonation and explosion pressures or the fractured rock pushing air out of the quarry.

The air vibrations produced by blasting cause the normal air pressure to fluctuate. Changes in normal air pressure due to the airblast are referred to as overpressure, as in pressure over atmospheric pressure. Air overpressure resulting from blasting is measured by microphones attached to seismographs. The microphones employed by blasting seismographs measure sound pressures with a linear system. Most air overpressures from blasting are measured in thousandths or ten thousandths of pounds per square inch (psi) (Kunzman Associates, Inc. 2012).

3.9.2 Applicable Laws, Regulations, and Standards

3.9.2.1 Federal

United States Bureau of Mines

The United States Bureau of Mines (USBM) has published airblast research and recommendations in its Report of Investigation RI-84853 *Structure Response and Damage Produced by Airblast from Surface Mining*. Although the air vibrations created by production blasting are typically referred to as noise levels, the USBM report recognizes that airblasts with frequencies below the threshold of human hearing (infrasonic) are capable of producing structural response. The most common example of infrasonic air vibrations that may produce structural response is wind rattling a window. Structural damage as a result of air overpressure is generally conceded not to be possible without extensive window breakage, as the glass is the weakest portion of a structure’s exterior where this pressure acts. Windowpanes are designed to safely withstand changes of 1.0 psi when properly installed, and even in the worst situation a pane should be able to withstand 0.1 psi. In the RI-84853 report, the USBM states that structural damage is improbable below 0.03 psi. However, the USBM, Washington, D.C. determined that the appropriate threshold of significance for human response to blast induced air overpressure is 0.01 psi. Therefore, the threshold of 0.01 psi was used for the noise analysis to evaluate structural impacts associated with air overpressure.

San Bernardino National Forest

The South Quarry site is located exclusively in the Desert Rim Place as designated in the SBNF LMP. The theme of the Desert Rim Place depicts a remote, high desert landscape with extensive industrial limestone mining operations. The SBNF LMP does not designate specific noise criteria for the forest, but does acknowledge that recreational users and wildlife may be affected by noise.

3.9.2.2 State

State of California

In 2004, Caltrans released the *Transportation- and Construction-Induced Vibration Guidance Manual,* which described human response to blasting vibration. Although the Project is not a transportation project, blasting is proposed. As shown in Table 3.9-1, vibration is distinctly perceptible at 0.10 in/sec, and becomes strongly perceptible at 0.50 in/sec. The 0.10 in/sec standard was used to evaluate potential noise impacts associated with human response at homes to the north of the site.

Table 3.9-1
Human Response to Blasting Ground Vibration

Average Human Response	PPV (in/sec)
Barely to distinctly perceptible	0.02–0.10
Distinctly to strongly perceptible	0.10–0.50
Strongly perceptible to mildly unpleasant	0.50–1.00
Mildly to distinctly unpleasant	1.00–2.00
Distinctly unpleasant to intolerable	2.00–10.00

Source: Kunzman and Associates 2012

3.9.2.3 Local

County of San Bernardino General Plan

The County of San Bernardino General Plan Noise Element provides goals, policies and implementation measures that are intended to achieve and maintain land use compatibility with environmental noise levels and to ensure that County residents will be protected from excessive noise intrusion, both now and in the future. The goal applicable to the Project is presented below.

Goal N1. The County will abate and avoid excessive noise exposures through noise mitigation measures incorporated into the design of new noise generating and new noise sensitive land uses, while protecting areas within the County where the present noise environment is within acceptable limits.

County of San Bernardino Development Code

Section 83.01.080 of the County of San Bernardino Development Code establishes standards concerning acceptable noise levels for both noise sensitive land uses and for noise generating land uses. Sections of the code applicable to the Project are presented below.

Noise Measurement

Noise shall be measured:

1. At the property line of the nearest site that is occupied by, and/or zoned or designated to allow the development of noise sensitive land uses;
2. With a sound level meter that meets the standards of the American National Standards Institute (ANSI Section SI4 1979, Type 1 or Type 2);
3. Using the "A" weighted sound pressure level scale in decibels (ref. pressure = 20 micronewtons per meter squared). The unit of measure shall be designated as dB(A).

Noise Standards for Stationary Noise Sources

Noise level limits for stationary sources, as they affect adjacent properties (Section 83.01.080(c)(1) of San Bernardino County Code) are presented in Table 3.9-2.

Table 3.9-2
Noise Standards for Stationary Noise Sources
(Development Code Table 83-2)

Affected Land Uses (Receiving Noise)	7:00 AM to 10:00 PM dBA L_{eq}	10:00 PM to 7:00 AM dBA L_{eq}
Residential	55	45
Professional Services	55	55
Other Commercial	60	60
Industrial	70	70

Source: Kunzman and Associates 2012

Noise Limit Categories. No person shall operate or cause to be operated a source of sound at a location or allow the creation of noise on property owned, leased, occupied, or otherwise controlled by the person, which causes the noise level, when measured on another property, either incorporated or unincorporated, to exceed any one of the following:

a) The noise standard for the receiving land use as specified in Subsection B (Noise-impacted areas), above, for a cumulative period of more than 30 minutes in any hour.

b) The noise standard plus 5 dBA for a cumulative period of more than 15 minutes in any hour.

c) The noise standard plus 10 dBA for a cumulative period of more than five minutes in any hour.

d) The noise standard plus 15 dBA for a cumulative period of more than one minute in any hour.

e) The noise standard plus 20 dBA for any period of time.

If the measured ambient level exceeds any of the first four noise limit categories, the allowable noise exposure standard shall be increased to reflect the ambient noise level. If the ambient noise level exceeds the fifth noise limit category, the maximum allowable noise level under this category shall be increased to reflect the maximum ambient noise level.

Construction Noise

Temporary construction, maintenance, repair, and demolition activities between 7:00 AM and 7:00 PM, except Sundays and Federal holidays are exempt from Section 83.01.080(g)(3) of the San Bernardino Development Code.

Noise Standards from Adjacent Mobile Noise Sources

The County of San Bernardino Development Code also provides standards for noise generated by mobile sources on adjacent properties. Mobile noise sources on adjacent properties are not to exceed the standards described in Table 3.9-3.

Table 3.9-3
Noise Standards for Adjacent Mobile Noise Sources
(Development Code Table 83-3)

Land Use Categories	Permitted Uses	Interior L_{dn} (or CNEL) dB(A)[1]	Exterior L_{dn} (or CNEL) dB(A)[2]
Residential	Single and multi-family, duplex, mobile homes	45	60[3]
Commercial	Hotel, motel, transient housing	45	60[3]
	Commercial retail, bank, restaurant	50	n/a
	Office building, research and development, professional offices	45	65
	Amphitheater, concert hall, auditorium, movie theater	45	n/a
Institutional/Public	Hospital, nursing home, school classroom, religious institution, library	45	65
Open Space	Park	n/a	65

Notes: Source: Kunzman and Associates 2012
[1] The indoor environment shall exclude bathrooms, kitchens, toilets, closets and corridors.
[2] The outdoor environment shall be limited to: hospital/office building patios, hotel and motel recreation areas, mobile home parks, multi-family private patios or balconies, park picnic areas, private yard of single-family dwellings, and school playgrounds.
[3] An exterior noise level of up to 65 dBA (or CNEL) shall be allowed provided exterior noise levels have been substantially mitigated through a reasonable application of the best available noise reduction technology, and interior noise exposure does not exceed 45 dBA (or CNEL) with windows and doors closed. Requiring that windows and doors remain closed to achieve an acceptable interior noise level shall necessitate the use of air conditioning or mechanical ventilation.

Ground Vibration

Section 83.01.090(a) of the County of San Bernardino Development Code prohibits the creation of ground vibration that can be felt without the aid of instruments at or beyond the lot line, nor shall any vibration be allowed which produces a particle velocity greater than or equal to two-tenths (0.2) inches per second measured at or beyond the lot-line.

a) Vibration measurement. Vibration velocity shall be measured with a seismograph or other instrument capable of measuring and recording displacement and frequency, particle velocity, or acceleration. Readings shall be made at points of maximum vibration along any lot line next to a parcel within a residential, commercial and industrial land use zoning district.

b) Exempt vibrations. The following sources of vibration shall be exempt from the regulations:

Motor vehicles not under the control of the subject use.

Temporary construction, maintenance, repair, or demolition activities between 7:00 AM and 7:00 PM, except Sundays and Federal holidays.

3.9.3 Affected Environment

3.9.3.1 Existing Noise Levels

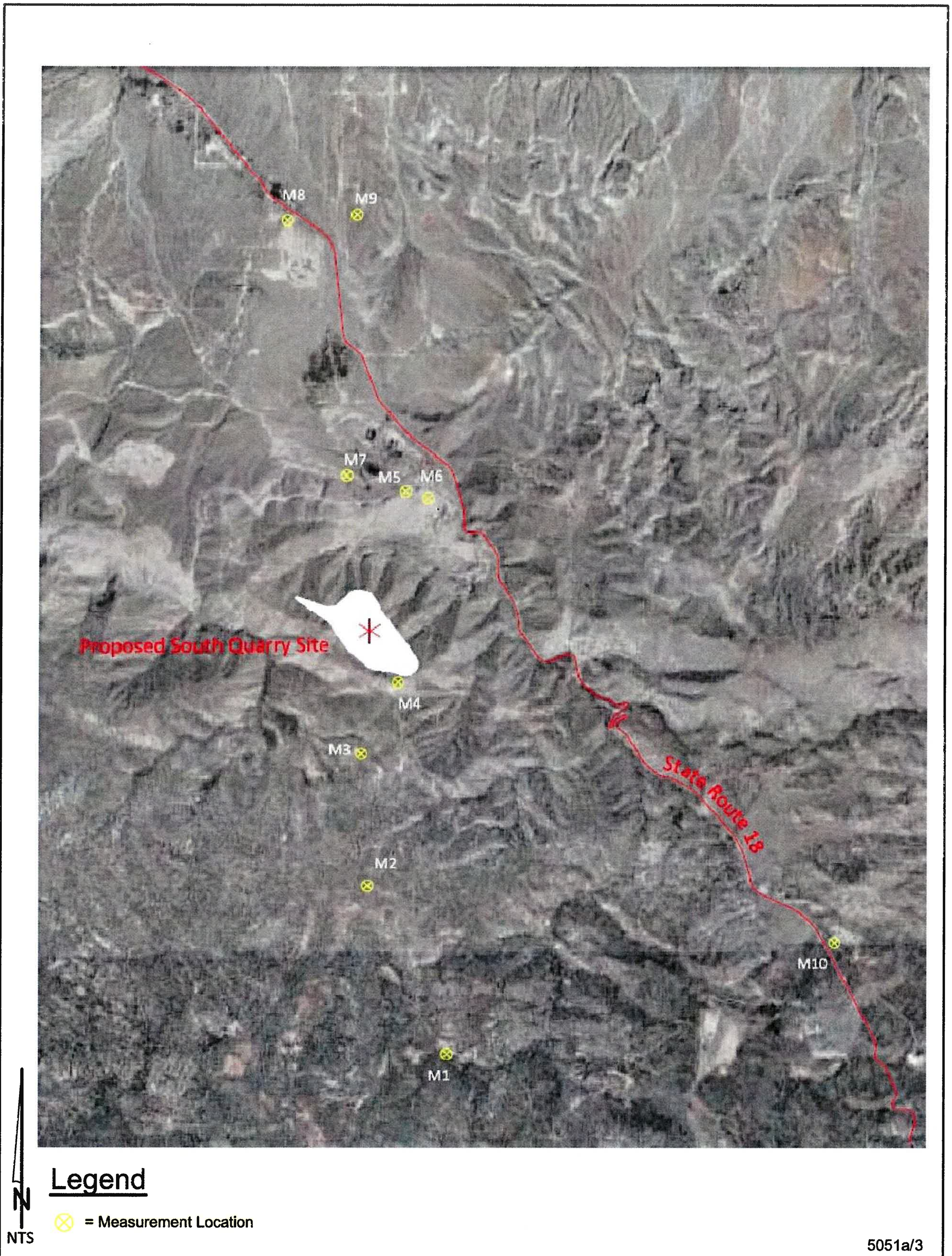
Noise measurements were taken consistent with requirements outlined in Section 83.01.080(a) of the San Bernardino Development Code at locations shown on Figure 3.9-1. A Larson Davis model LxT sound level meter was used to take ten 15-minute noise measurements between 9:55 AM to 5:32 PM on May 15, 2012. Two of these measurements were taken near sensitive receptors to the north within the community of Lucerne Valley that may be affected by the Project, five measurements were recorded within the SBNF at selected distances from the Project site (as recommended by Forest Service), and three were taken to document existing quarry noise sources. The representative noise source measurements were focused on select, dominant sources of noise. Other noise sources were captured in these measurements, but they can be considered insignificant compared to the dominant source. Ambient noise levels are presented in Table 3.9-4, representative noise measurements are presented in Table 3.9- 5.

Table 3.9-4
Ambient Noise Measurements

Name	Associated Land Use	Description	Distance to and Direction from Project Boundary	Existing Ambient Noise Levels (dBA L_{eq})
M1	SBNF- back country road	Holcomb Valley Road & 3N02	11,000 ft SSE	41.9
M2	SBNF- back country road	3N02 & 3N10	6,000 ft S	39.9
M3	SBNF- back country road	Burnt Flat	2,400 ft S	32.5
M4	South Quarry	SE Proposed Quarry Site	0 ft/ on boundary	42.4
M8	Residential/Institutional	Immanuel Christian Center (church)	11,500 ft NNE	55.8
M9	Residential	7085 Camp Rock Road	11,500 ft N	44.2
M10	SBNF- off-road vehicle recreation area (ORV)	Cactus Flats ORV Area along SR 18	15,300 ft SE	45.6

Source: Kunzman and Associates 2012

Location: N:\2012\2012-017 Mitsubishi Cement South Quarry\MAPS\Borders\MCCSouthQuarry_Noise_Measurement_Locations.mxd ()-aaguirre 11/11/2013



Map Date: 11/11/2013
Source: Kunzman Associates, Inc. 2012

Figure 3.9-1 Noise Measurement Locations

2012-017 Mitsubishi Cement Corporation South Quarry Project

Table 3.9-5
Representative Noise Measurements

Name	Description	Measured Noise Levels[1] (dBA L_{max})
M5	Blast Alarm/Blast	111.9
M6	Rock Crusher/Unloading	95.8
M7	Plant Operations ("Plant Hum")	67.5

Source: Kunzman and Associates 2012
Note: [1] Noise levels adjusted to 50 feet from source.

3.9.3.2 Sensitive Receptors

The State of California defines sensitive receptors as those land uses that require serenity or are otherwise adversely affected by noise events or conditions. Schools, libraries, churches, hospitals, and residential uses make up the majority of these areas. Noise sensitive land uses in the County of San Bernardino are described in the General Plan as residences of all types, hospitals, rest homes, convalescent hospitals, churches and schools. The sensitive receptors closest to the site are the single-family detached residential dwelling units along Camp Rock Road, approximately 2 miles to the north of the Project site, and the Immanuel Christian Center, approximately 2 miles north-northeast of the Project site (Kunzman Associates, Inc. 2012).

3.9.4 Environmental Consequences

3.9.4.1 Impact Analysis Approach

For purposes of both the CEQA and NEPA evaluation of noise impacts, both action alternatives are defined as the shifting of a portion of the limestone production from the West Pit to the South Quarry. As described in Section 2.3.2.2, the Project does not involve an increase in overall mine throughput (sum of throughputs from the West Pit and South Quarry).

CEQA Significance Criteria

Appendix G of the State CEQA Guidelines suggest that lead agencies evaluate the potential significance of noise impacts of a project by considering whether the project would:

- Result in exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;
- Result in exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels;
- Result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project;
- Result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project;
- Expose people residing or working in the project area to excessive noise levels for a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport; or

- Expose people residing or working in the project area to excessive noise levels for a project within the vicinity of a private airstrip.

The Project is not located within an airport land use plan, within two miles of a public airport, or within the vicinity of a private airstrip. No noise impacts associated with public or private air facilities would occur, and this issue is not discussed further in this section. This issue is further explained in the Initial Study prepared during Project scoping (Appendix A-2):

The approaches to modeling noise, vibration, and overpressure effects are described below.

3.9.4.2 Noise Modeling of On-Site Operational Noise

Mining Activities

Operational noise associated with mining activities was modeled using the Federal Highway Administration's Roadway Construction Noise Model (RCNM) and distance projection formulas. The worst case scenario includes a blast alarm, a demolition blast, a rock crusher, the cement plant's operating "hum", and an idling haul truck. The alarm, crusher, and "hum" were modeled using representative noise measurements taken at the existing quarry and cement plant. The blast alarm was assumed to be operating for 3 percent of the hour, the blast for 1 percent, the crusher for 90 percent, the idling haul truck for 75 percent, and the "hum" for 100 percent of the time.

The modeled distance from each fixed noise source (crusher, plant "hum") was measured separately for each receiver. Portable noise sources (blast alarm, blast, dump truck) can be expected to move around the site during Project operations. To evaluate the worst-case noise scenario, the locations of each portable noise source were modeled as close to each individual sensitive receptor as would be practical under normal Project operations.

It is important to note that when two noise levels are 10 dB or more apart, the lower value does not contribute significantly (less than 0.5 dB) to the total noise level. Therefore, existing ambient noise levels were not factored into Project operational noise because they are substantially less than Project generated operational noise and would not contribute significantly to the overall noise level.

Both hard and soft site conditions were assumed for on-site mining activities depending on the location, vegetation and topography between each noise source and sensitive receptor. Hard sites have a reflective surface between the source and receiver, such as bare hard ground, parking lots, or smooth bodies of water. No noise attenuation related to sound-absorbing features such as vegetation or soft dirt was assumed for these sites. With hard sites, changes in noise levels (drop-off rate) are related to distance only (3 dBA per doubling of distance for a line source and 6 dBA per doubling of distance for a point source).

Soft sites have a sound-absorbing ground surface, such as soft dirt, grass, or scattered bushes and trees. An additional ground attenuation value of 1.5 dBA per doubling of distance is normally assumed. When added to the decrease in noise levels from distance, this results in an overall dropoff rate of 4.5 dBA per doubling of distance for a line source and 7.5 dBA per doubling of distance for a point source.

On-Site, Off-Road Haul Truck Trips

On-site operational noise associated with on-site Project generated off-road haul truck trips was modeled using the FHWA Traffic Noise Prediction Model – FHWA-RD-77-108. This model arrives at a predicted noise level through a series of adjustments to the Reference Energy Mean Emission Level (REMEL). Adjustments are then made to the REMEL to account for: total average daily trips (ADT), roadway classification, width, speed and truck mix, and roadway grade and site conditions (hard or soft ground surface). Surfaces adjacent to all modeled roadways were assumed to have a "hard site" to predict worst-case, conservative noise levels.

Existing Operational

The Project does not propose any new noise sources. It does however, propose to move existing noise sources to the south. To evaluate Project impacts, a worst case operational noise scenario was modeled. The modeled worst case scenario, however, should not be directly compared to measured ambient noise levels because measured ambient noise levels represent an average condition and not a worst case scenario. Instead the modeled existing operations were compared to the modeled proposed operations. In this way, two sets of noise models with the same parameters were compared to produce more relevant results.

3.9.4.3 Vibration and Overpressure Modeling

Ground vibrations or seismic waves decay with distance. Ground vibrations from typical blasting in most geologic settings decay or attenuate to about one-third their former value for each doubling of distance. For example, at 200 feet from a vibration source the vibration is about one-third as intense as it is at 100 feet from a vibration source. Because vibration waves attenuate in a fairly regular manner it is possible to predict them within acceptable accuracy.

Peak particle velocity prediction formulas exist to calculate vibration intensity levels at a particular location based upon attenuation factors, charge weight, and distance from the blast to the location of concern. This formula was used to calculate Project generated peak particle velocity at nearby sensitive receptors.

In addition to vibration energy that travels through the ground, blasting also causes vibrations in air that will leave the blast site area. Similar to ground vibration energy, air vibrations also decay with distance, however they do not do so as rapidly. A formula was also used as an equation for predicting air overpressures from blasting.

NEPA Analysis Approach

The NEPA analysis determines whether direct or indirect noise impacts would result from the Proposed Action and provides a comparison of effects by alternative. As defined by the Council on Environmental Quality, significance of an effect is determined by the context and intensity of the resulting change relative to the existing environment (40 CFR 1508.27). As applicable, impacts are discussed in terms of spatial extent, duration and intensity. The modeling approach is the same as described previously in the CEQA Analysis Approach section.

3.9.4.4 Alternative 1 – Proposed Action

Direct and Indirect Impacts

San Bernardino National Forest Land Management Plan

Distances to the 70, 65, 60 and 55 dBA L_{eq} Project noise contours that extend into the San Bernardino National Forest were modeled using soft site conditions and are presented in Table 3.9-6. The 55 dBA L_{eq} is modeled at a distance of 340 feet from the quarry boundary when the mining/noise source is occurring along the South Quarry wall. These are worst case conditions that do not take into account intervening terrain which can further reduce noise levels.

Table 3.9-6
South Quarry Noise Contours (SBNF)

Noise Contour[1]	Distance From South Quarry Property Line (ft)[2]
70 dBA L_{eq}	73
65 dBA L_{eq}	116
60 dBA L_{eq}	192
55 dBA L_{eq}	340

Source: Kunzman and Associates 2012
Notes: [1] Contours only apply to San Bernardino National Forest and are calculated using the FHWA's Roadway Construction Noise Model (RCNM) as well as distance conversion formulas.
[2] Noise levels reflect worst case conditions on a day that includes blasting.

Distances to Project-generated ground vibration and air overpressure contours are shown in Table 3.9-7 and Table 3.9-8. Blasting would be perceptible approximately 2,780 feet from the quarry boundary when blasting is occurring along the South Quarry wall. As shown in Tables 3.9-9 to 3.9-13, Alternative 1 – Proposed Action would result in increases of up to 20.1 dBA L_{eq} in the SBNF (100 feet from proposed blasting activities at Site M4). The worst case scenario increase represents days in which blasting takes place. The other four sites in the SBNF, located 2,350 to 14,500 feet from the proposed South Quarry, would have increases of less than 3 dBA L_{eq} (considered barely perceptible) without taking into account intervening terrain, which would lower noise levels further.

Table 3.9-7
South Quarry Vibration Contours (SBNF)

Descriptor	Distance From Location of Blasting (ft)
Barely Perceptible	7599
Distinctly Perceptible	2779
Strongly Perceptible	1016
Mildly Unpleasant	659
Distinctly Unpleasant	427
Intolerable	156

Source: Kunzman and Associates 2012

Table 3.9-8
South Quarry Air Overpressure Contours (SBNF)

Descriptor	Distance From Location of Blasting (ft)
Barely Perceptible	767
Distinctly Perceptible	95
Strongly Perceptible	12
Mildly Unpleasant	1
Distinctly Unpleasant	0
Intolerable	0

Source: Kunzman and Associates 2012

Table 3.9-9
Comparison of Existing and Project Noise Levels
(San Bernardino National Forest, Site M1, 11,000 feet to the south)

Noise Level (dBA)[1]	Distance from Source (feet) [2]	L_{eq}	L_{max}	L_2	L_8	L_{25}	L_{50}
Existing Ambient	13,550 - 17,100	41.9	74.8	68.1	55.9	47.8	42.2
Modeled Existing Operational		35.5	48.1	48.1	41.5	37.9	35.5
Modeled Planned Operational	11,000 - 17,100	36.5	49.8	49.8	43.1	39.3	36.5

Source: Kunzman and Associates 2012
[1] Levels were estimated from modeled Lmax and Leq as well as measured levels from representative sources.
[2] The distance to immovable noise sources (crusher, plant "hum") was calculated separately for each receiver. Movable noise sources (blast, dump truck) were placed as close to each receiver as would be likely with Project operation. The blast alarm was modeled at the same distance from the furthest blast location as currently exists.

Table 3.9-10
Comparison of Existing and Project Noise Levels
(San Bernardino National Forest, Site M2, 6,000 feet to the south)

Noise Level (dBA)[1]	Distance from Source (feet)[2]	Leq	Lmax	L2	L8	L25	L50
Existing Ambient	8,900 - 12,300	39.9	53.1	46.4	42.8	40.6	38.6
Modeled Existing Operational		39.2	45.2	45.2	57.1	41.6	39.2
Modeled Planned Operational	6,000 - 12,300	40.9	54.5	54.5	47.8	43.8	40.9

Source: Kunzman and Associates 2012
Notes: [1] Levels were estimated from modeled Lmax and Leq as well as measured levels from representative sources.
[2] The distance to immovable noise sources (crusher, plant "hum") was calculated separately for each receiver. Movable noise sources (blast, dump truck) were placed as close to each receiver as would be likely with Project operation. The blast alarm was modeled at the same distance from the furthest blast location as currently exists.

Table 3.9-11
Comparison of Existing and Project Noise Levels
(San Bernardino National Forest, M3, 2,350 feet to the south)

Noise Level (dBA)[1]	Distance from Source (feet)[2]	L_{eq}	L_{max}	L_2	L_8	L_{25}	L_{50}
Existing Ambient	5,750 - 8,600	32.5	48.9	45.1	34.9	25.2	22.1
Modeled Existing Operational		43.3	55.9	55.9	49.3	45.7	43.3
Modeled Planned Operational	2,350 - 8,600	46.1	59.9	59.9	53.1	49.1	46.1

Source: Kunzman and Associates 2012
Notes: [1] Levels were estimated from modeled Lmax and Leq as well as measured levels from representative sources.
[2] The distance to immovable noise sources (crusher, plant "hum") was calculated separately for each receiver. Movable noise sources (blast, dump truck) were placed as close to each receiver as would be likely with Project operation. The blast alarm was modeled at the same distance from the furthest blast location as currently exists.

Table 3.9-12
Comparison of Existing and Project Noise Levels
(M4 - South Quarry Property Line)

Noise Level (dBA)[1]	Distance from Source (feet)[2]	L_{eq}	L_{max}	L_2	L_8	L_{25}	L_{50}
Existing Ambient	3,400 - 6,400	42.4	48.5	46.3	44.8	43.4	41.6
Modeled Existing Operational		46.5	59.1	59.1	52.5	48.9	46.5
Modeled Planned Operational	100 - 6,400	66.6	68.1	68.1	66.9	66.6	66.6

Source: Kunzman and Associates 2012
Notes: [1] Levels were estimated from modeled Lmax and Leq as well as measured levels from representative sources.
[2] The distance to immovable noise sources (crusher, plant "hum") was calculated separately for each receiver. Movable noise sources (blast, dump truck) were placed as close to each receiver as would be likely with Project operation. The blast alarm was modeled at the same distance from the furthest blast location as currently exists.

Table 3.9-13
Comparison of Existing and Project Noise Levels
(San Bernardino National Forest, Site M10, Cactus Flats ORV Area)

Noise Level (dBA)[1]	Distance from Source (feet)[2]	L_{eq}	L_{max}	L_2	L_8	L_{25}	L_{50}
Existing Ambient	14,700 - 18,550	45.6	54.7	51.4	49.1	46.4	44.3
Modeled Existing Operational		34.4	47	47	40.5	36.9	34.4
Modeled Planned Operational	14,500 - 18,550	36	49.6	49.6	42.9	38.9	36

Source: Kunzman and Associates 2012
Notes: [1] Levels were estimated from modeled Lmax and Leq as well as measured levels from representative sources.
[2] The distance to immovable noise sources (crusher, plant "hum") was calculated separately for each receiver. Movable noise sources (blast, dump truck) were placed as close to each receiver as would be likely with Project operation. The blast alarm was modeled at the same distance from the furthest blast location as currently exists.

Potential noise impacts to sensitive receptors are described in the following paragraphs, with the exception of noise impacts to recreational users. Potential impacts to recreational users within the vicinity of the Project site have been assessed separately in Section 3.10.

County of San Bernardino Development Code

Increase in Ambient Noise Levels Due to Quarry Operations. Worst case scenario noise levels at the property line of the nearest sensitive receptors were modeled using representative noise measurements taken at Mitsubishi's existing facility. As shown in Table 3.9-14 and Table 3.9-15, due to the shift in operation to the south, quarry operational noise is expected to decrease 1 to 2 dBA at the Immanuel Christian Center and from 1 to 2.5 dBA at the nearest residence. These decreases are due to the shift of some quarry operations further away from residential properties.

Table 3.9-14
Change In Noise Levels and Consistency with County Development Code[1, 2, 3]
(Site M8, Immanuel Christian Center)

Noise Level (dBA)[1]	Distance from Source (feet)[2]	L_{eq}	L_{max}	L_2	L_8	L_{25}	L_{50}
Existing Ambient	7,800 - 10,000	55.8	74.8	68.1	55.9	47.8	42.2
Modeled Existing Operational		53.6	66.1	66.1	59.6	55.9	53.6
Modeled Planned Operational	7,800 - 12,050	52.8	64.9	65.1	58.6	55	52.8
Daytime Standard (7 am to 10 pm)[3]		55	75	70	65	60	55
Change		-0.8	-1.2	-1.0	-1.0	-0.9	-0.8
Exceeds Daytime Standards?		No	No	No	No	No	No

Source: Kunzman and Associates 2012
Notes: [1] Levels were estimated from modeled Lmax and Leq as well as measured levels from representative sources.
[2] The distance to immovable noise sources (crusher, plant "hum") was calculated separately for each receiver. Movable noise sources (blast, dump truck) were placed as close to each receiver as would be likely with Project operation. The blast alarm was modeled at the same distance from the furthest blast location as currently exists.
[3]Quarry operations will be limited to the hours of 7:00 AM to 10:00 PM. Therefore nighttime standards are not addressed.

Table 3.9-15
Change In Noise Levels and Consistency with County Development Code
(Site M9, Nearest Residential, 7085 Camp Rock Road)

Noise Level (dBA)[1]	Distance from Source (feet)[2]	Leq	Lmax	L2	L8	L25	L50
Existing Ambient	7,400 -9,950	44.2	54.8	51.9	48.2	44.7	41.9
Modeled Existing Operational		53.1	65.7	65.7	59.2	55.9	53.1
Modeled Planned Operational	7,400 - 12,100	52.8	64.9	64.9	58.6	55.0	52.8
Daytime Standard (7 am to 10 pm)[3]		55.0	75.0	70.0	65.0	60.0	55.0
Change		*-0.3*	*-0.8*	*-0.8*	*-0.6*	*-0.9*	*-0.3*
Exceeds Daytime Standards?		No	No	No	No	No	No

Source: Kunzman and Associates 2012
Notes: [1] Levels were estimated from modeled Lmax and Leq as well as measured levels from representative sources.
[2] The distance to immovable noise sources (crusher, plant "hum") was calculated separately for each receiver. Movable noise sources (blast, dump truck) were placed as close to each receiver as would be likely with Project operation. The blast alarm was modeled at the same distance from the furthest blast location as currently exists.
[3]Quarry operations will be limited to the hours of 7:00 AM to 10:00 PM. Therefore nighttime standards are not addressed.

Alternative 1 – Proposed Action would not result in County of San Bernardino Stationary Noise Standard Development Code violations at the sensitive receptors in the vicinity of the site. As most residences and the community center of Lucerne Valley are located further north, no noise impacts are expected to occur at these receptors from Alternative 1 – Proposed Action.

Project Generated On-Site Vehicle Noise

New internal, off-road haul truck trips associated with Alternative 1 – Proposed Action would occur. Alternative 1 – Proposed Action would include the re-assignment of up to 55 existing off-road haul truck trips per day along a new internal haul route. These trucks would transport material using the new haul road to the existing primary crusher located at the north end of the existing East Pit near the cement plant. There would also be up to seven additional internal truck trips per day to haul waste rock. For modeling purposes, a total of 62 off-road haul truck trips were anticipated on the new haul road each day. Additionally water trucks are expected to make round trips to and from the South Quarry and within the South Quarry to provide water for dust control. These trucks would generate noise levels of 28.4 dBA L_{dn} and 31.4 dBA L_{eq} at 50 feet from the haul road centerline. Haul road noise would not exceed the County's noise standards for adjacent mobile noise sources. A less-than-significant impact would occur.

Project Generated Off-Site Vehicle Noise

Approximately eleven employees would be assigned to the South Quarry. Eight of those employees would be transferred from existing operations and three new employees would be required. The addition of three employee vehicle round-trips would result in a negligible increase in the L_{dn} and a less than significant impact would occur. Cement would continue to be shipped to various markets by bulk truck, train and in sacks. There would be no change in the existing plant cement distribution due to the proposed South Quarry. No impact would occur.

Project Generated Ground Vibration and Air Overpressure

As stated previously, limestone would be excavated at the South Quarry by standard open pit practices. Multiple holes (ranging between 7 to 40 in any particular area depending on the geology) would be drilled into the rock and small explosive charges of up to 455 pounds in size would be placed into each hole. Most charges would be less than 455 pounds in size. The explosives would be detonated using sequential delays (in milliseconds) between each explosion. The resulting overpressures using this method would be dramatically reduced compared to a single larger blast.

Ground Vibration

Section 83.01.090(a) of the County of San Bernardino Development Code prohibits the creation of ground vibration that can be felt without the aid of instruments or any vibration which produces a particle velocity greater than or equal to two-tenths (0.2) inches per second. Compliance is to be determined at the boundary (lot line) of any parcel zoned residential, commercial, or industrial. The State of California Department of Transportation's definition of "distinctly perceptible vibration" was used to more specifically define the County of San Bernardino's qualitative standard of "felt without the aid of instruments" as described in San Bernardino Development Code Section 83.01.090(a).

There are no parcels zoned residential, commercial, or industrial adjacent to the Project site. The Project site is surrounded by the Resource Conservation land use district, and the closest parcel zoned industrial is the Cushenbury Cement Plant over 3,500 feet north. The nearest commercial parcel is located approximately 11,300 feet north (Receptor M8).

Groundborne vibration associated with Alternative 1 – Proposed Action may reach up to 20.4 in/sec PPV at a distance of 100 feet from the blast. However, vibration decays rapidly with distance and would be less than the County criteria of 0.2 in/sec at approximately 1,800 feet and 0.109 in/sec at a distance of 2,680 feet (about 0.5 mile). Vibration levels at the nearest industrial and commercial zoned areas would be well below the County criteria. Vibration levels at the closest residential receptor (M1 at 11,000 feet north) would be 0.01 in/sec PPV. No structures would be exposed to vibration that exceeds the County of San Bernardino 0.20 in/sec PPV standard. A less than significant impact would occur.

Air Overpressure

Neither the County of San Bernardino nor the Forest Service has a threshold for an acceptable level of air overpressure, therefore the USBM threshold of 0.01 psi was used for the air overpressure analysis. Air overpressure generated by Alternative 1 – Proposed Action at the closest residential structures would range between 0.00030 and 0.00031 psi and would not exceed the USBM threshold, therefore impacts would be less than significant.

Cumulative Impacts

Noise impacts from mining operations would shift in a southerly direction with Alternative 1 – Proposed Action. Because the closest sensitive receptors are to the north, the noise levels at the nearby sensitive receptors would decrease by 1 to 2.5 dBA. There would be a beneficial impact or no impact to the nearby sensitive receptors from Alternative 1 – Proposed Action. The other reasonably foreseeable future actions listed in Section 3.1.2 include four other mining projects, energy projects, fuel reduction projects, and a variety of other development. Because the Project would result in no impact or a reduction in noise and vibration at sensitive receptors, the contribution from Alternative 1 – Proposed Action would not be cumulatively considerable and, when added to the noise generated by other projects, would not result in a significant cumulative impact.

Mitigation Measures

No mitigation measures to reduce Project impacts are necessary as the modeled noise, vibration and air overpressure levels are not expected to exceed applicable thresholds at the nearest sensitive receptors.

Residual Impacts after Mitigation

Less than significant impacts would occur.

3.9.4.5 Alternative 2 – Partial Implementation

This alternative was developed in response to public comments requesting an alternative with a shorter duration and/or smaller footprint. The footprint of the quarry would be approximately 20 acres smaller and would not be as deep as with Alternative 1 – Proposed Action. Mining in the South Quarry would last 40 years rather than 120 years. As a result, localized impacts related to mining, such as noise and vibration would also end earlier at this site. With this alternative, a higher grade limestone would still be required for blending at the existing Cushenbury cement plant and would be trucked to the plant after Phase 2 is completed, from approximately year 40 through year 120.

Direct and Indirect Impacts

Direct and indirect noise impacts of Alternative 2 - Partial Implementation would be similar to those identified for Alternative 1 – Proposed Action, during the operation of the South Quarry. The noise impacts from construction and operations activities at the South Quarry operation would end after 40 years, in comparison to 120 years as with Alternative 1 – Proposed Action. Direct and indirect impacts of Alternative 1 - Proposed Action, discussed in Section 3.9.4.2, resulted in less than significant impacts for all significance thresholds. Therefore, the noise impacts of Alternative 2 – Partial Implementation would also be less than significant through year 40. However, Alternative 2 – Partial Implementation would result in off-site traffic noise closer to sensitive receptors that would not occur with Alternative 1 – Proposed Action. The effects of trucking in limestone after Phase 2 (years 41 to 120) would cause a potentially substantial increase in road noise and vibration on local roads from haul trucks. Approximately 52,000 on-road haul truck trips per year (150 truck trips per day) would be required after year 40. The number of off-site, on road haul truck trips would be much greater during the last 80 years of Alternative 2 – Partial Implementation than the number of on-site off-road haul truck trips analyzed for mining in the South Quarry. On-road haul trucks are much smaller than on-site, off-road haul trucks, and a greater number of trucks would be required to haul limestone from an off-site source. Additionally, these trucks would use local roads through Lucerne Valley to access the existing Cushenbury Cement Plant, bringing the noise source from haul trucks much closer to sensitive receptors. Depending on the location of the alternative limestone source, noise and vibration impacts from these haul trucks to off-site sensitive receptors may occur.

Cumulative Impacts

The cumulative effects analysis for on-site noise with this alternative would be similar to that described for Alternative 1 – Proposed Action. Cumulative noise impacts from on-site activities with Alternative 2 – Partial Implementation would be shorter in duration and would be remain less than significant. However, Alternative 2 – Partial Implementation would result in off-site traffic noise in years 40 through 120 that would not occur with Alternative 1 – Proposed Action.

Mitigation Measures

Impacts would be less than significant therefore mitigation measures are not required.

Residual Impacts after Mitigation

Less than significant impacts would occur.

3.9.4.6 Alternative 3 – No Action/No Project

Direct and Indirect Impacts

If Alternative 3 – No Action/No Project is implemented and the South Quarry is not developed under this Plan of Operations, there would be no direct or indirect adverse noise impacts. Development of the limestone reserve under a different Plan of Operation or trucking limestone from an offsite source would result in noise impacts. Approximately 52,000 on-road truck trips per year (150 truck trips per day) would be required. The number of off-site, on-road haul truck trips would be much greater for Alternative 3 – No Action/No Project than the number of on-site, off-road haul truck trips analyzed for mining in the South Quarry because on-road haul trucks are much smaller than the off-road haul trucks. Additionally, these trucks would use local roads through Lucerne Valley to access the existing Cushenbury Cement Plant, bringing the noise source from haul trucks much closer to off-site sensitive receptors. Depending on the location of the alternative limestone source, noise and vibration impacts from these haul trucks may be significant.

Cumulative Impacts

No cumulative impacts would occur from increased on-site noise. However, Alternative 3 – Partial Implementation would result in off-site traffic noise that would not occur with Alternative 1 – Proposed Action.

Mitigation Measures

No impacts would occur therefore mitigation measure would not be required.

Residual Impacts after Mitigation

No impacts would occur.

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