APPENDIX I

Noise Impact Analysis

KUNZMAN ASSOCIATES, INC.

MITSUBISHI CEMENT CORPORATION
SOUTH QUARRY

NOISE IMPACT ANALYSIS

September 24, 2012

Traffic Engineering | Transportation Planning | Parking | Noise/Vibration | Expert Witness
Air Quality | Global Climate Change | Health Risk Assessment

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MITSUBISHI CEMENT CORPORATION
SOUTH QUARRY

NOISE IMPACT ANALYSIS

September 24, 2012

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Noise Impact Analysis

This report contains the noise impact analysis for the Mitsubishi Cement Corporation's South Quarry project. The proposed South Quarry site is located south of and adjacent to the existing Mitsubishi Cement Corporation facilities at 5808 State Route 18, approximately 6 miles south of the community of Lucerne Valley in the County of San Bernardino. The scope of this project is to develop and reclaim a new high grade limestone quarry to maintain an adequate supply of limestone to the existing cement plant.

The noise impact analysis contains documentation of existing noise levels as well as analysis of the impacts generated by project operation and traffic. Each of these topics is contained in a separate section of the report. In this way, information on any particular aspect of the study can be easily located by the reader.

Although this is a technical report, every effort has been made to write the report clearly and concisely. To assist the reader with terms unique to acoustics, a definition of terms has been provided in Section II.

I. Introduction and Setting

A. Purpose and Objectives

This study was performed to determine whether there would be significant impacts due to noise from the proposed project. The objectives of the study include:

- 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 project
- discussion of the effects of project noise, including blasting, on nearby sensitive receptors

B. Project Location

As shown on Figure 1, the proposed South Quarry site is located south of and adjacent to the existing Mitsubishi Cement Corporation facilities at 5808 State Route 18, approximately 6 miles south of the community of Lucerne Valley in the County of San Bernardino.

C. Project Description

The Mitsubishi Cement Corporation is proposing to develop and reclaim a new high grade limestone quarry (the South Quarry) to the south of its existing facilities. The South Quarry will total approximately 153.6 acres consisting of a 128 acre quarry, a 2.7 acre landscape berm, a 22.2 acre, 1.8 mile haul road and a temporary construction road of 0.7 acres. The South Quarry and haul road will be located almost entirely on public federal land under the jurisdiction of the San Bernardino National Forest (SBNF) (see Figure 2). This increase may affect noise levels in the community of Lucerne Valley to the north and the SBNF to the south.

Limestone will be excavated at the South Quarry by standard open pit practices. Once an area is stripped of vegetation and available soil salvaged, controlled blasting will loosen the rock at a vertical benching interval of 45 feet. Multiple holes (ranging between 7-40 in any particular area depending on the geology) will be drilled into the rock and small explosive charges of up to 455 lbs. in size will be placed into each hole. The explosives will then be detonated using sequential delays (in milliseconds) between each explosion. The resulting overpressures are dramatically reduced compared to a single larger blast. Vibration is also produced at relatively low levels.

Two to three loaders will load the shot or broken rock into off-highway haul trucks and the trucks will transport material down the new haul road to the existing primary crusher located at the north end of the existing East Pit near the cement plant. Limestone which does not meet cement quality specifications and other rock types encountered will be pushed or hauled directly to waste rock stockpiles located within the southeast portion of the quarry. No new waste stockpiles will be developed outside the perimeter of the South

Quarry to limit additional land disturbance and to reduce potential visual and erosion impacts.

Blasting operations will involve drilling along the mining face, placing of charges, and detonating of the charges by a licensed blaster under permit through the Bureau of Alcohol, Tobacco, Firearms and Explosives (BATF&E) for handling explosives. It is expected that an average of two blasts per week will be required for developing the South Quarry depending on production and geology of the particular area being mined. Blasting will typically be conducted twice each week at the South Quarry between the hours of 10:00 AM and 6:00 PM Monday through Saturday. Note that during the initial construction of the haul road, more numerous (up to once per day) but smaller blasts will occur.

D. Existing Noise Levels

Noise measurements were taken consistent with requirements outlined in Section 83.01.080(a) of the San Bernardino Development Code. 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 proposed project, five measurements were recorded within the SBNF at selected distances from the proposed project site (as recommended by SBNF), and three were taken to document existing quarry noise sources (see Figure 3). The representative noise source measurements were focused on select, dominant sources of noise present in each one. 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 1, representative noise measurements are presented in Table 2, and measurement output data is included within Appendix A.

Table 1

Ambient Noise Measurements[1]

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	42.4
M8	Residential/Institutional	Imanuel Christian Center	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

[1] Source: On-site noise survey, Kunzman Associates, Inc. (May 15, 2012).

Table 2

Representative Noise Measurements[1]

Name	Description	Measured Noise Levels[2] (dBA L_{max})
M5	Blast Alarm/Blast	111.9
M6	Rock Crusher/Unloading	95.8
M7	Plant Operations ("Plant Hum")	67.5

[1] Source: On-site noise survey, Kunzman Associates, Inc. (May 15, 2012).

[2] Noise levels adjusted to 50 feet from source.

Figure 1
Project Location Map

N

NTS

Source: Plan of Operations and Reclamation Plan for Mitsubishi Cement Corporation's South Quarry, July 2011

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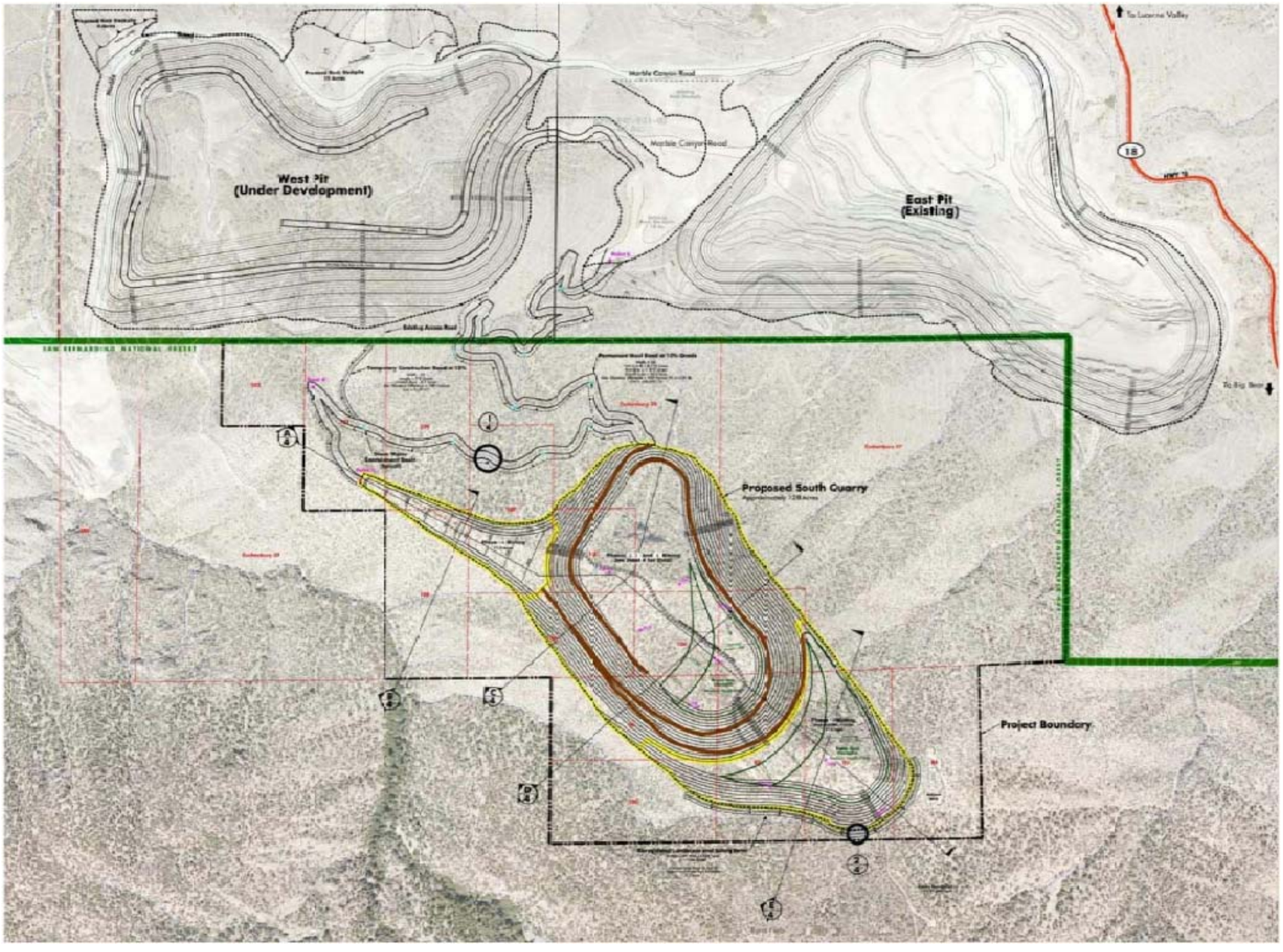
Figure 2
Proposed Project



N

NTS

Source: Plan of Operations and Reclamation Plan for Mitsubishi Cement Corporation's South Quarry, July 2011

Figure 2
Proposed Project

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Figure 3
Noise Measurement Locations

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NTS

Legend

⊗ = Measurement Location

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II. Definition of Terms

A. 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.

Commonly used noise terms are presented in Table 3. 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.

Decibels are measured on a logarithmic scale, which quantifies sound intensity in a manner similar to the Richter scale used for earthquake magnitudes. Thus, a doubling of the energy of a noise source, such as a doubled traffic volume, would increase the noise levels by 3 dBA; halving of the energy would result in a 3 dBA decrease. Table 4 shows the relationship of various noise levels to commonly experienced noise events.

Average noise levels over a period of minutes or hours are usually expressed as dBA $L_{eq,}$ or the equivalent noise level for that period of time. For example, $L_{eq(3)}$ would represent a 3-hour average. When no period is specified, a one-hour average is assumed.

Noise standards for land use compatibility are stated in terms of the Community Noise Equivalent Level (CNEL) and the Day-Night Average Noise Level (L_{dn}). 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. L_{dn} 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.

B. Ground Vibration Terminology

Human perception and structural response to ground vibrations from blasting have been a continual issue for the mining industry, the public living near mining operations, and regulatory agencies responsible for setting environmental standards since the 1930s. This section provides an introduction to the effects of blasting operations, the causes of blast vibrations, and how vibrations are measured.

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[1]. 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.

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.

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.

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.

[1] A rock surface exposed to air or water that provides room for expansion upon fragmentation; sometimes called open face.

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.

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).

C. Air Overpressure Terminology

Quarry blasting may also produce airborne vibration. This section is dedicated to educating the reader about the effects of blasting operations in the atmosphere, the causes of air overpressure, and how air overpressure is measured.

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. Sound pressures can be measured with a variety of instruments, however not all instruments respond equally to both high frequency pressures called sound and low frequency, infrasonic pulses (1 to 20 Hz) that excite structures. The microphones employed by blasting seismographs measure sound pressures with a linear system, whereas noise level meters typically used to measure sound employ A or C weighting scales. Most air overpressures from blasting are measured in thousandths or ten thousandths of pounds per square inch (psi).

Table 3

Definitions of Acoustical Terms[1]

Term	Definition
Decibel, dB	A logarithmic unit of noise level measurement that relates the energy of a noise source to that of a constant reference level; the number of decibels is 10 times the logarithm (to the base 10) of this ratio.
Frequency, Hertz	In a function periodic in time, the number of times that the quantity repeats itself in one second (i.e., the number of cycles per second).
A-Weighted Sound Level, dBA	The sound level obtained by use of A-weighting. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear.
Root Mean Square (RMS)	A measure of the magnitude of a varying noise source quantity. The name derives from the calculation of the square root of the mean of the squares of the values. It can be calculated from either a series of lone values or a continuous varying function.
Fast/Slow Meter Response	The fast and slow meter responses are different settings on a sound level meter. The fast response setting takes a measurement every 100 milliseconds, while a slow setting takes one every second.
L_{02}, L_{08}, L_{50}, L_{90}	The A-weighted noise levels that are equaled or exceeded by a fluctuating sound level, 2 percent, 8 percent, 50 percent, and 90 percent of a stated time period, respectively.
Equivalent Continuous Noise Level, L_{eq}	A level of steady state sound that in a stated time period, and a stated location, has the same A-weighted sound energy as the time-varying sound.
L_{max}, L_{min}	L_{max} is the RMS (root mean squared) 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.
Ambient Noise Level	The all-encompassing noise environment associated with a given environment, at a specified time, usually a composite of sound from many sources, at many directions, near and far, in which usually no particular sound is dominant.
Offensive/ Offending/ Intrusive Noise	The noise that intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of sound depends on its amplitude, duration, frequency, and time of occurrence, and tonal information content as well as the prevailing ambient noise level.

[1] Adapted from: Cyril M. Harris; Handbook of Acoustical Measurement and Noise Control, 1991.

Table 4

Common Noise Sources and Noise Levels[1]

Noise Source (at a Given Distance)	Scale of A-Weighted Sound Level in Decibels	Noise Environment	Human Judgement of Noise Loudness (Relative to a Reference Loudness of 70 Decibels*)
Military Jet Take-off with Afterburner (50 ft) Civil Defense Siren (100 ft)	130	Carrier Flight Deck	**Threshold of Pain** *32 times as loud
Commercial Jet Take-off (200 ft)	120	Airport Runway	*16 times as loud
Pile Driver (50 ft)	110	Rock Music Concert	**Very Loud** *8 times as loud
Ambulance Sire (100 ft) Newspaper Press (5ft) Power Lawn Mower (3 ft)	100	Boiler Room Printing Press Plant	* 4 times as loud
Motorcycle (25 ft) Propeller Plane Flyover (1,000 ft) Diesel Truck, 40 mph (50 ft)	90		
Garbage Disposal (3 ft)	80	High Urban Ambient Sound	*2 times as loud
Passenger Car, 65 mph (25 ft) Living Room Stereo (15 ft) Vacuum Cleaner (3 ft) Electronic Typewriter (10 ft)	70	Busy Shopping Mall Indoor Sports Park	**Moderately Loud** *70 dB (Reference Loudness)
Normal Conversation (5 ft) Air Conditioning Unit (100 ft)	60	Data Processing Center Department Store	*1/2 as loud
Light Traffic (100 ft)	50	Private Business Office	*1/4 as loud
Bird Calls (distant)	40	Lower Limit of Urban Ambient Sound	**Quiet** *1/8 as loud
Soft Whisper (5 ft)	30	Rural Residential Area	
	20	Quiet Bedroom	**Just Audible**
	10		**Threshold of Hearing**

[1] Bolt, Baranek, and Newman, 1971. Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances. 1971.

III. Applicable Standards

A. United States Bureau of Mines

The United States Bureau of Mines (USBM) has set forth 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 produced 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 to not 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 RI-8485, the USBM consensus was that damage was improbable below 0.03 psi. The USBM however, recommended that the air overpressure limit be set at 0.01295 psi for a 2 Hz recording system. 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. As it is more restrictive than the 0.01295 psi threshold for damage to structures, the threshold of 0.01 psi will be utilized for this study to evaluate impacts associated with air overpressure.

B. San Bernardino National Forest

Per the 2005 San Bernardino National Forest Land Management Plan (LMP), the South Quarry site is located exclusively in the Desert Rim Place. The theme of the Desert Rim Place depicts a remote, high desert landscape with extensive industrial limestone mining operations. Primitive and semi-primitive recreation experiences including hiking, backpacking, horseback riding, and hunting opportunities are found in the Desert Rim. Other popular activities include driving for pleasure, wildlife viewing, and OHV use along designated routes. No developed recreation sites are located within the Desert Rim. Potential impacts to recreational users within the vicinity of the proposed project are assessed separately in the recreation focused soundscape analysis prepared by the SBNF.

C. State of California

The California Department of Transportation released a study which included human response to blasting vibration. As shown in Table 5, the results show that vibration is distinctly perceptible at 0.10 in/sec, and becomes strongly perceptible at 0.50 in/sec. The 0.10 in/sec standard will be used to evaluate potential impacts associated with human response at homes to the north of the site.

D. 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. Goals and Policies applicable to the proposed project are 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.

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 proposed 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 6.

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) the San Bernardino Development Code.

Noise Standards from Adjacent Mobile Noise Sources

The County of San Bernardino Development Code also sets forth 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 7.

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.

(b) 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.

(c) Exempt vibrations. The following sources of vibration shall be exempt from the regulations of this Section.

(1) Motor vehicles not under the control of the subject use.

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

Table 5

Human Response to Blasting Ground Vibration[1]

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

[1] Source: Caltrans, Transportation - and Construction-Induced Vibration Guidance Manual, 2004.

Table 6

Noise Standards for Stationary Noise Sources (Development Code Table 83-2)[1]

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

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 dB(A) for a cumulative period of more than 15 minutes in any hour.

(C) The noise standard plus 10 dB(A) for a cumulative period of more than five minutes in any hour.

(D) The noise standard plus 15 dB(A) for a cumulative period of more than one minute in any hour.

(E) The noise standard plus 20 dB(A) 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.

[1] Source: County of San Bernardino Development Code

Table 7

Noise Standards for Adjacent Mobile Noise Sources (Development Code Table 83-3)[1]

Land Use		L_{dn} (or CNEL) dB(A)	
Categories	Uses	Interior[2]	Exterior[3]
Residential	Single and multi-family, duplex, mobile homes	45	60[4]
Commercial	Hotel, motel, transient housing	45	60[4]
	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

[1] Source: County of San Bernardino Development Code

[2] The indoor environment shall exclude bathrooms, kitchens, toilets, closets and corridors.

[3] 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
School playgrounds

[4] An exterior noise level of up to 65 dB(A) (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 dB(A) (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.

IV. Analytical Methodology and Model Parameters

A. 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, to the north of the project site. Also, the project's potential to affect recreational uses in the SBNF will be assessed separately by the SBNF.

B. Noise Modeling

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 output sheets are presented in Appendix B. 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% of the hour, the blast for 1%, the crusher for 90%, the idling haul truck for 75%, and the "hum" for 100% 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. In order 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 will 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 excess ground attenuation is assumed for these sites. With hard sites, changes in noise levels with distance (drop-off rate) are related to geometric spreading 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 an absorptive ground surface, such as soft dirt, grass, or scattered bushes and trees. An excess ground attenuation value of 1.5 dBA per doubling of distance is normally assumed. When added to the geometric spreading, this results in an overall drop-off 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 Truck Trips

On-site operational noise associated with on-site project generated truck trips was modeled utilizing 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, 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.

Modeled Existing Operational

The project does not proposed any new noise sources. It does however, propose to move existing noise sources to the south. In order 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 as they represent an average condition and not a worst case scenario. A more appropriate solution would be to compare modeled existing operations to modeled proposed operations. In this way, two sets of noise models with the same parameters can be compared to produce more relevant results.

C. 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 1/3 their former value for each doubling of distance. For example, at 200 feet the vibration is about 1/3 as intense as it is at 100 feet. 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. The following equation was utilized to calculate project generated peak particle velocity at nearby sensitive receptors.

Equation 1[2]:

[2] 17th Edition ISEE Blasters Handbook, (1998), Cleveland, OH, pg. 601.

$$PPV = 242 \left[\frac{D}{\sqrt{W}}\right] - 1.6$$

Where PPV= Peak particle velocity (in./sec.)
D = Distance from blast to structure (feet)
W = Maximum lbs. of explosives/delay

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. This is reflected in the following equation for predicting air overpressures from blasting.

Equation 2[2]:

$$P = 1.0 \left[\frac{D}{\sqrt[3]{W}}\right] - 1.1$$

Where P= Peak air overpressure (psi)
D = Distance from blast to structure (feet)
W = Maximum lbs. of explosives/delay

V. Findings

A. Consistency with Applicable Standards

San Bernardino National Forest

Distances to the 70, 65, 60 and 55 dBA Leq project noise contours that extend into the San Bernardino National Forest modeled using soft site conditions are presented in Table 8. 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.

Distances to project ground vibration and air overpressure contours are shown in Table 9 and Table 10. 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 13 to 17, operation of the proposed project would result in increases of up to 20.1 dBA L_{eq} in the SBNF (100 feet from proposed blasting activities at Site M4, directly south of the proposed quarry). This worst case increase represents days in which blasting takes place. The other four sites in the SBNF, located 2,350 to 14,500 feet from the 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.

As stated previously, there are no recreational sites within the Desert Rim area of SBNF and the nearest camp site, Arrastre Trail Camp, is located approximately 2.3 miles (12,150 feet) south of the project site. Noise levels would be similar to Site M1 (11,000 feet south) as included in Table 13. The noise level increase at this distance would be about 1 dBA and would be not be perceptible. Potential impacts to recreational users within the vicinity of the proposed project will be assessed separately in the recreation focused soundscape analysis prepared by the SBNF.

County of San Bernardino Development Code

Increase in Ambient Noise Levels Due to Quarry Operations

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 (2009).

Worst case scenario noise levels at the property line of the nearest sensitive receptors were modeled utilizing representative noise measurements taken at Mitsubishi's existing facility. As shown in Table 11 and Table 12, due to the shift in operation to the south, quarry operational noise is expected to decrease 1-2 dBA at the Immanuel Christian Center and

from 1-2.5 dBA at the nearest residence. These decreases are due to the shift of some quarry operations further away from residential properties.

The proposed project would not result in County of San Bernardino Stationary Noise Standard Development Code violations at the sensitive receptors in the vicinity of the proposed project. 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 the proposed project.

Project Generated On-Site Vehicle Noise

New internal haul truck trips associated with the proposed project are presented in the Mitsubishi South Quarry Plan of Operations. According to the plan, the project would include the re-apportionment of 55 haul trucks along a new internal haul route. These trucks will transport material down the new haul road to the existing primary crusher located at the north end of the existing East Pit near the cement plant. Up to seven additional trucks will haul waste rock. For modeling purposes, a total of 62 haul trucks were anticipated to use the new haul road each day. The haul trucks would only generate noise levels of 28.4dBA L_{dn} and 31.4 dBA L_{eq} at 50 feet from the haul road centerline (see Appendix C). Haul road noise would not exceed previously discussed Noise Standards for Adjacent Mobile Noise Sources.

In addition to the above mentioned trucks, up to eight trucks are expected to make round trips to and from the project site and within the site to provide water for road and mine dust control. These trips were included in the above discussed modeling effort.

Project Generated Off-Site Vehicle Noise

Approximately 11 employees will work on the South Quarry with only 3 new employees required. The addition of 3 employee vehicle round-trips together with the above-mentioned water trucks would result in a negligible increase in the Day/Night Noise Level (L_{dn}) and was not modeled.

Cement will be shipped to various markets by bulk truck, train and in sacks. There will be no change in the existing plant cement distribution due to the proposed South Quarry.

Project Generated Ground Vibration and Air Overpressure

As stated previously, limestone will be excavated at the South Quarry by standard open pit practices. Multiple holes (ranging between 7-40 in any particular area depending on the geology) will be drilled into the rock and small explosive charges of up to 455 lbs in size will be placed into each hole. Most charges will be less than 455 lbs in size. The explosives will then be detonated using sequential delays (in milliseconds) between each explosion. The resulting overpressures are dramatically reduced compared to a single larger blast. The following discussion evaluates project generated ground vibration and air overpressure in light of County of San Bernardino and other applicable standards.

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 Transportations' definition of "distinctly perceptible vibration" (see Table 5) 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 Section83.01.090(a).

There are no parcels zoned residential, commercial, or industrial adjacent to the project site. The 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 and the nearest commercial is located approximately 11,300 feet north (Receptor M8).

Groundborne vibration associated with the proposed project 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 ½ mile). Vibration levels at the nearest industrial and commercial zoned areas are 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 will be exposed to vibration that exceeds the County of San Bernardino 0.20 in/sec PPV standard. Vibration parameters, modeling and results are shown in Appendix D.

Air Overpressure

Because the County of San Bernardino does not have a threshold for an acceptable level of air overpressure, the USBM threshold, of 0.01 psi was utilized for this analysis.

Project generated air overpressure will range between 0.0003-0.05951 psi at receptors modeled in the SBNF (see Appendix D). Air overpressure levels at residential structures will range between 0.00030-0.00031 psi and will not exceed the USBM threshold.

Table 8

South Quarry Noise Contours (SBNF)[1,2]

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

[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.

Table 9

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

Table 10

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

Table 11

Change In Noise Levels and Consistency with County Development Code[1,2,3] (Site M8, Imanuel Christian Center)

Noise Level (dBA)	Distance from Source (feet)[4]	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	55.0	52.8
Daytime Standard (7 am to 10 pm)		55.0	75.0	70.0	65.0	60.0	55.0
Change		*-0.8*	*-1.2*	*-1.0*	*-1.0*	-0.9	*-0.8*
Exceeds Daytime Standards?		No	No	No	No	No	No

[1] Source: On-site noise survey, Kunzman Associates, Inc. (May 15, 2012).

[2] Ln's were estimated from modeled Lmax and Leq as well as measured Ln's from representative sources.

[3] Quarry operations will be limited to the hours of 7:00 AM to 10:00 PM. Therefore nighttime standards are not addressed.

[4] The distance to immovable noise sources (crusher, plant "hum") was calculated separately for each receiver. Movable

Table 12

Change In Noise Levels and Consistency with County Development Code[1,2,3] (Site M9, Nearest Residential, 7085 Camp Rock Road)

Noise Level (dBA)	Distance from Source (feet)[4]	L_{eq}	L_{max}	L_2	L_8	L_{25}	L_{50}
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)		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

[1] Source: On-site noise survey, Kunzman Associates, Inc. (May 15, 2012).

[2] Ln's were estimated from modeled Lmax and Leq as well as measured Ln's from representative sources.

[3] Quarry operations will be limited to the hours of 7:00 AM to 10:00 PM. Therefore nighttime standards are not addressed.

[4] 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 13

Change in Noise Levels[1,2]
(San Bernardino National Forest, Site M1, 11,000 feet to the south)

Noise Level (dBA)	Distance from Source (feet)[3]	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

[1] Source: On-site noise survey, Kunzman Associates, Inc. (May 15, 2012).

[2] Ln's were estimated from modeled Lmax and Leq as well as measured Ln's from representative sources.

[3] 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 14

Change In Noise Levels[1,2]
(San Bernardino National Forest, Site M2, 6,000 feet to the south)

Noise Level (dBA)	Distance from Source (feet)[3]	L_{eq}	L_{max}	L_2	L_8	L_{25}	L_{50}
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

[1] Source: On-site noise survey, Kunzman Associates, Inc. (May 15, 2012).

[2] Ln's were estimated from modeled Lmax and Leq as well as measured Ln's from representative sources.

[3] 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

Table 15

Change In Noise Levels[1,2]
(San Bernardino National Forest, M3, 2,350 feet to the south)

Noise Level (dBA)	Distance from Source (feet)[3]	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

[1] Source: On-site noise survey, Kunzman Associates, Inc. (May 15, 2012).

[2] Ln's were estimated from modeled Lmax and Leq as well as measured Ln's from representative sources.

[3] 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 16

Change In Noise Levels[1,2]
(M4 - South Quarry Property Line)

Noise Level (dBA)	Distance from Source (feet)[3]	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

[1] Source: On-site noise survey, Kunzman Associates, Inc. (May 15, 2012).

[2] Ln's were estimated from modeled Lmax and Leq as well as measured Ln's from representative sources.

[3] 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 17

Change In Noise Levels[1,2]
(San Bernardino National Forest, Site M10, Cactus Flats ORV Area)

Noise Level (dBA)	Distance from Source (feet)[3]	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	47.0	47.0	40.5	36.9	34.4
Modeled Planned Operational	14,500 - 18,550	36.0	49.6	49.6	42.9	38.9	36.0

[1] Source: On-site noise survey, Kunzman Associates, Inc. (May 15, 2012).

[2] Ln's were estimated from modeled Lmax and Leq as well as measured Ln's from representative sources.

[3] 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.

VI. Recommendations

No 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. No increase in noise is expected within the community of Lucerne Valley from the proposed project.

VII. References

Bolt, Baranek, and Newman

1971 Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances

California Department of Transportation (Caltrans)

2004 Transportation and Construction-Induced Vibration Guidance Manual, Environmental Engineering Noise, Vibration, and Hazardous Waste Management Office.

2009 Technical Noise Supplement. Division of Environmental Analysis, November.

Mitsubishi Cement Corporation

2011 Operations and Reclamation Plan for the South Quarry, July. Revised January 2012.

San Bernardino County

1995 General Plan Noise Element

2007 Development Code

United States Bureau of Mines (USBM)

1980 Siskind, David et. al. Structural Response and Damage Produced by Airblast from Surface Mining (Report of Investigation 8485).

Appendices

Appendix A –Noise Measurement Data Sheets

Appendix B – RCNM Quarry Noise Modeling Sheets

Appendix C – FHWA Sound32 Spreadsheet - Haul Road

Appendix D – Worst-Case Predicted Values of Peak Particle Velocities and Air Overpressure

APPENDIX A

Noise Measurement Data Sheets

Noise Measurement Field Data

KUNZMAN ASSOCIATES, INC.
Over 30 Years of Excellent Service

Project Name: Mitsubishi
Project #: 5051

Receiver Name: _____ Technician: Chris Pylant
Date: 5/15/12

Address: intersection of Holcomb Valley Rd. & 3N02
Site Description: 40' from road

Temperature: 70° Settings: (SLOW) FAST
Wind: moderate (10-15 mph) Terrain: mountainous
Weather: sunny

Primary Source: wind, birds
Secondary Sources: one passing truck

1	Start: 9:55 AM	End: 10:10	Leq: 41.9	Lmax: 59.4	Other:	L_1=54.3, L_5=43.1, L_{15}=38.6, L_{30}=34.3
2	Start:	End:	Leq:	Lmax:	Other:	
3	Start:	End:	Leq:	Lmax:	Other:	
4	Start:	End:	Leq:	Lmax:	Other:	

Additional Notes/Sketch: Lmax: passing truck, 2nd highest: 49.4 wind/birds

Noise Measurement Field Data

KUNZMAN ASSOCIATES, INC.
OVER 20 YEARS OF EXCELLENT SERVICE

Project Name: Mitsubishi
Project #: 5051

Receiver Name: _____ Technician: Chris Rylant
Date: 5/15/12

Address: Intersection of 3N02 & 3N10
Site Description: 25' off of 3N10

Temperature: 76° Settings: (SLOW) FAST
Wind: moderate (10-15 mph) Terrain: flat,
Weather: sunny

Primary Source: wind, birds

Secondary Sources: _____

1	Start: 10:25 AM	End: 10:40	Leq: 39.9	Lmax: 53.1*	Other: L_1=46.4, L_5=42.8, $L_{1.5}$=40.6, L_{30}=38.6		
2	Start:	End:	Leq:	Lmax:	Other:		
3	Start:	End:	Leq:	Lmax:	Other:		
4	Start:	End:	Leq:	Lmax:	Other:		

Additional Notes/Sketch

Lmax: human error, 2nd highest: 45.5 (wind)

Noise Measurement Field Data

KUNZMAN ASSOCIATES, INC.
OVER 30 YEARS OF EXCELLENT SERVICE

Project Name: Mitsubishi
Project #: 5051

Receiver Name: _____ Technician: Chris Rylant
Date: 5/15/12

Address: burnt flat, (gate on 3N02)
Site Description: 50' west of gate

Temperature: 81° Settings: (SLOW) FAST
Wind: moderate (@ 10 mph) Terrain: hilly
Weather: sunny

Primary Source: wind, birds, insects

Secondary Sources: _____

1	Start: 11:20 AM	End: 11:35	Leq: 32.5	Lmax: 48.9	Other:	$L_1 = 45.1$, $L_5 = 34.9$, $L_{15} = 25.2$, $L_{30} = 22.1$
2	Start:	End:	Leq:	Lmax:	Other:	
3	Start:	End:	Leq:	Lmax:	Other:	
4	Start:	End:	Leq:	Lmax:	Other:	

Additional Notes/Sketch

Noise Measurement Field Data

KUNZMAN ASSOCIATES, INC.
Over 30 Years of Excellent Service

Project Name: Mitsubishi
Project #: 5051

Receiver Name: _____ Technician: Chris Pylant
Date: 5/15/12

Address: SE edge of proposed South Quary
Site Description: top of ridge overlooking existing operations

Temperature: 83°
Wind: moderate (10-15mph) * Settings: (SLOW) FAST
Weather: _____ Terrain: maintainous, ridge top

Primary Source: existing cement plant, wind
Secondary Sources: birds, traffic on SR-18

1	Start: 11:55 AM	End: 12:10 PM	Leq: 42.4	Lmax: 48.5	Other: $L_1 = 46.3, L_5 = 44.8, L_{15} = 43.4, L_{30} = 41.6$		
2	Start:	End:	Leq:	Lmax:	Other:		
3	Start:	End:	Leq:	Lmax:	Other:		
4	Start:	End:	Leq:	Lmax:	Other:		

Additional Notes/Sketch

* gusts possibly up to 25-30 mph

Noise Measurement Field Data

KUNZMAN ASSOCIATES, INC.
Over 30 Years of Excellent Service

Project Name: Mitsubishi
Project #: 5051

Receiver Name: Blast
Technician: Chris Pylant
Date: 5/15/12

Address: Existing quarry
Site Description: other side of pit from blast

Temperature: 90°
Settings: (SLOW) FAST
Wind: moderate (10-15 mph)
Terrain: mountainous / quarry pit
Weather: sunny

Primary Source: warning Alarm
Secondary Sources: Haul trucks, crusher, talking, blast

1	Start: 1:43	End: 1:56	Leq: 77.7	Lmax: 93.0	Other:	$L_1 = 89.3, L_5 = 83.5, L_{45} = 63.6, L_{30} = 58.6$
2	Start:	End:	Leq:	Lmax:	Other:	
3	Start:	End:	Leq:	Lmax:	Other:	
4	Start:	End:	Leq:	Lmax:	Other:	

Additional Notes/Sketch

Lmax → warning alarm
407 yds from blast site
blast audible, but not loud.

Noise Measurement Field Data

KUNZMAN ASSOCIATES, INC.
Over 30 Years of Excellent Service

Project Name: Mitsubishi
Project #: 5051

Receiver Name: crusher
Technician: Chris Rylant
Date: 5/15/12

Address: edge of quarry, about 300' from crusher
Site Description:

Temperature: 91°
Settings: (SLOW) FAST
Wind: moderate (10-15mph)
Terrain: mountainous / quarry pit
Weather: sunny

Primary Source: aggregate crusher
Secondary Sources: haul trucks

1	Start: 2:03	End: 2:18	Leq: 75.1	Lmax: 79.6	Other: L_1=78.2, L_5=77.3, L_{15}=76.3, L_{30}=75.3
2	Start:	End:	Leq:	Lmax:	Other:
3	Start:	End:	Leq:	Lmax:	Other:
4	Start:	End:	Leq:	Lmax:	Other:

Additional Notes/Sketch

constant spinner for crusher
unloading of dump trucks barely audible
plant noise audible last 10 sec

Noise Measurement Field Data

KUNZMAN ASSOCIATES, INC.
Over 30 Years of Excellent Service

Project Name: Mitsubishi
Project #: 5051

Receiver Name: plant
Technician: Chris Pylant
Date: 5/15/12

Address: just above Cushenbury Rd,
Site Description: about 700' from edge of plant

Temperature: 92°
Wind: moderate (10-15mph)
Weather: sunny

Settings: (SLOW) FAST
Terrain: flat to south, mountainous to north

Primary Source: plant noise (humming)
Secondary Sources: crusher, haul trucks, reverse alarm from trucks

1	Start: 2:28	End: 2:43	Leq: 63.1	Lmax: 67.5	Other:	$L_1 = 65.8, L_5 = 64.7, L_{15} = 63.7, L_{30} = 62.8$
2	Start:	End:	Leq:	Lmax:	Other:	
3	Start:	End:	Leq:	Lmax:	Other:	
4	Start:	End:	Leq:	Lmax:	Other:	

Additional Notes/Sketch

Noise Measurement Field Data

KUNZMAN ASSOCIATES, INC.
OVER 30 YEARS OF EXCELLENT SERVICE

Project Name: Mitsubishi
Project #: 5051

Receiver Name: _____ Technician: Chris Pylant
Date: 5/15/12

Address: 6801 El Vaquero Rd.
Site Description: 100' NE of Vaquero, near Imanuel Christian Center about 250' from SR-18

Temperature: 95° Settings: (SLOW) FAST
Wind: moderate (@ 10 mph) Terrain: flat, earth berm to SE
Weather: sunny

Primary Source: traffic on SR-18
Secondary Sources: passing haul trucks, wind

1	Start: 4:09	End: 4:24	Leq: 55.8	Lmax: 74.8	Other:	$L_1 = 68.1$, $L_5 = 55.9$, $L_{15} = 47.8$, $L_{30} = 42.2$
2	Start:	End:	Leq:	Lmax:	Other:	
3	Start:	End:	Leq:	Lmax:	Other:	
4	Start:	End:	Leq:	Lmax:	Other:	

Additional Notes/Sketch

Lmax: passing haul truck going over rough road

Noise Measurement Field Data

KUNZMAN ASSOCIATES, INC.
OVER 30 YEARS OF EXCELLENT SERVICE

Project Name: Mitsubishi

Project #:

Receiver Name: M9

Technician: Chris Pylant

Date: 5/15/12

Address: Dirt Access Road near closest residential

Site Description:

Temperature: 93°

Wind: moderate (~15mph)

Weather: sunny

Settings: (SLOW) FAST

Terrain: hilly

Primary Source: traffic from SR-18

Secondary Sources: wind

1	Start: 4:37	End: 4:52	Leq: 44.2	Lmax: 54.8	Other:	$L_1 = 51.9$, $L_5 = 48.2$, $L_{15} = 44.7$, $L_{30} = 41.9$
2	Start:	End:	Leq:	Lmax:	Other:	
3	Start:	End:	Leq:	Lmax:	Other:	
4	Start:	End:	Leq:	Lmax:	Other:	

Additional Notes/Sketch

Noise Measurement Field Data

KUNZMAN ASSOCIATES, INC.
OVER 20 YEARS OF EXCELLENT SERVICE

Project Name: Mitsubishi
Project #: 5051

Receiver Name: M10
Technician: Chris Pylant
Date: 5/15/12

Address: 34.313526, -116.808346
Site Description: cactus flats ORV area

Temperature: 83°
Settings: (SLOW) FAST
Wind: moderate (10-15 mph)
Terrain: mountainous
Weather: sunny

Primary Source: traffic on SR-18
Secondary Sources: wind

1	Start: 5:17	End: 5:32	Leq: 45.6	Lmax: 54.7	Other:	L_1=51.4, L_5=49.1, L_{15}=46.4, L_{30}=44.3
2	Start:	End:	Leq:	Lmax:	Other:	
3	Start:	End:	Leq:	Lmax:	Other:	
4	Start:	End:	Leq:	Lmax:	Other:	

Additional Notes/Sketch

APPENDIX B

RCNM Quarry Noise Modeling Sheets

Planned Quarry Operation
NOISE CONTOURS
South Quarry Expansion

Location: 55 dBA Contour

Noise Source	Noise Reference Level (50 feet)	Noise Level (dB L_{eq})[1] Distance to Point of Reception (feet) 340	3590	6190	6440	340
Blasting	74.0	53.2				
Blast Alarm	95.9		49.5			
Crusher	95.3			43.0		
Plant Hum	67.5				14.8	
Dump Truck	72.5					51.7

	w/o barrier
TOTAL ONSITE SOUND GENERATION LEVEL AT SENSITIVE RECEPTOR:	**55.0**

[1] Assuming soft site (4.5 dBA attenuation per doubling of distance)

Planned Quarry Operation
NOISE CONTOURS
South Quarry Expansion

Location: 60 dBA Contour

Noise Source	Noise Reference Level (50 feet)	Noise Level (dB L_{eq})[1] — Distance to Point of Reception (feet)				
		192	3442	6042	6292	192
Blasting	74.0	59.4				
Blast Alarm	95.9		50.0			
Crusher	95.3			43.2		
Plant Hum	67.5				15.0	
Dump Truck	72.5					57.9

	w/o barrier
TOTAL ONSITE SOUND GENERATION LEVEL AT SENSITIVE RECEPTOR:	**60.0**

[1] Assuming soft site (4.5 dBA attenuation per doubling of distance)

Planned Quarry Operation
NOISE CONTOURS
South Quarry Expansion

Location: 60 dBA Contour

Noise Source	Noise Reference Level (50 feet)	Noise Level (dB L_{eq})[1] — Distance to Point of Reception (feet)				
		116	3366	5966	6216	116
Blasting	74.0	64.9				
Blast Alarm	95.9		50.2			
Crusher	95.3			43.4		
Plant Hum	67.5				15.1	
Dump Truck	72.5					63.4

	w/o barrier
TOTAL ONSITE SOUND GENERATION LEVEL AT SENSITIVE RECEPTOR:	**65.0**

[1] Assuming soft site (4.5 dBA attenuation per doubling of distance)

Planned Quarry Operation
NOISE CONTOURS
South Quarry Expansion

Location: 60 dBA Contour

Noise Source	Noise Reference Level (50 feet)	Noise Level (dB L_{eq})[1] Distance to Point of Reception (feet)				
		73	3323	5923	6173	73
Blasting	74.0	69.9				
Blast Alarm	95.9		50.3			
Crusher	95.3			43.5		
Plant Hum	67.5				15.2	
Dump Truck	72.5					68.4

	w/o barrier
TOTAL ONSITE SOUND GENERATION LEVEL AT SENSITIVE RECEPTOR:	**69.9**

[1] Assuming soft site (4.5 dBA attenuation per doubling of distance)

Existing Quarry Operation 01 min - Results
Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 08/29/2012
Case Description: Quarry Operation, All

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
M8 - Christian Center	Residential	55.8	55.8	55.8

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Blasting	Yes	1	94.0		10000.0	0.0
Blast Alarm	No	100		111.1	9450.0	0.0
Crusher	No	100		95.8	9450.0	0.0
Cement Plant Operation	No	100		67.5	7800.0	0.0
Dump Truck	No	75		76.5	10000.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq	Noise Limits (dBA) Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq	Noise Limit Exceedance (dBA) Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq
Blasting	48.0	28.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Blast Alarm	65.6	65.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Crusher	50.3	50.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Cement Plant Operation	23.6	23.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A								
Dump Truck	30.5	29.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A								
Total	65.6	65.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A								

**** Receptor #2 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
M9 - Nearest Residential	Residential	44.2	44.2	44.2

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Blasting	Yes	1	94.0		9950.0	0.0
Blast Alarm	No	100		111.1	9000.0	0.0
Crusher	No	100		95.8	9000.0	0.0
Cement Plant Operation	No	100		67.5	7400.0	0.0
Dump Truck	No	75		76.5	9950.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq	Noise Limits (dBA) Day Lmax	Leq	Evening Lmax	Leq	Night Lmax	Leq	Noise Limit Exceedance (dBA) Day Lmax	Leq	Evening Lmax	Leq	Night Lmax	Leq
Blasting	48.0	28.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Blast Alarm	66.0	66.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Existing Quarry Operation 01 min - Results

Crusher			50.7	50.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cement Plant Operation			24.1	24.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dump Truck			30.5	29.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Total	66.0	66.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Existing Quarry Operation 01 min
NOISE GENERATION IMPACTS TO SBNF
South Quarry Expansion

Location: M1 - SBNF 11,000 ft

Noise Source	Noise Reference Level (50 feet)	Noise Level (dB L_{eq})[1] Distance to Point of Reception (feet) 13550	16800	16800	17100	13550
Blasting	74.0	13.2				
Blast Alarm	111.1		47.9			
Crusher	95.8			32.6		
Plant Hum	67.5				4.1	
Dump Truck	76.5					15.7

	w/o barrier
TOTAL ONSITE SOUND GENERATION LEVEL AT SENSITIVE RECEPTOR:	**48.1**

[1] Assuming soft site (4.5 dBA attenuation per doubling of distance)

Existing Quarry Operation 01 min
NOISE GENERATION IMPACTS TO SBNF
South Quarry Expansion

Location: M2 - SBNF 6,000 ft

Noise Source	Noise Reference Level (50 feet)	Noise Level (dB L_{eq})[1] — Distance to Point of Reception (feet)				
		8900	11950	11950	12300	8900
Blasting	74.0	17.7				
Blast Alarm	111.1		51.6			
Crusher	95.8			36.3		
Plant Hum	67.5				7.7	
Dump Truck	76.5					20.2

	w/o barrier
TOTAL ONSITE SOUND GENERATION LEVEL AT SENSITIVE RECEPTOR:	**51.8**

[1] Assuming soft site (4.5 dBA attenuation per doubling of distance)

Existing Quarry Operation 01 min
NOISE GENERATION IMPACTS TO SBNF
South Quarry Expansion

Location: M3 - SBNF 2350 ft

Noise Source	Noise Reference Level (50 feet)	Noise Level (dB L_{eq})[1] Distance to Point of Reception (feet) 5750	8200	8200	8600	5750
Blasting	74.0	22.5				
Blast Alarm	111.1		55.7			
Crusher	95.8			40.4		
Plant Hum	67.5				11.6	
Dump Truck	76.5					25.0

	w/o barrier
TOTAL ONSITE SOUND GENERATION LEVEL AT SENSITIVE RECEPTOR:	**55.9**

[1] Assuming soft site (4.5 dBA attenuation per doubling of distance)

Existing Quarry Operation 01 min
NOISE GENERATION IMPACTS TO SBNF
South Quarry Expansion

Location: M4 - South Quarry 1000 ft

Noise Source	Noise Reference Level (50 feet)	Noise Level (dB L_{eq})[1] — Distance to Point of Reception (feet)				
		3400	6100	6100	6400	3400
Blasting	74.0	28.2				
Blast Alarm	111.1		58.9			
Crusher	95.8			43.6		
Plant Hum	67.5				14.8	
Dump Truck	76.5					30.7

	w/o barrier
TOTAL ONSITE SOUND GENERATION LEVEL AT SENSITIVE RECEPTOR:	**59.1**

[1] Assuming soft site (4.5 dBA attenuation per doubling of distance)

Existing Quarry Operation 01 min
NOISE GENERATION IMPACTS TO SBNF
South Quarry Expansion

Location: M10 - Cactus Flats

Noise Source	Noise Reference Level (50 feet)	Noise Level (dB L_{eq})[1] — Distance to Point of Reception (feet)				
		14700	18500	18500	18550	14700
Blasting	74.0	12.3				
Blast Alarm	111.1		46.9			
Crusher	95.8			31.6		
Plant Hum	67.5				3.3	
Dump Truck	76.5					14.8

	w/o barrier
TOTAL ONSITE SOUND GENERATION LEVEL AT SENSITIVE RECEPTOR:	**47.0**

[1] Assuming soft site (4.5 dBA attenuation per doubling of distance)

Existing Quarry Operation 05 min - Results
Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 08/29/2012
Case Description: Quarry Operation, All

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
M8 - Christian Center	Residential	55.8	55.8	55.8

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Blasting	Yes	1	94.0		10000.0	0.0
Blast Alarm	No	20		111.1	9450.0	0.0
Crusher	No	98		95.8	9450.0	0.0
Cement Plant Operation	No	100		67.5	7800.0	0.0
Dump Truck	No	94		76.5	10000.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq	Day Lmax	Leq	Evening Lmax	Leq	Night Lmax	Leq	Noise Limits (dBA) Day Lmax	Leq	Noise Limit Exceedance (dBA) Evening Lmax	Leq	Night Lmax	Leq
Blasting	48.0	28.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Blast Alarm	65.6	58.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Crusher	50.3	50.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cement Plant Operation	23.6	23.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dump Truck	30.5	30.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Total	65.6	59.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

**** Receptor #2 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
M9 - Nearest Residential	Residential	44.2	44.2	44.2

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Blasting	Yes	1	94.0		9950.0	0.0
Blast Alarm	No	20		111.1	9000.0	0.0
Crusher	No	98		95.8	9000.0	0.0
Cement Plant Operation	No	100		67.5	7400.0	0.0
Dump Truck	No	94		76.5	9950.0	0.0

Results

Noise Limit Exceedance (dBA)												
	Calculated (dBA)		Day		Evening		Night		Day		Evening	Night
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Blasting	48.0	28.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Blast Alarm	66.0	59.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Crusher	50.7	50.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cement Plant Operation	24.1	24.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dump Truck	30.5	30.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	66.0	59.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Existing Quarry Operation 05 min
NOISE GENERATION IMPACTS TO SBNF
South Quarry Expansion

Location: M1 - SBNF 11,000 ft

Noise Source	Noise Reference Level (50 feet)	Noise Level (dB L_{eq})[1] Distance to Point of Reception (feet) 13550	16800	16800	17100	13550
Blasting	74.0	13.2				
Blast Alarm	104.1		40.9			
Crusher	95.7			32.5		
Plant Hum	67.5				4.1	
Dump Truck	76.2					15.4

	w/o barrier
TOTAL ONSITE SOUND GENERATION LEVEL AT SENSITIVE RECEPTOR:	**41.5**

[1] Assuming soft site (4.5 dBA attenuation per doubling of distance)

Existing Quarry Operation 05 min
NOISE GENERATION IMPACTS TO SBNF
South Quarry Expansion

Location: M2 - SBNF 6,000 ft

Noise Source	Noise Reference Level (50 feet)	Noise Level (dB L_{eq})[1] — Distance to Point of Reception (feet)				
		8900	11950	11950	12300	8900
Blasting	74.0	17.7				
Blast Alarm	104.1		44.6			
Crusher	95.7			36.2		
Plant Hum	67.5				7.7	
Dump Truck	76.2					19.9

	w/o barrier
TOTAL ONSITE SOUND GENERATION LEVEL AT SENSITIVE RECEPTOR:	**45.2**

[1] Assuming soft site (4.5 dBA attenuation per doubling of distance)

Existing Quarry Operation 05 min
NOISE GENERATION IMPACTS TO SBNF
South Quarry Expansion

Location: M3 - SBNF 2350 ft

Noise Source	Noise Reference Level (50 feet)	Noise Level (dB L_{eq})[1] Distance to Point of Reception (feet) 5750	8200	8200	8600	5750
Blasting	74.0	22.5				
Blast Alarm	104.1		48.7			
Crusher	95.7			40.3		
Plant Hum	67.5				11.6	
Dump Truck	76.2					24.7

	w/o barrier
TOTAL ONSITE SOUND GENERATION LEVEL AT SENSITIVE RECEPTOR:	**49.3**

[1] Assuming soft site (4.5 dBA attenuation per doubling of distance)

Existing Quarry Operation 05 min
NOISE GENERATION IMPACTS TO SBNF
South Quarry Expansion

Location: M4 - South Quarry 1000 ft

Noise Source	Noise Reference Level (50 feet)	Noise Level (dB L_{eq})[1] — Distance to Point of Reception (feet)				
		3400	6100	6100	6400	3400
Blasting	74.0	28.2				
Blast Alarm	104.1		51.9			
Crusher	95.7			43.5		
Plant Hum	67.5				14.8	
Dump Truck	76.2					30.4

	w/o barrier
TOTAL ONSITE SOUND GENERATION LEVEL AT SENSITIVE RECEPTOR:	**52.5**

[1] Assuming soft site (4.5 dBA attenuation per doubling of distance)

Existing Quarry Operation 05 min
NOISE GENERATION IMPACTS TO SBNF
South Quarry Expansion

Location: M10 - Cactus Flats

Noise Source	Noise Reference Level (50 feet)	Noise Level ($dB L_{eq}$)[1] Distance to Point of Reception (feet) 14700	18500	18500	18550	14700
Blasting	74.0	12.3				
Blast Alarm	104.1		39.9			
Crusher	95.7			31.5		
Plant Hum	67.5				3.3	
Dump Truck	76.2					14.5

	w/o barrier
TOTAL ONSITE SOUND GENERATION LEVEL AT SENSITIVE RECEPTOR:	**40.5**

[1] Assuming soft site (4.5 dBA attenuation per doubling of distance)

Existing Quarry Operation 15 min - Results
Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 08/29/2012
Case Description: Quarry Operation, All

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
M8 - Christian Center	Residential	55.8	55.8	55.8

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Blasting	Yes	1	94.0		10000.0	0.0
Blast Alarm	No	7		111.1	9450.0	0.0
Crusher	No	95		95.8	9450.0	0.0
Cement Plant Operation	No	100		67.5	7800.0	0.0
Dump Truck	No	88		76.5	10000.0	0.0

Results

Noise Limit Exceedance (dBA)													
	Calculated (dBA)				Noise Limits (dBA) Day		Evening		Night		Day		
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Evening Night
Blasting	48.0	28.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A N/A
Blast Alarm	65.6	54.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A N/A
Crusher	50.3	50.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A N/A
Cement Plant Operation	23.6	23.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A N/A
Dump Truck	30.5	29.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A N/A

	Total	65.6	55.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

**** Receptor #2 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
M9 - Nearest Residential	Residential	44.2	44.2	44.2

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Blasting	Yes	1	94.0		9950.0	0.0
Blast Alarm	No	7		111.1	9000.0	0.0
Crusher	No	95		95.8	9000.0	0.0
Cement Plant Operation	No	100		67.5	7400.0	0.0
Dump Truck	No	88		76.5	9950.0	0.0

Results

Noise Limit Exceedance (dBA)													
		Calculated (dBA)		Day		Evening		Night		Day		Evening	Night
Equipment		Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Blasting		48.0	28.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Blast Alarm		66.0	54.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Crusher		50.7	50.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cement Plant Operation		24.1	24.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dump Truck		30.5	30.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Total	66.0	55.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Existing Quarry Operation 15 min
NOISE GENERATION IMPACTS TO SBNF
South Quarry Expansion

Location: M1 - SBNF 11,000 ft

Noise Source	Noise Reference Level (50 feet)	Noise Level (dB L_{eq})[1] Distance to Point of Reception (feet) 13550	16800	16800	17100	13550
Blasting	74.0	13.2				
Blast Alarm	99.6		36.4			
Crusher	95.6			32.4		
Plant Hum	67.5				4.1	
Dump Truck	75.9					15.1

	w/o barrier
TOTAL ONSITE SOUND GENERATION LEVEL AT SENSITIVE RECEPTOR:	**37.9**

[1] Assuming soft site (4.5 dBA attenuation per doubling of distance)

Existing Quarry Operation 15 min
NOISE GENERATION IMPACTS TO SBNF
South Quarry Expansion

Location: M2 - SBNF 6,000 ft

Noise Source	Noise Reference Level (50 feet)	Noise Level (dB L_{eq})[1] — Distance to Point of Reception (feet)				
		8900	11950	11950	12300	8900
Blasting	74.0	17.7				
Blast Alarm	99.6		40.1			
Crusher	95.6			36.1		
Plant Hum	67.5				7.7	
Dump Truck	75.9					19.6

	w/o barrier
TOTAL ONSITE SOUND GENERATION LEVEL AT SENSITIVE RECEPTOR:	**41.6**

[1] Assuming soft site (4.5 dBA attenuation per doubling of distance)

Existing Quarry Operation 15 min
NOISE GENERATION IMPACTS TO SBNF
South Quarry Expansion

Location: M3 - SBNF 2350 ft

Noise Source	Noise Reference Level (50 feet)	Noise Level (dB L_{eq})[1] Distance to Point of Reception (feet) 5750	8200	8200	8600	5750
Blasting	74.0	22.5				
Blast Alarm	99.6		44.2			
Crusher	95.6			40.2		
Plant Hum	67.5				11.6	
Dump Truck	75.9					24.4

	w/o barrier
TOTAL ONSITE SOUND GENERATION LEVEL AT SENSITIVE RECEPTOR:	**45.7**

[1] Assuming soft site (4.5 dBA attenuation per doubling of distance)

Existing Quarry Operation 15 min
NOISE GENERATION IMPACTS TO SBNF
South Quarry Expansion

Location: M4 - South Quarry 1000 ft

Noise Source	Noise Reference Level (50 feet)	Noise Level (dB L_{eq})[1] — Distance to Point of Reception (feet)				
		3400	6100	6100	6400	3400
Blasting	74.0	28.2				
Blast Alarm	99.6		47.4			
Crusher	95.6			43.4		
Plant Hum	67.5				14.8	
Dump Truck	75.9					30.1

	w/o barrier
TOTAL ONSITE SOUND GENERATION LEVEL AT SENSITIVE RECEPTOR:	**48.9**

[1] Assuming soft site (4.5 dBA attenuation per doubling of distance)

Existing Quarry Operation 15 min
NOISE GENERATION IMPACTS TO SBNF
South Quarry Expansion

Location: M10 - Cactus Flats

Noise Source	Noise Reference Level (50 feet)	Noise Level (dB L_{eq})[1] — Distance to Point of Reception (feet)				
		14700	18500	18500	18550	14700
Blasting	74.0	12.3				
Blast Alarm	99.6		35.4			
Crusher	95.6			31.4		
Plant Hum	67.5				3.3	
Dump Truck	75.9					14.2

	w/o barrier
TOTAL ONSITE SOUND GENERATION LEVEL AT SENSITIVE RECEPTOR:	36.9

[1] Assuming soft site (4.5 dBA attenuation per doubling of distance)

Existing Quarry Operation 30 min - Results
Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 08/29/2012
Case Description: Quarry Operation, All

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
M8 - Christian Center	Residential	55.8	55.8	55.8

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Blasting	Yes	1	94.0		10000.0	0.0
Blast Alarm	No	3		111.1	9450.0	0.0
Crusher	No	90		95.8	9450.0	0.0
Cement Plant Operation	No	100		67.5	7800.0	0.0
Dump Truck	No	75		76.5	10000.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq	Noise Limits (dBA) Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq	Day Lmax	Day Leq	Noise Limit Exceedance (dBA) Evening Lmax	Evening Leq	Night Lmax	Night Leq
Blasting	48.0	28.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Blast Alarm	65.6	50.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Crusher	50.3	49.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Cement Plant Operation	23.6	23.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dump Truck	30.5	29.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	65.6	53.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

**** Receptor #2 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
M9 - Nearest Residential	Residential	44.2	44.2	44.2

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Blasting	Yes	1	94.0		9950.0	0.0
Blast Alarm	No	3		111.1	9000.0	0.0
Crusher	No	90		95.8	9000.0	0.0
Cement Plant Operation	No	100		67.5	7400.0	0.0
Dump Truck	No	75		76.5	9950.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq	Noise Limits (dBA) Day Lmax	Leq	Evening Lmax	Leq	Night Lmax	Leq	Noise Limit Exceedance (dBA) Day Lmax	Leq	Evening Lmax	Leq	Night Lmax	Leq
Blasting	48.0	28.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Blast Alarm	66.0	50.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Existing Quarry Operation 30 min - Results

Crusher			50.7	50.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cement Plant Operation			24.1	24.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dump Truck			30.5	29.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Total	66.0	53.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Existing Quarry Operation 30 min
NOISE GENERATION IMPACTS TO SBNF
South Quarry Expansion

Location: M1 - SBNF 11,000 ft

Noise Source	Noise Reference Level (50 feet)	Noise Level (dB L_{eq})[1] Distance to Point of Reception (feet)				
		13550	16800	16800	17100	13550
Blasting	74.0	13.2				
Blast Alarm	95.9		32.7			
Crusher	95.3			32.1		
Plant Hum	67.5				4.1	
Dump Truck	72.5					11.7

	w/o barrier
TOTAL ONSITE SOUND GENERATION LEVEL AT SENSITIVE RECEPTOR:	**35.5**

[1] Assuming soft site (4.5 dBA attenuation per doubling of distance)

Existing Quarry Operation 30 min
NOISE GENERATION IMPACTS TO SBNF
South Quarry Expansion

Location: M2 - SBNF 6,000 ft

Noise Source	Noise Reference Level (50 feet)	Noise Level (dB L_{eq})[1] — Distance to Point of Reception (feet)				
		8900	11950	11950	12300	8900
Blasting	74.0	17.7				
Blast Alarm	95.9		36.4			
Crusher	95.3			35.8		
Plant Hum	67.5				7.7	
Dump Truck	72.5					16.2

	w/o barrier
TOTAL ONSITE SOUND GENERATION LEVEL AT SENSITIVE RECEPTOR:	**39.2**

[1] Assuming soft site (4.5 dBA attenuation per doubling of distance)

Existing Quarry Operation 30 min
NOISE GENERATION IMPACTS TO SBNF
South Quarry Expansion

Location: M3 - SBNF 2350 ft

Noise Source	Noise Reference Level (50 feet)	Noise Level (dB L_{eq})[1] — Distance to Point of Reception (feet)				
		5750	8200	8200	8600	5750
Blasting	74.0	22.5				
Blast Alarm	95.9		40.5			
Crusher	95.3			39.9		
Plant Hum	67.5				11.6	
Dump Truck	72.5					21.0

	w/o barrier
TOTAL ONSITE SOUND GENERATION LEVEL AT SENSITIVE RECEPTOR:	**43.3**

[1] Assuming soft site (4.5 dBA attenuation per doubling of distance)

Existing Quarry Operation 30 min
NOISE GENERATION IMPACTS TO SBNF
South Quarry Expansion

Location: M4 - South Quarry 1000 ft

Noise Source	Noise Reference Level (50 feet)	Noise Level (dB L_{eq})[1] — Distance to Point of Reception (feet)				
		3400	6100	6100	6400	3400
Blasting	74.0	28.2				
Blast Alarm	95.9		43.7			
Crusher	95.3			43.1		
Plant Hum	67.5				14.8	
Dump Truck	72.5					26.7

	w/o barrier
TOTAL ONSITE SOUND GENERATION LEVEL AT SENSITIVE RECEPTOR:	**46.5**

[1] Assuming soft site (4.5 dBA attenuation per doubling of distance)

Existing Quarry Operation 30 min
NOISE GENERATION IMPACTS TO SBNF
South Quarry Expansion

Location: M10 - Cactus Flats

Noise Source	Noise Reference Level (50 feet)	Noise Level (dB L_{eq})[1] — Distance to Point of Reception (feet)				
		14700	18500	18500	18550	14700
Blasting	74.0	12.3				
Blast Alarm	95.9		31.7			
Crusher	95.3			31.1		
Plant Hum	67.5				3.3	
Dump Truck	72.5					10.8

	w/o barrier
TOTAL ONSITE SOUND GENERATION LEVEL AT SENSITIVE RECEPTOR:	**34.4**

[1] Assuming soft site (4.5 dBA attenuation per doubling of distance)

Planned Quarry Operation 01 min - Results
Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 08/29/2012
Case Description: Quarry Operation, Planned

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
M8 - Christian Center	Residential	55.8	55.8	55.8

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Blasting	Yes	1	94.0		12050.0	0.0
Blast Alarm	No	100		111.1	10200.0	0.0
Crusher	No	100		95.8	9450.0	0.0
Cement Plant Operation	No	100		67.5	7800.0	0.0
Dump Truck	No	100		76.5	12050.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq	Noise Limits (dBA) Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq	Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq
Blasting	46.4	26.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Blast Alarm	64.9	64.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Crusher	50.3	50.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cement Plant Operation	23.6	23.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dump Truck	28.9	28.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Noise Limit Exceedance (dBA)

Equipment	Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq
Blasting	N/A	N/A	N/A	N/A	N/A	N/A
Blast Alarm	N/A	N/A	N/A	N/A	N/A	N/A
Crusher	N/A	N/A	N/A	N/A	N/A	N/A
Cement Plant Operation	N/A	N/A	N/A	N/A	N/A	N/A
Dump Truck	N/A	N/A	N/A	N/A	N/A	N/A

Total	64.9	65.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

**** Receptor #2 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
M9 - Nearest Residential	Residential	44.2	44.2	44.2

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Blasting	Yes	1	94.0		12100.0	0.0
Blast Alarm	No	100		111.1	10250.0	0.0
Crusher	No	100		95.8	9000.0	0.0
Cement Plant Operation	No	100		67.5	7400.0	0.0
Dump Truck	No	100		76.5	12100.0	0.0

Results

Noise Limit Exceedance (dBA)													
	Calculated (dBA)		Day		Evening		Night		Day		Evening		Night	
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Blasting	46.3	26.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Blast Alarm	64.9	64.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Crusher	50.7	50.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cement Plant Operation	24.1	24.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dump Truck	28.8	28.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	64.9	65.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Planned Quarry Operation 01 min
NOISE GENERATION IMPACTS TO SBNF
South Quarry Expansion

Location: M1 - SBNF 11,000 ft

Noise Source	Noise Reference Level (50 feet)	Noise Level (dB L_{eq})[1] Distance to Point of Reception (feet) 11000	14250	16850	17100	11000
Blasting	74.0	15.4				
Blast Alarm	111.1		49.7			
Crusher	95.8			32.6		
Plant Hum	67.5				4.1	
Dump Truck	76.5					17.9

	w/o barrier
TOTAL ONSITE SOUND GENERATION LEVEL AT SENSITIVE RECEPTOR:	**49.8**

[1] Assuming soft site (4.5 dBA attenuation per doubling of distance)

Planned Quarry Operation 01 min
NOISE GENERATION IMPACTS TO SBNF
South Quarry Expansion

Location: M2 - SBNF 6,000 ft

Noise Source	Noise Reference Level (50 feet)	Noise Level (dB L_{eq})[1] Distance to Point of Reception (feet) 6000	9250	11950	12300	6000
Blasting	74.0	22.0				
Blast Alarm	111.1		54.4			
Crusher	95.8			36.3		
Plant Hum	67.5				7.7	
Dump Truck	76.5					24.5

	w/o barrier
TOTAL ONSITE SOUND GENERATION LEVEL AT SENSITIVE RECEPTOR:	**54.5**

[1] Assuming soft site (4.5 dBA attenuation per doubling of distance)

Planned Quarry Operation 01 min
NOISE GENERATION IMPACTS TO SBNF
South Quarry Expansion

Location: M3 - SBNF 2350 ft

Noise Source	Noise Reference Level (50 feet)	Noise Level (dB L_{eq})[1] Distance to Point of Reception (feet) 2350	5600	8200	8600	2350
Blasting	74.0	32.2				
Blast Alarm	111.1		59.9			
Crusher	95.8			40.4		
Plant Hum	67.5				11.6	
Dump Truck	76.5					34.7

	w/o barrier
TOTAL ONSITE SOUND GENERATION LEVEL AT SENSITIVE RECEPTOR:	**59.9**

[1] Assuming soft site (4.5 dBA attenuation per doubling of distance)

Planned Quarry Operation 01 min
NOISE GENERATION IMPACTS TO SBNF
South Quarry Expansion

Location: M4 - South Quarry 100 ft

Noise Source	Noise Reference Level (50 feet)	Noise Level (dB L_{eq})[1] — Distance to Point of Reception (feet) 100	4250	6100	6400	250
Blasting	74.0	66.5				
Blast Alarm	111.1		62.9			
Crusher	95.8			43.6		
Plant Hum	67.5				14.8	
Dump Truck	76.5					59.0

	w/o barrier
TOTAL ONSITE SOUND GENERATION LEVEL AT SENSITIVE RECEPTOR:	**68.1**

[1] Assuming soft site (4.5 dBA attenuation per doubling of distance)

Planned Quarry Operation 01 min
NOISE GENERATION IMPACTS TO SBNF
South Quarry Expansion

Location: M4 - South Quarry 1000 ft

Noise Source	Noise Reference Level (50 feet)	Noise Level (dB L_{eq})[1] — Distance to Point of Reception (feet) 14500	14500	18500	18550	14500
Blasting	74.0	12.4				
Blast Alarm	111.1		49.5			
Crusher	95.8			31.6		
Plant Hum	67.5				3.3	
Dump Truck	76.5					14.9

	w/o barrier
TOTAL ONSITE SOUND GENERATION LEVEL AT SENSITIVE RECEPTOR:	**49.6**

[1] Assuming soft site (4.5 dBA attenuation per doubling of distance)

Planned Quarry Operation 05 min - Results
Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 08/29/2012
Case Description: Quarry Operation, Planned

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
M8 - Christian Center	Residential	55.8	55.8	55.8

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Blasting	Yes	1	94.0		12050.0	0.0
Blast Alarm	No	20		111.1	10200.0	0.0
Crusher	No	98		95.8	9450.0	0.0
Cement Plant Operation	No	100		67.5	7800.0	0.0
Dump Truck	No	94		76.5	12050.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq	Noise Limits (dBA) Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq	Noise Limit Exceedance (dBA) Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq
Blasting	46.4	26.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Blast Alarm	64.9	57.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Crusher	50.3	50.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Cement Plant Operation	23.6	23.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A								
Dump Truck	28.9	28.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A								
Total	64.9	58.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A								

**** Receptor #2 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
M9 - Nearest Residential	Residential	44.2	44.2	44.2

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Blasting	Yes	1	94.0		12100.0	0.0
Blast Alarm	No	20		111.1	10250.0	0.0
Crusher	No	98		95.8	9000.0	0.0
Cement Plant Operation	No	100		67.5	7400.0	0.0
Dump Truck	No	94		76.5	12100.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq	Noise Limits (dBA) Day Lmax	Leq	Evening Lmax	Leq	Night Lmax	Leq	Noise Limit Exceedance (dBA) Day Lmax	Leq	Evening Lmax	Leq	Night Lmax	Leq
Blasting	46.3	26.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Blast Alarm	64.9	57.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Planned Quarry Operation 05 min - Results

Crusher			50.7	50.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cement Plant Operation			24.1	24.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dump Truck			28.8	28.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Total	64.9	58.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Planned Quarry Operation 05 min
NOISE GENERATION IMPACTS TO SBNF
South Quarry Expansion

Location: M1 - SBNF 11,000 ft

Noise Source	Noise Reference Level (50 feet)	Noise Level (dB L_{eq})[1] Distance to Point of Reception (feet) 11000	14250	16850	17100	11000
Blasting	74.0	15.4				
Blast Alarm	104.1		42.7			
Crusher	95.7			32.5		
Plant Hum	67.5				4.1	
Dump Truck	76.2					17.6

	w/o barrier
TOTAL ONSITE SOUND GENERATION LEVEL AT SENSITIVE RECEPTOR:	**43.1**

[1] Assuming soft site (4.5 dBA attenuation per doubling of distance)

Planned Quarry Operation 05 min
NOISE GENERATION IMPACTS TO SBNF
South Quarry Expansion

Location: M2 - SBNF 6,000 ft

Noise Source	Noise Reference Level (50 feet)	Noise Level ($dB L_{eq}$)[1] Distance to Point of Reception (feet) 6000	9250	11950	12300	6000
Blasting	74.0	22.0				
Blast Alarm	104.1		47.4			
Crusher	95.7			36.2		
Plant Hum	67.5				7.7	
Dump Truck	76.2					24.2

	w/o barrier
TOTAL ONSITE SOUND GENERATION LEVEL AT SENSITIVE RECEPTOR:	**47.8**

[1] Assuming soft site (4.5 dBA attenuation per doubling of distance)

Planned Quarry Operation 05 min
NOISE GENERATION IMPACTS TO SBNF
South Quarry Expansion

Location: M3 - SBNF 2350 ft

Noise Source	Noise Reference Level (50 feet)	Noise Level (dB L_{eq})[1] Distance to Point of Reception (feet) 2350	5600	8200	8600	2350
Blasting	74.0	32.2				
Blast Alarm	104.1		52.9			
Crusher	95.7			40.3		
Plant Hum	67.5				11.6	
Dump Truck	76.2					34.4

	w/o barrier
TOTAL ONSITE SOUND GENERATION LEVEL AT SENSITIVE RECEPTOR:	**53.1**

[1] Assuming soft site (4.5 dBA attenuation per doubling of distance)

Planned Quarry Operation 05 min
NOISE GENERATION IMPACTS TO SBNF
South Quarry Expansion

Location: M4 - South Quarry 100 ft

Noise Source	Noise Reference Level (50 feet)	Noise Level (dB L_{eq})[1] — Distance to Point of Reception (feet) 100	4250	6100	6400	250
Blasting	74.0	66.5				
Blast Alarm	104.1		55.9			
Crusher	95.7			43.5		
Plant Hum	67.5				14.8	
Dump Truck	76.2					58.7

	w/o barrier
TOTAL ONSITE SOUND GENERATION LEVEL AT SENSITIVE RECEPTOR:	66.9

[1] Assuming soft site (4.5 dBA attenuation per doubling of distance)

Planned Quarry Operation 05 min
NOISE GENERATION IMPACTS TO SBNF
South Quarry Expansion

Location: M10 - Cactus Flats

Noise Source	Noise Reference Level (50 feet)	Noise Level (dB L_{eq})[1] — Distance to Point of Reception (feet)				
		14500	14500	18500	18550	14500
Blasting	74.0	12.4				
Blast Alarm	104.1		42.5			
Crusher	95.7			31.5		
Plant Hum	67.5				3.3	
Dump Truck	76.2					14.6

	w/o barrier
TOTAL ONSITE SOUND GENERATION LEVEL AT SENSITIVE RECEPTOR:	**42.9**

[1] Assuming soft site (4.5 dBA attenuation per doubling of distance)

Planned Quarry Operation 15 min - Results
Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 08/29/2012
Case Description: Quarry Operation, Planned

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
M8 - Christian Center	Residential	55.8	55.8	55.8

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Blasting	Yes	1	94.0		12050.0	0.0
Blast Alarm	No	7		111.1	10200.0	0.0
Crusher	No	95		95.8	9450.0	0.0
Cement Plant Operation	No	100		67.5	7800.0	0.0
Dump Truck	No	88		76.5	12050.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq	Noise Limits (dBA) Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq	Noise Limit Exceedance (dBA) Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq
Blasting	46.4	26.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Blast Alarm	64.9	53.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Crusher	50.3	50.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cement Plant Operation	23.6	23.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dump Truck	28.9	28.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

	Total	64.9	55.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

**** Receptor #2 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
M9 - Nearest Residential	Residential	44.2	44.2	44.2

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Blasting	Yes	1	94.0		12100.0	0.0
Blast Alarm	No	7		111.1	10250.0	0.0
Crusher	No	95		95.8	9000.0	0.0
Cement Plant Operation	No	100		67.5	7400.0	0.0
Dump Truck	No	88		76.5	12100.0	0.0

Results

Noise Limit Exceedance (dBA)													
		Calculated (dBA)		Day		Evening		Night		Day		Evening	Night
Equipment		Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Blasting		46.3	26.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Blast Alarm		64.9	53.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Crusher		50.7	50.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cement Plant Operation		24.1	24.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dump Truck		28.8	28.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Total	64.9	55.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Planned Quarry Operation 15 min
NOISE GENERATION IMPACTS TO SBNF
South Quarry Expansion

Location: M1 - SBNF 11,000 ft

Noise Source	Noise Reference Level (50 feet)	Noise Level (dB L_{eq})[1] Distance to Point of Reception (feet) 11000	14250	16850	17100	11000
Blasting	74.0	15.4				
Blast Alarm	99.6		38.2			
Crusher	95.6			32.4		
Plant Hum	67.5				4.1	
Dump Truck	75.9					17.3

	w/o barrier
TOTAL ONSITE SOUND GENERATION LEVEL AT SENSITIVE RECEPTOR:	**39.3**

[1] Assuming soft site (4.5 dBA attenuation per doubling of distance)

Planned Quarry Operation 15 min
NOISE GENERATION IMPACTS TO SBNF
South Quarry Expansion

Location: M2 - SBNF 6,000 ft

Noise Source	Noise Reference Level (50 feet)	Noise Level (dB L_{eq})[1] — Distance to Point of Reception (feet) 6000	9250	11950	12300	6000
Blasting	74.0	22.0				
Blast Alarm	99.6		42.9			
Crusher	95.6			36.1		
Plant Hum	67.5				7.7	
Dump Truck	75.9					23.9

	w/o barrier
TOTAL ONSITE SOUND GENERATION LEVEL AT SENSITIVE RECEPTOR:	**43.8**

[1] Assuming soft site (4.5 dBA attenuation per doubling of distance)

Planned Quarry Operation 15 min
NOISE GENERATION IMPACTS TO SBNF
South Quarry Expansion

Location: M3 - SBNF 2350 ft

Noise Source	Noise Reference Level (50 feet)	Noise Level (dB L_{eq})[1] Distance to Point of Reception (feet) 2350	5600	8200	8600	2350
Blasting	74.0	32.2				
Blast Alarm	99.6		48.4			
Crusher	95.6			40.2		
Plant Hum	67.5				11.6	
Dump Truck	75.9					34.1

	w/o barrier
TOTAL ONSITE SOUND GENERATION LEVEL AT SENSITIVE RECEPTOR:	**49.1**

[1] Assuming soft site (4.5 dBA attenuation per doubling of distance)

Planned Quarry Operation 15 min
NOISE GENERATION IMPACTS TO SBNF
South Quarry Expansion

Location: M4 - South Quarry 100 ft

Noise Source	Noise Reference Level (50 feet)	Noise Level (dB L_{eq})[1] — Distance to Point of Reception (feet) 100	4250	6100	6400	250
Blasting	74.0	66.5				
Blast Alarm	99.6		51.4			
Crusher	95.6			43.4		
Plant Hum	67.5				14.8	
Dump Truck	75.9					58.4

	w/o barrier
TOTAL ONSITE SOUND GENERATION LEVEL AT SENSITIVE RECEPTOR:	66.6

[1] Assuming soft site (4.5 dBA attenuation per doubling of distance)

Planned Quarry Operation 15 min
NOISE GENERATION IMPACTS TO SBNF
South Quarry Expansion

Location: M10 - Cactus Flats

Noise Source	Noise Reference Level (50 feet)	Noise Level (dB L_{eq})[1] — Distance to Point of Reception (feet)				
		14500	14500	18500	18550	14500
Blasting	74.0	12.4				
Blast Alarm	99.6		38.0			
Crusher	95.6			31.4		
Plant Hum	67.5				3.3	
Dump Truck	75.9					14.3

	w/o barrier
TOTAL ONSITE SOUND GENERATION LEVEL AT SENSITIVE RECEPTOR:	**38.9**

[1] Assuming soft site (4.5 dBA attenuation per doubling of distance)

Planned Quarry Operation 30 min - Results
Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 08/29/2012
Case Description: Quarry Operation, Planned

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
M8 - Christian Center	Residential	55.8	55.8	55.8

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Blasting	Yes	1	94.0		12050.0	0.0
Blast Alarm	No	3		111.1	10200.0	0.0
Crusher	No	90		95.8	9450.0	0.0
Cement Plant Operation	No	100		67.5	7800.0	0.0
Dump Truck	No	75		76.5	12050.0	0.0

Results

Equipment	Calculated (dBA) Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq	Noise Limits (dBA) Day Lmax	Day Leq	Noise Limit Exceedance (dBA) Evening Lmax	Evening Leq	Night Lmax	Night Leq
Blasting	46.4	26.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Blast Alarm	64.9	49.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Crusher	50.3	49.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Cement Plant Operation	23.6	23.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A								
Dump Truck	28.9	27.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A								
Total	64.9	52.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A								

**** Receptor #2 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
M9 - Nearest Residential	Residential	44.2	44.2	44.2

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Blasting	Yes	1	94.0		12100.0	0.0
Blast Alarm	No	3		111.1	10250.0	0.0
Crusher	No	90		95.8	9000.0	0.0
Cement Plant Operation	No	100		67.5	7400.0	0.0
Dump Truck	No	75		76.5	12100.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq	Noise Limits (dBA) Day Lmax	Leq	Evening Lmax	Leq	Night Lmax	Leq	Noise Limit Exceedance (dBA) Day Lmax	Leq	Evening Lmax	Leq	Night Lmax	Leq
Blasting	46.3	26.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Blast Alarm	64.9	49.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Planned Quarry Operation 30 min - Results

Crusher			50.7	50.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cement Plant Operation			24.1	24.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dump Truck			28.8	27.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Total	64.9	53.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Planned Quarry Operation 30 min
NOISE GENERATION IMPACTS TO SBNF
South Quarry Expansion

Location: M1 - SBNF 11,000 ft

Noise Source	Noise Reference Level (50 feet)	Noise Level (dB L_{eq})[1] Distance to Point of Reception (feet) 11000	14250	16850	17100	11000
Blasting	74.0	15.4				
Blast Alarm	95.9		34.5			
Crusher	95.3			32.1		
Plant Hum	67.5				4.1	
Dump Truck	72.5					13.9

	w/o barrier
TOTAL ONSITE SOUND GENERATION LEVEL AT SENSITIVE RECEPTOR:	**36.5**

[1] Assuming soft site (4.5 dBA attenuation per doubling of distance)

Planned Quarry Operation 30 min
NOISE GENERATION IMPACTS TO SBNF
South Quarry Expansion

Location: M2 - SBNF 6,000 ft

Noise Source	Noise Reference Level (50 feet)	Noise Level ($dB L_{eq}$)[1] Distance to Point of Reception (feet) 6000	9250	11950	12300	6000
Blasting	74.0	22.0				
Blast Alarm	95.9		39.2			
Crusher	95.3			35.8		
Plant Hum	67.5				7.7	
Dump Truck	72.5					20.5

	w/o barrier
TOTAL ONSITE SOUND GENERATION LEVEL AT SENSITIVE RECEPTOR:	**40.9**

[1] Assuming soft site (4.5 dBA attenuation per doubling of distance)

Planned Quarry Operation 30 min
NOISE GENERATION IMPACTS TO SBNF
South Quarry Expansion

Location: M3 - SBNF 2350 ft

Noise Source	Noise Reference Level (50 feet)	Noise Level (dB L_{eq})[1] — Distance to Point of Reception (feet) 2350	5600	8200	8600	2350
Blasting	74.0	32.2				
Blast Alarm	95.9		44.7			
Crusher	95.3			39.9		
Plant Hum	67.5				11.6	
Dump Truck	72.5					30.7

	w/o barrier
TOTAL ONSITE SOUND GENERATION LEVEL AT SENSITIVE RECEPTOR:	**46.1**

[1] Assuming soft site (4.5 dBA attenuation per doubling of distance)

Planned Quarry Operation 30 min
NOISE GENERATION IMPACTS TO SBNF
South Quarry Expansion

Location: M4 - South Quarry 100 ft

Noise Source	Noise Reference Level (50 feet)	Noise Level ($dB\ L_{eq}$)[1] Distance to Point of Reception (feet) 100	4250	6100	6400	250
Blasting	74.0	66.5				
Blast Alarm	95.9		47.7			
Crusher	95.3			43.1		
Plant Hum	67.5				14.8	
Dump Truck	72.5					55.0

	w/o barrier
TOTAL ONSITE SOUND GENERATION LEVEL AT SENSITIVE RECEPTOR:	66.6

[1] Assuming soft site (4.5 dBA attenuation per doubling of distance)

Planned Quarry Operation 30 min
NOISE GENERATION IMPACTS TO SBNF
South Quarry Expansion

Location: M4 - South Quarry 1000 ft

Noise Source	Noise Reference Level (50 feet)	Noise Level (dB L_{eq})[1] — Distance to Point of Reception (feet) 14500	14500	18500	18550	14500
Blasting	74.0	12.4				
Blast Alarm	95.9		34.3			
Crusher	95.3			31.1		
Plant Hum	67.5				3.3	
Dump Truck	72.5					10.9

	w/o barrier
TOTAL ONSITE SOUND GENERATION LEVEL AT SENSITIVE RECEPTOR:	36.0

[1] Assuming soft site (4.5 dBA attenuation per doubling of distance)

APPENDIX C

FHWA Sound32 Spreadsheet - Haul Road

FHWA Sound32 Spreadsheet

South Quarry Noise Analysis

Haul Road

	DAYTIME			EVENING			NIGHTTIME					
	AUTOS	M.TRUCKS	H.TRUCKS	AUTOS	M.TRUCKS	H.TRUCKS	AUTOS	M.TRUCKS	H.TRUCKS	ADT		62.00
										SPEED		20.00
										DISTANCE		50.00
INPUT PARAMETERS												
Vehicles per hour	2.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	% A		99.98
Speed in MPH	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00			
Left angle	-90.00	-90.00	-90.00	-90.00	-90.00	-90.00	-90.00	-90.00	-90.00			
Right angle	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	% MT		0.01
NOISE CALCULATIONS												
Reference levels	55.68	68.61	75.38	55.68	68.61	75.38	55.68	68.61	75.38	% HT		0.01
ADJUSTMENTS												
Flow	0.80	-79.19	-79.19	-39.20	-79.19	-79.19	-39.20	-79.19	-79.19			
Distance	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	LEFT		-90.00
Finite Roadway	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	RIGHT		90.00
Barrier	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
Grade	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Ldn		28.41
Constant	-25.00	-25.00	-25.00	-25.00	-25.00	-25.00	-25.00	-25.00	-25.00	DAY LEQ		31.41
LEQ	31.41	-35.66	-28.88	-8.59	-35.66	-28.88	-8.59	-35.66	-28.88	Day hour		89.00
										Absorbtive?	no	
	DAY LEQ	**31.41**		EVENING LEQ	-8.54		NIGHT LEQ	-8.54		Use hour?	no	
										GRADE dB		0.00
	Ldn		**28.41**									

APPENDIX D

Worst-Case Predicted Values of Peak Particle Velocities and Air Overpressure

Worst-Case Predicted Values of Peak Particle Velocities and Air Overpressure
For Structure Receptors

Existing Conditions

Receptor	Distance Feet	Charge Weight (lbs)	Calculated PPV	Criteria	Exceeds Criteria	Calculated PSI	Criteria	Exceeds Criteria
M8	10000	455	0.013	0.10	NO	0.00038	0.01	NO
M9	9950	455	0.013	0.10	NO	0.00038	0.01	NO

PPV - Peak Particle Velocity

psi - pounds per square inch

Proposed Project Conditions

Receptor	Distance Feet	Charge Weight (lbs)	Predicted PPV	Criteria	Exceeds Criteria	Predicted PSI	Criteria	Exceeds Criteria
M8	12050	455	0.010	0.10	NO	0.00031	0.01	NO
M9	12100	455	0.010	0.10	NO	0.00030	0.01	NO

PPV - Peak Particle Velocity

psi - pounds per square inch

Vibration (PPV) Distance Calculations

Distance to 0.10, Distinctly Perceptib	*2779*	ft
Distance to 0.20, SB County Criteria	*1802*	ft

Overpressure (psi) Distance Calculations

Distance to 0.01 Criteria	*506*	ft

Worst-Case Predicted Values of Peak Particle Velocities and Air Overpressure
For Structure Receptors

Existing Conditions

Receptor	Distance Feet	Charge Weight (lbs)	Calculated PPV	Calculated PSI
M1	13550	455	0.008	0.00027
M2	8900	455	0.016	0.00043
M3	5750	455	0.031	0.00069
M4	*3400*	455	0.072	0.00123
M10	14700	455	0.007	0.00025

PPV - Peak Particle Velocity

psi - pounds per square inch

Proposed Project Conditions

Receptor	Distance Feet	Charge Weight (lbs)	Predicted PPV	Predicted PSI
M1	11000	455	0.011	0.00034
M2	6000	455	0.029	0.00066
M3	2350	455	0.131	0.00185
M4	100	455	20.428	0.05951
M10	14500	455	0.007	0.00025
1/2 Mile	2640	455	0.109	0.00162

PPV - Peak Particle Velocity

psi - pounds per square inch

Caltrans Human Response to Blasting Ground Vibration
Contour Distance Calculations

Barely Perceptible	*7599*	ft
Distinctly Perceptible	*2779*	ft
Strongly Perceptible	*1016*	ft
Mildly Unpleasant	*659*	ft
Distinctly Unpleasant	*427*	ft
Intolerable	*156*	ft

Caltrans Human Response to Blasting Air Overpressure
Contour Distance Calculations

Barely Perceptible	*767*	ft
Distinctly Perceptible	*95*	ft
Strongly Perceptible	*12*	ft
Mildly Unpleasant	*1*	ft
Distinctly Unpleasant	*0*	ft
Intolerable	*0*	ft