Environmental Noise Assessment

Moody Flats Quarry

Shasta County, California

BAC Job #2009-067

Prepared For:

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INTRODUCTION

The acoustical consulting firm of Bollard Acoustical Consultants, Inc. (BAC) has been retained by Resource Design Technology, Inc. to assess noise and vibration emissions associated with the proposed Moody Flats Quarry.

This analysis assesses the Project's compliance with applicable Shasta County noise level standards and recommends feasible mitigation, as necessary, to ensure compliance with those standards as well as compliance with the standards set forth in the CEQA guidelines. This report assesses noise generated by on-site mining activities (excavation), processing (primary aggregate plant and permanent processing plant), ancillary facilities (concrete ready-mix, asphaltic concrete, and recycling) and load-out of aggregate materials by rail as well as offsite truck traffic.

Project Location

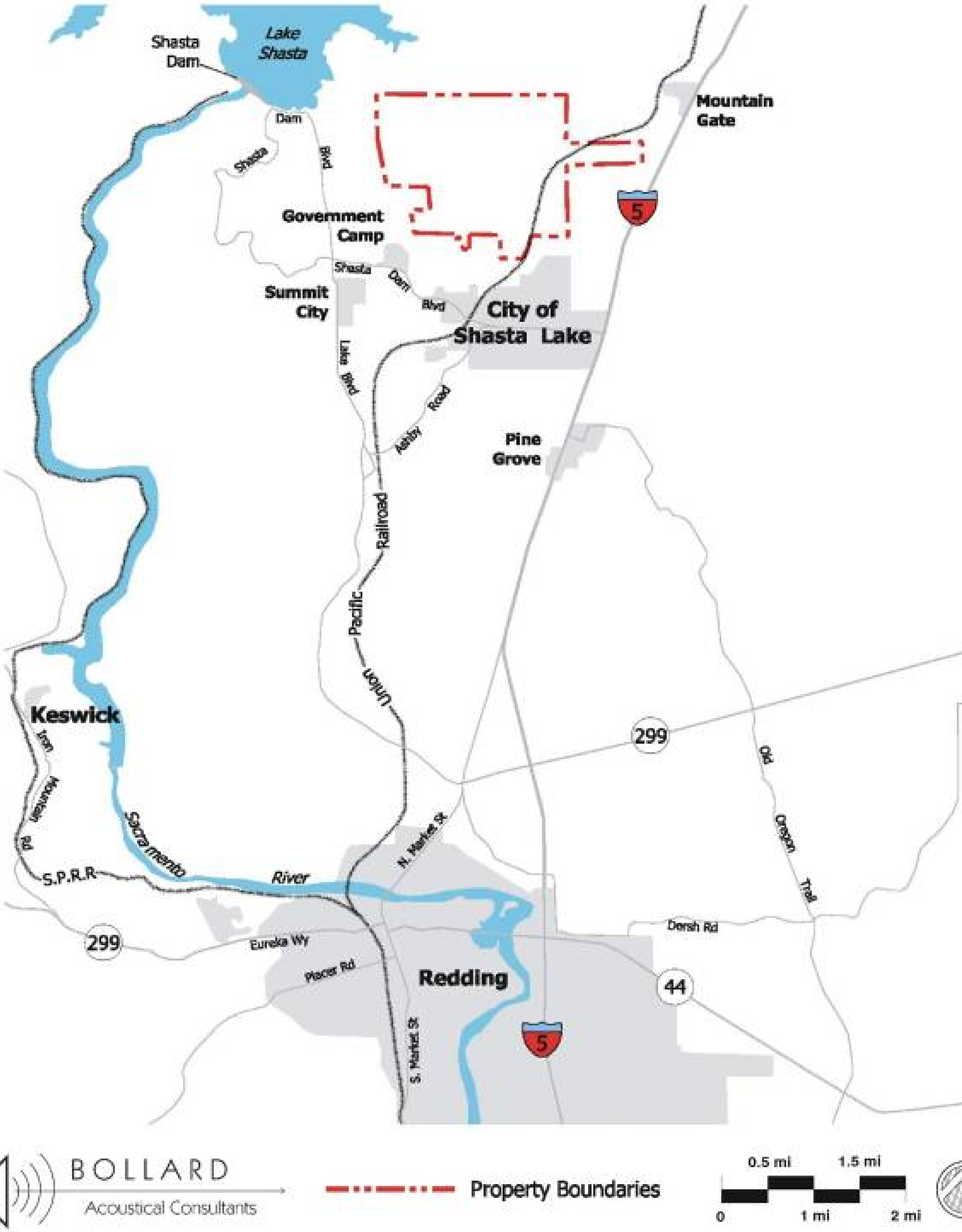
The Project site is located in western Shasta County, California, about 1 mile west of Interstate 5, north of the City of Shasta Lake, and 9 miles north of the City of Redding. Please see Figure 1 for the project location.

General Project Description

The Project proposed to develop a new 430-acre hardrock quarry, aggregate processing facility, ancillary aggregate product facilities (i.e. ready-mix plant, asphalt batch plant, and recycled construction materials plant), aggregate truck and railcar lead-out facility within the 1,900±-acre project site. Production and distribution goals include approximately 1.5 million tons annually shipped via rail to regional markets, and 0.5 million tons distributed to the local markets via trucks.

The maximum proposed annual aggregate production for the Moody Flats Quarry would be 2 million tons per year. The operation is planned for 100 years, although mineral resources are identified that could extend operations. About 200± million tons of aggregate material would be generated by the Project.

Figure 1
Moody Flats Quarry – Shasta County, California
Project Vicinity



OBJECTIVES OF THIS ANALYSIS

The objectives of this analysis are as follows:

- Provide background information pertaining to the effects of noise and vibration.
- Identify existing noise-sensitive land uses in the immediate project vicinity.
- Quantify existing ambient noise and vibration levels at those nearest noise-sensitive land uses.
- To clearly set out applicable thresholds of significance by using the California Environmental Quality Act (CEQA) Guidelines in concert with Shasta County noise standards
- Compare existing noise and vibration levels at noise-sensitive receptors and evaluate the significance of project-related noise and vibration impacts.
- Predict project-related noise and vibration levels at the nearest noise-sensitive areas, and to compare those levels against the applicable thresholds of significance.
- To evaluate noise and vibration mitigation options where significant project-related impacts are identified.
- To summarize the results of this analysis into a report for eventual use in the development of the project environmental documents.

BACKGROUND ON NOISE AND VIBRATION

Noise/Sound

Noise is often described as unwanted sound. Sound is defined as any pressure variation in air that human hearing can detect. If the pressure variations occur frequently enough (i.e., at least 20 times per second) they can be identified as sound. The number of pressure variations per second is called the frequency of sound, and is expressed as cycles per second or Hertz (Hz). Please see Appendix A for definitions of terminology used in this report.

Measuring sound directly in terms of pressure would require a very large and awkward range of numbers. To avoid this, the decibel scale was devised. The decibel scale utilizes the hearing threshold (20 micropascals of pressure) as a point of reference, defined as 0 dB. Other sound pressures are then compared to the reference pressure, and the logarithm is taken to keep the numbers within a practical range. The decibel scale allows a million-fold increase in pressure to be expressed as 120 dB. Another useful aspect of the decibel scale is that changes in decibel levels correspond closely to human perception of relative loudness. Figure 2 illustrates common noise levels associated with various sources.

Figure 2
Typical A-Weighted Sound Levels of Common Noise Sources

Loudness Ratio Level	A-Weighted Sound Level (dBA)	
128	130	Threshold of pain
64	120	Jet aircraft take-off at 100 feet
32	110	Riveting machine at operators position
16	100	Shotgun at 200 feet
8	90	Bulldozer at 50 feet
4	80	Diesel locomotive at 300 feet
2	70	Commercial jet aircraft interior during flight
1	60	Normal conversation speech at 5-10 feet
1/2	50	Open office background level
1/4	40	Background level within a residence
1/8	30	Soft whisper at 2 feet
1/16	20	Interior of recording studio

The perceived loudness of sound is dependent upon many factors, including sound pressure level and frequency content. However, within the usual range of environmental noise levels, perception of loudness is relatively predictable, and can be approximated by weighting the frequency response of a sound level meter by means of the standardized A-weighting network. There is a strong correlation between A-weighted sound levels (expressed as dBA) and community response to noise. All noise levels reported in this section are A-weighted.

Community noise is commonly described in terms of the Aambient@ noise level, which is defined as the all-encompassing noise level associated with a given noise environment. A common statistical tool to measure the ambient noise level is the average, or equivalent, sound level (L_{eq}) over a given time period (usually one hour). The L_{eq} is the foundation of the Day-Night Average Level noise descriptor, L_{dn}, and shows very good correlation with community response to noise.

The Day-Night Average Level (L_{dn}) is based upon the average noise level over a 24-hour day, with a +10 decibel weighing applied to noise occurring during nighttime (10:00 p.m. to 7:00 a.m.) hours. The nighttime penalty is based upon the assumption that people react to nighttime noise exposures as though they were twice as loud as daytime exposures. Because L_{dn} represents a 24-hour average, it tends to disguise short-term variations in the noise environment. L_{dn} based noise standards are commonly used to assess noise impacts associated with traffic, railroad and aircraft noise sources.

Vibration

Vibration is like noise in that it involves a source, a transmission path, and a receiver. While vibration is related to noise, it differs in that noise is generally considered to be pressure waves transmitted through air, while vibration is usually associated with transmission through a structure. As with noise, vibration consists of an amplitude and frequency. A person’s response to vibration will depend on their individual sensitivity as well as the amplitude and frequency of the source.

Vibration can be described in terms of acceleration, velocity, or displacement. A common practice is to monitor vibration measures in terms of peak particle velocities (inches/second). Standards pertaining to perception as well as damage to structures have been developed for vibration in terms of peak particle velocity. Although aggregate mining and processing vibration levels are not expected to be significant for this project due to the relatively large distances between project equipment (sources) and acoustically sensitive receivers, an assessment of mining-related vibration levels is included nonetheless.

BASELINE NOISE AND VIBRATION ENVIRONMENTS

Identification of Existing Sensitive Receivers (Residences)

BAC utilized aerial imagery and site inspections to identify the nearest potentially affected sensitive receptors to the project site. A total of 7 receptor locations (R1-R7) were selected to represent the nearest potentially affected residences. Those receptors are shown on Figure 3.

Baseline Ambient Noise Environment

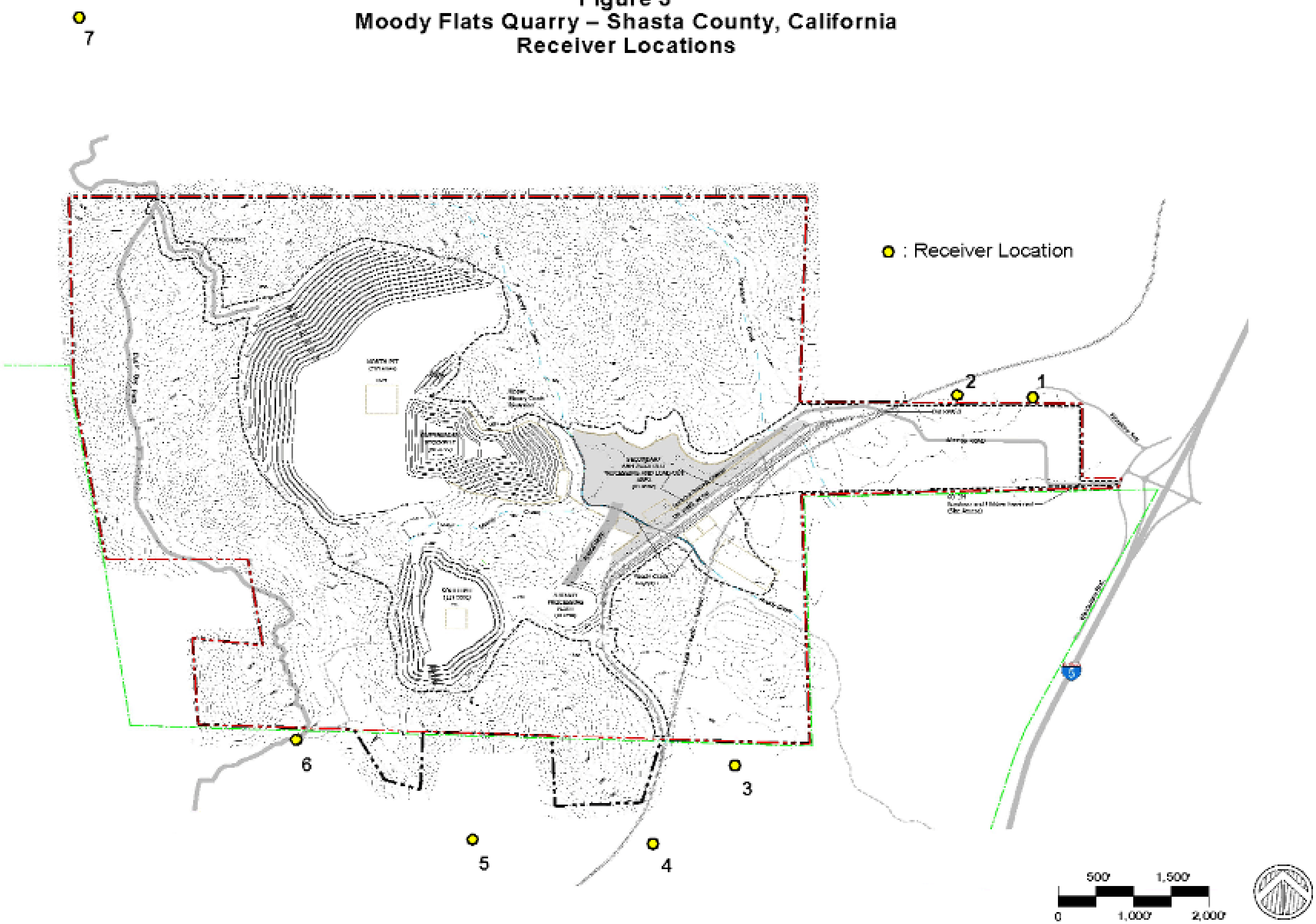
The existing ambient noise environment in the immediate project vicinity is defined by local railroad activity, distant traffic, and natural sounds (wind, birds, insects, etc.). To quantify the existing ambient noise environment in the project area at representative residential receivers near the project site, continuous ambient noise level measurements were conducted at the 5 locations shown on Figure 3 on October 28-29, 2009. The relationship of the ambient noise measurement locations to the modeled representative receptors are provided in Table 1.

Table 1
Description of Ambient Noise Measurement Locations
Moody Flats Quarry – Shasta County, California

Measurement Site	Represented Receiver(s)	Location (GPS)		Measurement Dates
		Latitude	Longitude	
1	R1, R2	40˚ 42' 33.40" N	122˚ 21' 2.90" W	October 28-29, 2009
2	R3	40˚ 41' 44.63" N	122˚ 21' 26.85" W	October 28-29, 2009
3	R4, R5	40˚ 41' 31.54" N	122˚ 22' 2.59" W	October 28-29, 2009
4	R6	40˚ 41' 45.61" N	122˚ 22' 56.37" W	October 28-29, 2009
5	R7	40˚ 42' 59.68" N	122˚ 23' 15.70" W	October 28-29, 2009

Larson Davis Laboratories (LDL) Model 820 precision integrating sound level meters were used to complete the ambient noise level measurement surveys. The meters were calibrated before and after use with an LDL Model CAL200 acoustical calibrator to ensure the accuracy of the measurements. The equipment used meets all pertinent specifications of the American National Standards Institute for Type 1 (Precision) sound measurement equipment (ANSI S1.4).

Figure 3
Moody Flats Quarry – Shasta County, California
Receiver Locations



Numerical summaries of the ambient noise level measurements are provided in Table 2. The Table 2 data include average noise levels recorded for both daytime and nighttime hours (L_{max}, L_{eq}, L_{50}, L_{90}). Appendices B & C show complete tabular and graphical representations of the results, respectively.

Table 2
Summary of Ambient Noise Level Measurements
Moody Flats Quarry – Shasta County, California

Measurement Site	Average Measured Noise Level, dB (Range)				
	L_{dn}	L_{max} (Range)	L_{eq} (Range)	L_{50} (Range)	L_{90} (Range)
Daytime (7 a.m.-10 p.m.)					
1	64	72 (48-91)	63 (37-70)	40 (33-46)	37 (31-43)
2	47	58 (50-65)	42 (37-46)	39 (35-42)	36 (33-40)
3	44	57 (42-80)	43 (31-52)	31 (28-37)	28 (25-30)
4	41	59 (53-74)	41 (31-50)	32 (27-38)	28 (24-35)
5	64	68 (41-83)	55 (26-61)	37 (23-58)	29 (21-53)
Nighttime (10 p.m.-7 a.m.)					
1	64	60 (50-86)	55 (39-63)	39 (38-43)	35 (34-38)
2	47	52 (45-63)	40 (36-46)	37 (35-38)	33 (31-36)
3	44	42 (33-62)	35 (24-43)	25 (23-31)	23 (21-27)
4	41	49 (38-53)	31 (26-33)	29 (25-33)	26 (23-31)
5	64	64 (40-81)	58 (25-64)	40 (24-59)	28 (22-53)

Notes:
1. See Figure 3 for ambient noise measurement locations.
2. Ldn Values shown represent 24-hour weighted averages, so the levels shown for both daytime and nighttime periods are similar but not intended to imply that Ldn is computed separately for daytime and nighttime periods.
3. Source: Bollard Acoustical Consultants, Inc.

The Table 2 data indicate that baseline ambient noise levels present during the ambient noise measurement period were fairly low at Sites 2-4, and elevated at Sites 1 and 5. At Site 1, the elevated average (Leq) and maximum (Lmax) noise readings were due to the passage of several trains near the monitoring station. At Site 5, the elevated measured average (Leq) and maximum (Lmax) noise levels are believed to have been affected both by nearby traffic on Digger Bay Road and unidentified sources near the microphone (inspection of Appendix C-5 indicates unusual noise activity between the hours of 1 am and 8 am at Site 5). At Sites 2-4, the remote location of the monitors at positions somewhat removed from significant sources of noise led to the lower ambient conditions.

After removal of the anomalous data collected at Site 5, and inspection of the Appendix C data, daytime average ambient noise levels can generally be characterized as ranging from 40 to 50 dB Leq in the absence of railroad noise, and nighttime average ambient noise levels can generally be characterized as ranging from 30-40 dB Leq in the absence of railroad noise. These ranges are approximate, but provide a reasonable representation of existing ambient conditions in the immediate vicinity of the project site.

Existing Traffic Noise Environment

To describe existing noise levels due to traffic, the Federal Highway Administration Highway Traffic Noise Prediction Model (FHWA RD-77-108) was used. The Model is based on the Calveno reference noise factors for automobiles, medium trucks, and heavy trucks – with consideration given to vehicle volume, speed, roadway configuration, distance to the receiver, and the acoustical characteristics of the area. The Model was developed to predict hourly L_{eq} values for free-flowing traffic conditions. The day/night distribution of traffic is factored into the Model calculations to assess noise exposure in terms of L_{dn}.

Traffic volumes and percentages of truck usage for existing conditions were obtained from Caltrans traffic volumes and truck traffic. Table 3 shows the predicted existing traffic noise levels in terms of L_{dn} at a reference distance of 100 feet from the centerlines of the primary project-area roadways. This is considered to be the baseline condition. A listing of the FHWA Model input data for existing conditions is provided in Appendix D.

Table 3
Summary of Existing (2007) Traffic Noise Exposure for Local Area Roadways
Moody Flats Quarry – Shasta County, California

Roadway	Segment	L_{dn}, dB @ 100 Feet	60 dB L_{dn} Contour, Feet
Interstate 5	North of Old Oregon Trail	76	1103
Interstate 5	Old Oregon Trail to State Route 151	76	1131
Interstate 5	State Route 151 to State Route 273	75	1061
Interstate 5	State Route 273 to State Route 299	77	1261
Interstate 5	State Route 299 to State Route 44	77	1360
Interstate 5	South of State Route 44	79	1720
State Route 151	West of Interstate 5	66	271
State Route 273	South of Interstate 5	66	265
State Route 299	East of Interstate 5	70	472
State Route 44	East of Interstate 5	74	814

Sources: Caltrans Traffic Volumes (AADT) and Bollard Acoustical Consultants, Inc.

The extent by which the existing ambient noise environment at existing noise-sensitive land uses located in the general project area are affected by existing traffic noise depends primarily on their proximity to the roadways shown in Table 3 and the degree of roadway shielding provided by intervening topography. As such, the Table 3 data is not intended to represent the actual noise exposure of each resident located near the Table 3 roadways. Rather, it is provided to establish general baseline noise levels at unshielded locations normalized to a distance of 100 feet from the roadway centerline for subsequent comparison of similar traffic noise levels for project conditions.

Existing Railroad Noise Environment

To assess the existing and projected future railroad noise environment at the project site, a combination of noise level measurements, existing railroad noise level data for this area, and accepted railroad noise-prediction algorithms were utilized. Based on a combination of historical data and normalized reference noise level data collected at noise measurement Sites 1 and 3 (See Figure 3), the mean Sound Exposure Level (SEL) for trains passing the project area was assessed to be approximately 100 dB SEL at a distance of 100 feet from the railroad tracks, with a maximum noise level of approximately 95 dB Lmax at that 100 foot reference distance. Based upon previous discussions with the UPRR officials and BAC file data, operations on this line consist of approximately 15 trains per day, randomly distributed throughout the day and nighttime hours.

To relate railroad noise level and operational information to Day/Night Average noise levels (L_{dn}), the following formula is used:

$$L_{dn} = \overline{SEL} + 10 \log N_{eq} - 49.4, \text{ dB, where:}$$

$\overline{SEL}$ is the mean SEL of the event, N_{eq} is the sum of the number of daytime events (7 a.m. - 10 p.m.) per day plus 10 times the number of nighttime events (10 p.m. - 7 a.m.) per day, and 49.4 is 10 times the logarithm of the number of seconds per day.

The results of this analysis indicate that existing L_{dn} value at an unshielded location 100 feet from the tracks computes to 69 dB L_{dn}. As noted previously, the computed L_{max} at that 100 foot distance would be approximately 95 dB during the loudest portion of the train passage.

Railroad noise exposure at existing residences in the project vicinity depends on the proximity of those residences to the railroad tracks and the degree of natural shielding provided by intervening topography between the residence and railroad tracks. It should be noted that, although the ambient noise environment in the immediate vicinity of the railroad tracks increases substantially approximately 15 times per day for a period of 1-2 minutes during each train passage (depending on train length and speed), the remainder of the time ambient conditions near the railroad tracks were measured to be considerably lower.

Baseline Vibration Environment

The existing ambient vibration environment in the immediate project vicinity is extremely low, as would be expected in a rural area with no appreciable sources of local vibration other than very near the railroad tracks during brief train passages. To quantify the existing ambient vibration environment in the immediate project vicinity, short-term vibration measurements were conducted at the 5 locations shown on Figure 3 using a Larson Davis Laboratories Model HVM vibration meter and a PCB Piezotronics Model 356B08 vibration transducer. Because there were no identified sources of existing vibration present during the vibration monitoring, measured vibration levels were well below the threshold of perception as expected. Specifically, peak particle velocities representing the sum of all peak vibration levels along the x, y and z axes, were measured to range from 0.005 to 0.013 inches per second.

CRITERIA FOR ACCEPTABLE NOISE AND VIBRATION EXPOSURE

In California, cities and counties are required to adopt a noise element as part of their general plan. Cities and counties can also adopt noise control requirements within their zoning ordinances or as a separate noise ordinance. The project site is located in Shasta County, which has a Noise Element. Applicable noise-level criteria for Shasta County are discussed below.

Shasta County General Plan Noise Element

For residential uses affected by transportation noise sources (i.e., off-site traffic), the County's Noise Element identifies 60 dB L_{dn} as an acceptable noise exposure limit. This is consistent with the State of California standard recommended for transportation noise sources.

For residential uses affected by non-transportation (stationary or operational) noise sources (i.e., on-site aggregate extraction and processing), the Shasta County General Plan establishes performance standards as presented in Table 4. For this project, the evaluation period is considered to be the worst-case hours during which on-site equipment would be operating, including maximum truck traffic operations. Each of the noise level standards specified in Table 4 shall be reduced by five dBA for simple tone noises, noises consisting primarily of speech or music, or for recurring impulsive noises. The County can impose noise level standards which are more restrictive than the Table 4 standards based upon determination of existing low ambient noise levels. In addition, in rural areas where large lots exist, the exterior noise level standard shall be applied at a point 100' away from the residence.

Table 4
Noise Level Performance Standards For New Projects Affected By Or Including Non-Transportation Sources

Noise Level Descriptor	Noise Level, dB	
	Daytime (7 a.m.-10 p.m.)	Nighttime (10 p.m.-7 a.m.)
Hourly Leq, dB	55	50

Source: Shasta County Noise Element

Noise Level Increase Criteria

CEQA guidelines require assessment of a project's noise impacts relative to both established local noise standards and existing noise conditions without the project. The local noise standards of Shasta County were described in the previous section. This section pertains to criteria for assessing the significance of project-related increases in existing ambient noise conditions.

While CEQA requires that noise impacts be assessed relative to ambient noise levels which are present without the project, it should be noted that audibility is not a test of significance according to CEQA. If this were the case, any project which added any audible amount of noise to the environment would be considered unacceptable according to CEQA. Because every physical process creates noise, whether by the addition of a single vehicle on a roadway, or an additional tractor in an agricultural field, the use of audibility alone as a significance criterion would be unworkable. CEQA therefore requires a substantial increase in noise levels before identification of noise impacts, not simply an audible change.

While the CEQA guidelines do not provide numerical thresholds for use in determining the significance of project-related noise level increases, it is generally recognized that an increase of at least 3 dB for similar noise sources is usually required before most people will perceive a change in noise levels, and an increase of 6 dB is required before the change will be clearly noticeable (*Egan, Architectural Acoustics, McGraw Hill*). Where the new source of noise differs from existing noise levels, a perceptible change may be observed with lower increases in ambient noise levels due to the new source having different frequency characteristics than existing ambient conditions.

The Federal Interagency Commission on Noise (FICON) has developed a graduated scale for guidance in the identification of the significance of project-related noise level increases. Table 5 was developed by FICON as a means of developing thresholds for impact identification for project-related noise level increases. The rationale for the graduated scale is that test subject=s reactions to increases in noise levels varied depending on the starting level of the noise. Specifically, with lower ambient noise environments, such as those below 60 dB L_{dn}, a larger increase in noise levels was required to achieve a negative reaction than was necessary in more elevated noise environments.

Table 5
Significance of Changes in Cumulative Noise Exposure

Ambient Noise Level (No Project), dB L_{dn}	Increase Required for Finding of Significance, dB
<60	+5 or more
60-65	+3 or more
>65	+1.5 or more

Source: Federal Interagency Committee on Noise (FICON)

Based on the FICON research, a 5 dB increase in noise levels due to a project is required for a finding of significant noise impact where ambient noise levels without the project are less than 60 dB L_{dn}. Where pre-project ambient conditions are between 60 and 65 dB L_{dn}, a 3 dB increase is applied as the standard of significance. Finally, in areas already exposed to higher noise levels – specifically pre-project noise levels in excess of 65 dB L_{dn} – a 1.5 dB increase is considered by FICON as the threshold of significance.

Noise Exposure Criteria Used for Impact Assessment in this Study

For this analysis, it is assumed that a project-related noise impact would occur if noise level increases from on-site project-related activities would exceed the Shasta County Noise criteria presented in Table 4, or if project-generated noise levels would generally cause noise level increases in excess of the FICON thresholds shown above in Table 5.

Vibration Criteria

Human and structural response to different vibration levels is influenced by a number of factors, including ground type, distance between source and receptor, duration, and the number of perceived vibration events. Table 6 indicates that the threshold for damage to structures ranges from 2 to 6 in/sec peak particle velocity (ppv). One-half this minimum threshold, or 1 in/sec ppv is considered a criterion that would protect against significant architectural or structural damage. The general threshold at which human annoyance could occur is noted as one tenth of that level, or 0.1 in/sec ppv.

Table 6
General Human and Structural Responses to Vibration Levels

Effects on Structures and People	Peak Vibration Threshold (in./sec. ppv)
Structural damage to commercial structures	6
Structural damage to residential structures	2
Architectural damage to structures (cracking, etc.)	1
General threshold of human annoyance	0.1
General threshold of human perception	0.01

Sources: Survey of Earth-borne Vibrations due to Highway Construction and Highway Traffic, Caltrans, 1976

NOISE GENERATION OF THE PROPOSED PROJECT

Project-Related Noise Sources

The most significant noise-producing components of this project consist of the following sources and/or activities:

- Asphalt batch plant and related equipment operation.
- Concrete ready-mix plant and related equipment operation.
- Main aggregate processing plant (crushing, screening, washing) and related equipment operation.
- Recycle plant and related equipment.
- Aggregate material excavation and pre-processing (jaw crushing), and related equipment operation.
- Truck and rail load-out facilities and related equipment operation.

Locations of Major On-Site Project Noise Sources

Figure 4 shows the overall site plan and locations of various noise-producing components of the project. As noted by this figure, project noise generation will not be concentrated in any single area of the project site, as excavation, pre-processing, processing, and load-out (both by truck and rail), will all occur at different locations on the site. As a result, the subsequent analysis of project noise generation and the effects of that noise on the nearest noise-sensitive receptors accounted for the distinct noise generation each area.

Proposed Hours of Operation

Under certain conditions, such as during emergencies or projects which specifically require materials during nighttime hours, operations may occur at any time during the day or night. As a result, this application does not propose any restrictions on operating hours.

Reference Noise Levels for On-Site Noise Sources

Table 7 shows the reference noise levels corresponding to the operation of the proposed equipment that would be used at the Project site based on extensive aggregate industry noise level data collected by BAC in recent years for similar equipment. Table 7 also shows the approximate distances to the 55 and 50 dB L_{eq} noise contours for each on-site noise source without correction for shielding by intervening topography which exists between most of the proposed project area noise sources and residences. As a result, the contour distances should be considered worst-case.

Table 7
Reference Noise Level Data and Predicted Noise Contours
Moody Flats Quarry – Shasta County, California

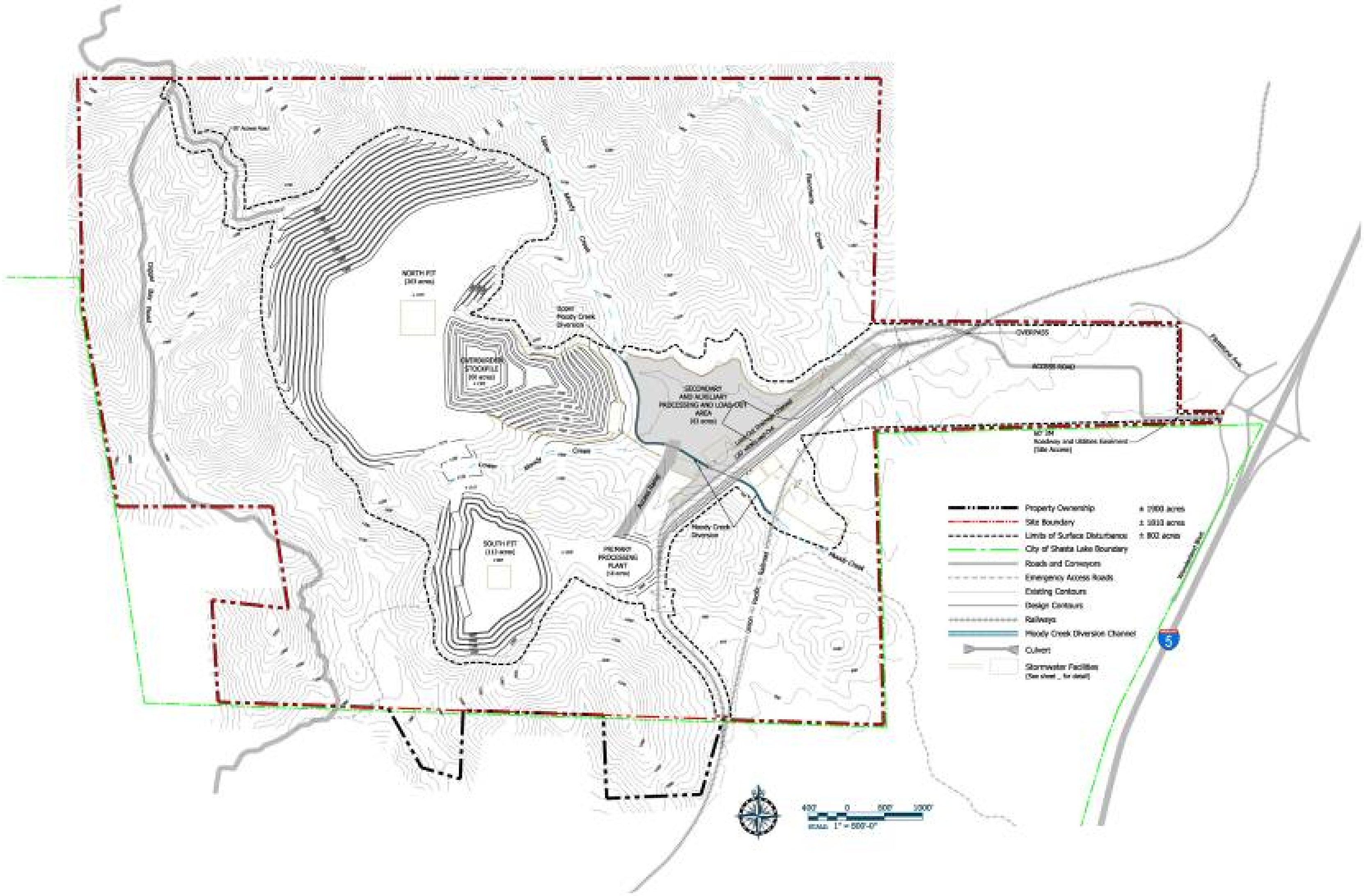
Noise Source	Reference Noise Level at 100 Feet[1] L_{eq}, dB	Distance to Unmitigated / Unshielded Noise Contours, Feet[2] 55 dB L_{eq} (Day)	50 dB L_{eq} (Night)
Excavation	80	1,400	2,200
Jaw Crushing	85	2,200	3,200
Processing (Rock) Plant	85	2,200	3,200
Hot-Mix Asphalt Plant	80	1,400	2,200
Ready-Mix Concrete Plant	75	850	1,400
Recycle Plant	78	1,150	1,800
Rail Car Loading	80	1,400	2,200
Load-Out (Rock Plant)	70	500	850

[1]Average noise levels represent any 1-hour period and assume continuous operation of the noise sources.

[2]The locations of the noise contours were computed from the reference levels assuming standard spherical spreading loss (-6 dB per doubling of distance) and a 1.5 dB reduction per 1,000 feet for atmospheric absorption and ground attenuation.

The distances to noise contours shown in this table DO NOT include corrections for shielding of these noise sources by existing topography. A discussion of such shielding is provided later in this analysis.

Figure 4
Moody Flats Quarry – Shasta County, California
Project Site Plan



Distances from Nearest Residences to On-Site Project Noise Sources

Figures 3 and 4 were used to scale the source-to-receiver distances needed to project the reference noise levels shown in Table 7 to the nearest residences. Table 8 summarizes the approximate distances from each receiver to the various noise-generating project components identified in Table 7.

Table 8
Summary of Approximate Distances from On-Site Noise Sources to Nearest Receptors
Moody Flats Quarry – Shasta County, California

Receiver	Source to Receiver Distance, Feet			
	Excavation	Jaw Crushing	Plant Operations	Rail Operations
1	9,300	7,600	5,900	4,900
2	8,400	6,600	4,800	3,900
3	4,500	3,600	4,100	4,000
4	4,200	3,800	5,000	5,200
5	2,900	3,800	5,500	6,200
6	1,900	4,200	6,000	6,900
7	5,500	11,000	11,000	11,700

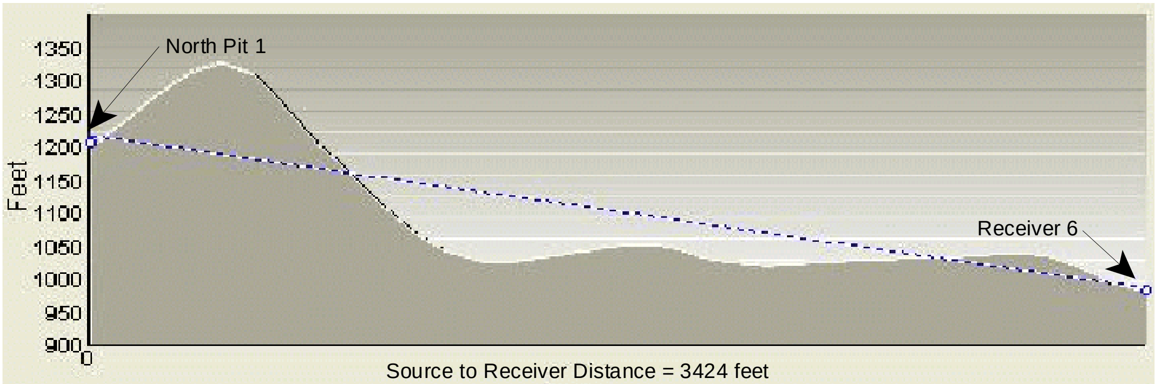
Notes:

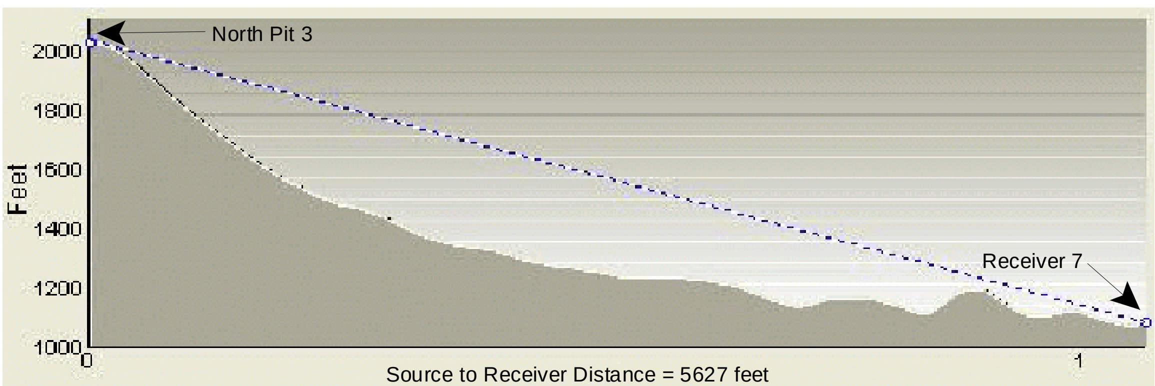
- The distances to the nearest noise-sensitive uses were obtained from USGS mapping and the locations of project noise sources and identified representative sensitive receptors shown on Figures 3 -4.
- Plant Operations includes the processing plant, asphalt plant, ready-mix plant, and recycle plant
- Rail Operations includes rail car loading and rail engine idle
- The closest excavation locations were assumed to be at the mining border closest to the affected receiver.

Evaluation of Topographic Shielding Between On-Site Noise Sources and Nearest Residences

As noted previously, there is considerable topographic relief within the project site and surrounding areas. At locations where existing topography would intercept line of sight between project noise sources and nearby residences, a perceptible decrease in project noise levels would result. The extent of the decrease depends on the degree of intervening shielding. To visually depict the extent by which intervening topography would provide shielding of project noise sources at nearby residences, the Terrain Navigator computer program was utilized. That program produces line of sight drawings between sources and receptors using USGS topographic maps, and allows for increasing the height above ground of both the noise source and receptor, which was performed for this analysis as appropriate for each source type. Figures 5(a) through 5(c) show representative Terrain Navigator cross-sections for this project.

Figure 5A
Moody Flats Quarry – Shasta County, California
Line of Sight from Noise Sources to Receivers





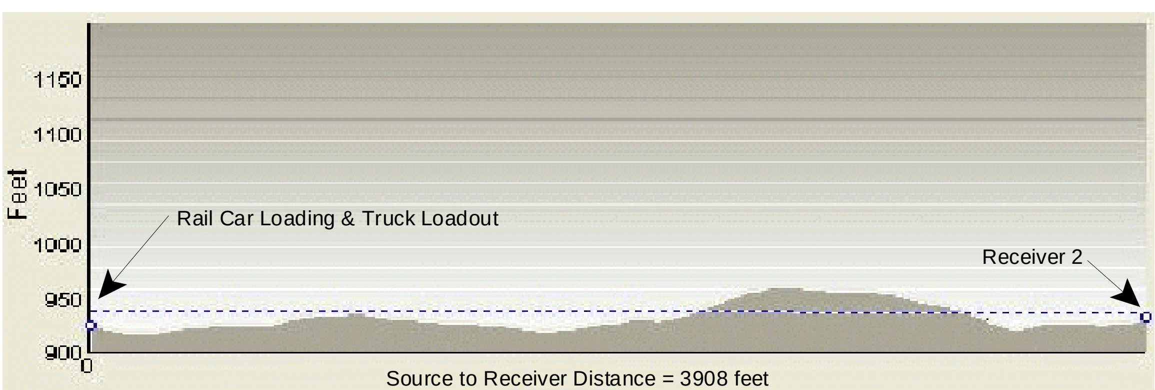
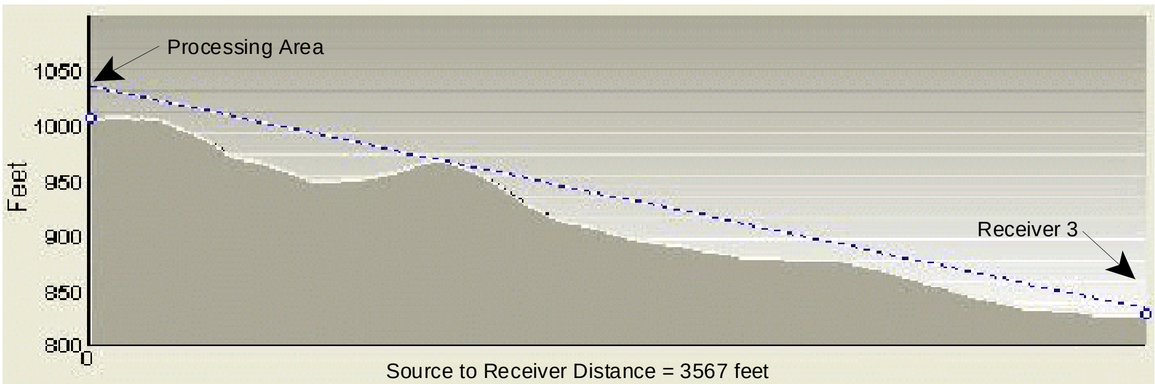
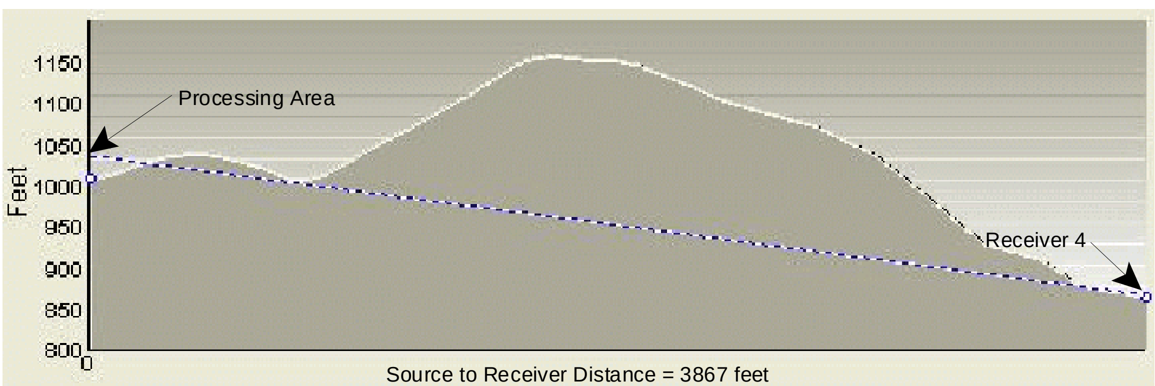


Figure 5B
Moody Flats Quarry – Shasta County, California
Line of Sight from Noise Sources to Receivers





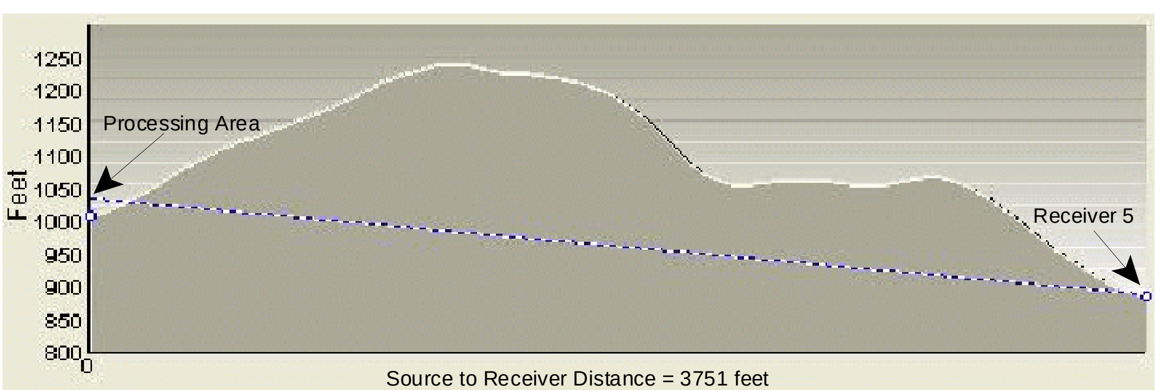
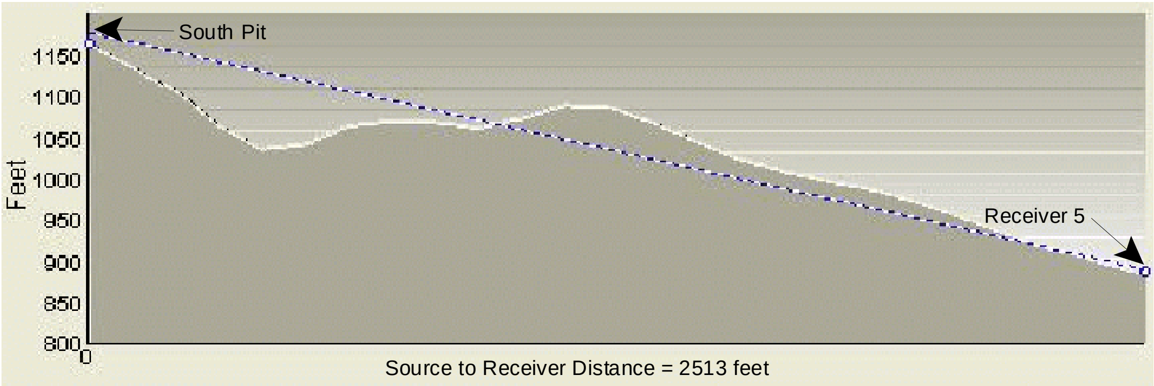
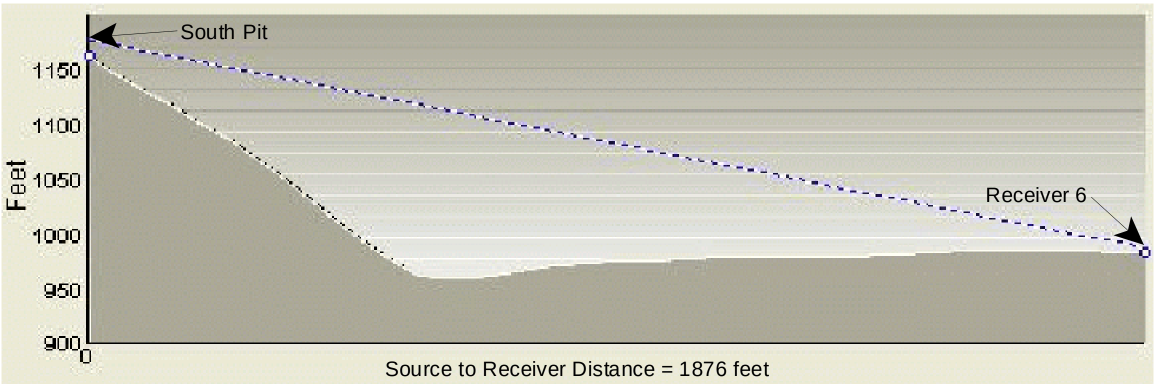


Figure 5C
Moody Flats Quarry – Shasta County, California
Line of Sight from Noise Sources to Receivers





Prediction of Noise from On-Site Project Noise Sources at Nearest Residences

To project project-generated noise levels at each of the representative receptor locations surrounding the project site, the SoundPlan model was utilized. SoundPlan is a three-dimensional noise prediction model capable of accounting for variations in noise sources, receiver locations, intervening ground topography, ground absorption, intervening structures, vegetation, and atmospheric conditions.

Table 9 summarizes the SoundPlan predicted noise exposure from on-site noise sources at the nearest identified noise-sensitive receivers, including the effects of intervening topography. Table 9 also compares the predicted noise levels against the daytime and nighttime average noise level standards of Shasta County (Table 4). The shaded cells of Table 9 indicate levels which could exceed the County noise standards. The Table 9 data indicate that the Shasta County noise standards are predicted to be satisfied for the majority of noise sources and nearby residences. However, Table 9 indicates that noise generated during initial excavation activities could exceed the County's nighttime noise standard at residences represented by Receptor 6.

As noted previously, CEQA guidelines (Appendix G), require that noise impacts of a project be evaluated against ambient conditions without the project as well as relative to locally adopted noise standards. In response to this CEQA requirement, Table 10 was developed to compare project noise levels against existing ambient conditions without the project. As discussed previously in this report, existing average ambient conditions in the absence of railroad noise generally ranged from 40 to 50 dB Leq at the nearest residences during daytime hours, and from 30 to 40 dB Leq during nighttime hours (with the exception of Site 1, where generally higher average and median noise levels were measured). Based on these ambient conditions, median daytime and nighttime ambient conditions were assumed to be approximately 45 dB Leq and 35 dB Leq, respectively at sites 2-4. At Site 1, daytime and nighttime ambient conditions were assumed to be approximately 5 dB higher, or 50 dB Leq during daytime hours and 40 dB Leq during nighttime hours. Based on these relatively low ambient levels, the FICON guidelines provided in Table 5 indicate that significant project-related noise impacts could be expected where project-generated noise levels exceed existing ambient conditions by 5 dB. Applying this 5 dB threshold to the median daytime and nighttime Leq values of 35 and 45 dB Leq yields noise impact thresholds of 40 and 50 dB Leq for nighttime and daytime conditions, respectively, at Receptors 3-7. At receptors 1-2, which are more heavily influenced by noise from Interstate 5, daytime and nighttime average noise level standards of 55 dB Leq and 45 dB Leq, respectively, are applied to this project. The shaded cells of Table 10 indicate levels which could exceed those adjusted noise standards.

The Table 10 data indicate that the project standards of significance developed relative to ambient conditions are predicted to be satisfied for the majority of noise sources and nearby residences. However, noise generated by primary processing (jaw crushing), excavation, and combined sources may exceed existing ambient conditions by 5 dB or more at the locations indentified by highlighted cells in Table 10. A discussion of noise mitigation options follows for all sources identified in Tables 9 and 10 as potentially exceeding the project standards of significance.

Figure 6 illustrates the approximate locations of the cumulative project noise contours with all sources of noise operating concurrently.

Noise Generated During Blasting

Blasting would reportedly periodically occur at the project site. To minimize the potential for adverse reaction of the nearest sensitive land uses during blasting activities, the following measures are proposed by the project applicants.

1. All shots will occur during daytime hours.

2. The nearest residents will be notified at least 24-hours in advance of days when blasting would occur.

3. The quarry blasting contractor will be required to design the shots (number, depth, charge amounts, detonation sequencing, etc.), so as to minimize noise levels in the community.

Project Vibration

With the exception of vibration generated by blasting events, the project is not expected to produce any discernible levels of vibration at sensitive receivers (residences) in the project vicinity. This is due to the type of equipment which will be used at the site, substantial intervening topography and relatively large distances between the project operations and potential receivers. As such, the potential impact associated with project-generated vibration during normal (not blasting) operations is expected to be less than significant.

With respect to blast induced vibration, the type, sizes, number, depth and timing delay sequence of the charges, as well as the geology of the surrounding area, will all be variables which will affect the transmission of that vibration from the site. BAC data collected at the San Rafael Rock Quarry of a blast in August of 2000 was used to generally estimate the magnitude of vibration which can be expected off site. That blast consisted of 7,000 lbs of ANFO distributed in 17 holes each timed to detonate in a sequence, rather than all together. The measured Peak Particle Velocity of that shot at a distance of 1,400 feet was 0.05 inches per second. Given the assumption that vibration energy is radiating away from the blast site proportional to inverse square law, the level of vibration energy present at 1,900 feet from the mining area (1,900 feet is the distance from the proposed excavation area to the nearest residence), would be less than it would be at 1,400 feet. The resulting PPV then at the nearest identified sensitive areas is, therefore, estimated to be below 0.05 inches per second peak particle velocity. This level is below the 0.01 in/sec PPV vibration threshold for annoyance, and well below thresholds required for damage to structures. As a result, vibration generated during periodic blasting operations is predicted to be less than significant at the nearest residences.

It should be noted that, during periodic blasting events, the quarry blasting contractor will be required to design the shots (number, depth, charge amounts, detonation sequencing, etc.), so as to generate vibration levels below thresholds which would be expected to result in severe annoyance or damage to structures.

Table 9

Summary of Predicted Noise Levels from On-Site Noise Sources and Assessment of Impacts Relative to Shasta County Standards

Moody Flats Quarry – Shasta County, California

Receiver	Noise Exposure – Hourly L_{eq}, dB										
	Excavation	Jaw Crushing	Processing Plant	Asphalt Plant	Ready-Mix Plant	Recycle Plant	Rail Car Loading	Rail Engine Idle	Cumulative	County Daytime Standard	County Nighttime Standard
1	29	24	29	27	18	23	31	22	36	55	50
2	30	23	28	25	17	22	29	21	35	55	50
3	34	44	39	34	28	32	40	27	47	55	50
4	29	25	31	27	19	23	27	24	36	55	50
5	41	25	27	23	15	20	17	10	41	55	50
6	53	25	31	28	20	24	26	18	53	55	50
7	37	11	13	9	2	6	7	0	37	55	50

Notes:

- Average (Hourly L_{eq}) noise levels represent any 1-hour period and assume continuous operation of each noise source.
- The predicted noise levels were calculated using the reference noise level data in Table 7 with the SoundPlan Noise Prediction Model.
- Highlighted values indicated levels in excess of the applicable County noise criteria.
- Excavation levels assume a direct line of sight between source(s) and receiver. Once excavation equipment progresses deeper into the mining pit, excavation-related noise levels will be significantly reduced.

Table 10
Summary of Predicted Noise Levels from On-Site Noise Sources and Assessment of Impacts Relative to Ambient Conditions
Moody Flats Quarry – Shasta County, California

Receiver	Noise Exposure – Hourly L_{eq}, dB										
	Excavation	Jaw Crushing	Processing Plant	Asphalt Plant	Ready-Mix Plant	Recycle Plant	Rail Car Loading	Rail Engine Idle	Cumulative	Daytime Standard Based on Ambient	Nighttime Standard Based on Ambient
1	29	24	29	27	18	23	31	22	36	55	45
2	30	23	28	25	17	22	29	21	35	55	45
3	34	44	39	34	28	32	40	27	47	50	40
4	29	25	31	27	19	23	27	24	36	50	40
5	41	25	27	23	15	20	17	10	41	50	40
6	53	25	31	28	20	24	26	18	53	50	40
7	37	11	13	9	2	6	7	0	37	50	40

Notes:

- Average (Hourly L_{eq}) noise levels represent any 1-hour period and assume continuous operation of each noise source.
- The predicted noise levels were calculated using the reference noise level data in Table 7 with the SoundPlan Noise Prediction Model.
- Highlighted values indicated levels in excess of 5 dB over typical daytime and nighttime average ambient noise levels.
- Excavation levels assume a direct line of sight between source(s) and receiver. Once excavation equipment progresses deeper into the mining pit, excavation-related noise levels will be significantly reduced.

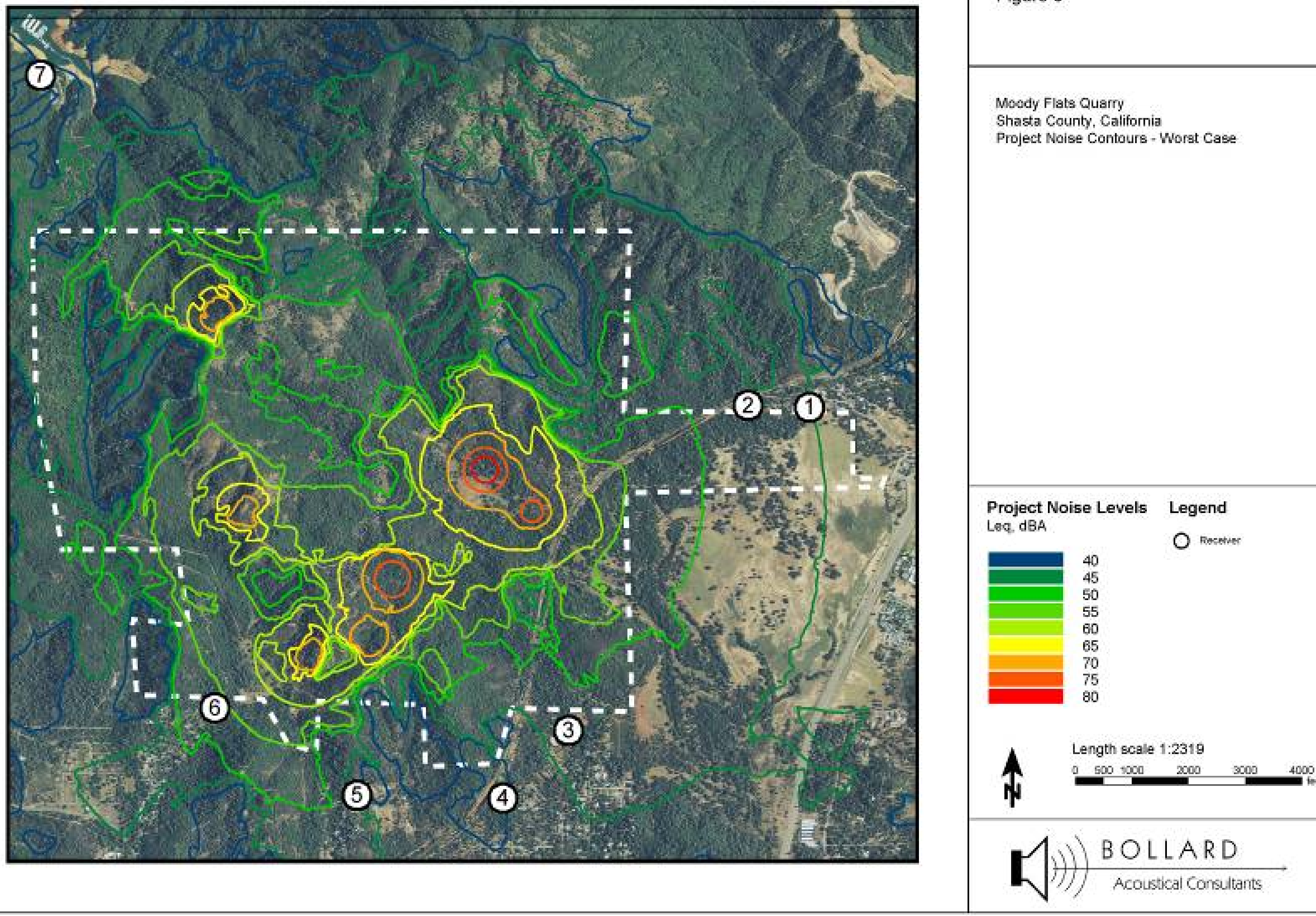


Figure 6

Moody Flats Quarry
Shasta County, California
Project Noise Contours - Worst Case

Off-Site Traffic Noise Increases

To quantitatively assess traffic noise levels associated with the Project, the Federal Highway Administration Highway Traffic Noise Prediction Model (FHWA RD-77-108) was used. The Model is based on the Calveno reference noise factors for automobiles, medium trucks, and heavy trucks, with consideration given to vehicle volume, speed, roadway configuration, distance to the receiver, and the acoustical characteristics of the site.

Traffic volumes for existing (2009) and future (2030) conditions without the Project were provided by the Fresno COG. The Project's proposed truck usage on the area roadways was provided by the project applicant, taking into account the planned yearly material production. Table 11 shows the predicted existing plus project (interim) and future plus project (build-out) traffic noise levels in terms of L_{dn} at a reference distance of 100 feet from the centerlines of existing project-area roadways. Table 11 also shows the change in traffic noise levels, in parentheses, due to the addition of project trucks. The extent by which existing land uses located along the roadways listed below are affected by existing traffic noise depends on their proximity to the roads and their individual sensitivity to noise. A listing of the FHWA Model input data is provided in Appendix D.

Table 11
Summary of Traffic Noise Exposure Calculations
Moody Flats Quarry – Shasta County, California

Roadway	Segment	L_{dn}, dB @100 Feet (Δ re: No Project)
Interstate 5	North of Old Oregon Trail	76 (0)
Interstate 5	Old Oregon Trail to State Route 151	76 (0)
Interstate 5	State Route 151 to State Route 273	75 (+1)
Interstate 5	State Route 273 to State Route 299	77 (0)
Interstate 5	State Route 299 to State Route 44	77 (0)
Interstate 5	South of State Route 44	79 (0)
State Route 151	West of Interstate 5	66 (+1)
State Route 273	South of Interstate 5	66 (+1)
State Route 299	East of Interstate 5	70 (0)
State Route 44	East of Interstate 5	74 (0)

Sources: Caltrans Traffic Volumes (AADT), Moody Flats Quarry Project Description and Bollard Acoustical Consultants, Inc.

Noise Impacts Associated with On-Site Traffic

To quantitatively assess traffic noise levels associated with heavy truck movements on the project site, BAC utilized single-event noise level data for individual aggregate truck passby's collected at various aggregate facilities in recent years. Assuming that 20% of the project's typical daily heavy truck trip generation of 110 trips per day occurred during a typical busy hour, approximately 22 heavy truck trips would occur during that hour. Given a heavy truck single event sound exposure level of 80 dB SEL at a reference distance of 100 feet, the hourly average noise level at that reference distance would be approximately 57 dB Leq. The shortest distance from the proposed on-site truck route to the existing residences located on Flintstone Avenue is approximately 400 feet. At that distance, onsite truck traffic noise is predicted to be approximately 45 dB Leq, including a -3 dB correction for shielding by dense intervening vegetation. Because the predicted average hourly noise level of 45 dB Leq does not exceed the 45 dB Leq nighttime noise threshold for receptors located along Flintstone Avenue, no impact is identified for this aspect of the project.

SUMMARY OF POTENTIAL PROJECT IMPACTS

As noted in the previous sections, impacts associated with off-site traffic, blasting, or project-generated vibration are predicted to be less than significant at existing residences in the immediate project vicinity. However, noise from some on-site activities, or combination of activities, could exceed the project standards of significance at some existing residences. Tables 9 and 10 provide comparisons of calculated project noise exposure from on-site sources to the applicable noise criteria at each of the closest identified noise-sensitive receivers for both daytime and nighttime operations. Because the noise standards developed relative to ambient conditions are more restrictive than the County's noise standards, more significant impacts were identified relative to project-related increases in ambient noise levels than relative to compliance with the County's thresholds (Table 4). As a result, Table 10 provides the most conservative assessment of project noise impacts, and indicates that noise impacts from on-site sources may result in the following cases:

Impact #	Explanation
1.	Cumulative noise from all on-site sources may exceed the 40 dB nighttime standard at Receptors 3, 5 and 6.
2.	Cumulative noise from all on-site sources may exceed the 50 dB daytime standard at Receptor 6.
3.	Noise from pre-processing (Jaw Crushing) is responsible for the potential cumulative exceedance of the nighttime 40 dB standard at Receptor 3.

4. Noise from initial excavation may exceed the 40 dB nighttime standard at Receptor 5. This source is also responsible for the potential cumulative exceedance of the 40 dB nighttime standard at Receptor 5.

5. Noise from initial excavation may exceed the 40 dB nighttime and 50 dB daytime standards at Receptor 6. This source is also responsible for the potential cumulative exceedance of the daytime and nighttime standards at Receptor 6.

NOISE MITIGATION OPTIONS

The impacts described above result from relatively minor exceedances of the project standards of significance at all residences except #6. Due to the conservative assumptions regarding the level of noise reduction which will be provided by topographic shielding, it is possible that the minor exceedances identified at Receptors 2-5 may never occur. At receptor 6, however, which would not benefit from topographic shielding of initial excavation-generated noise, it is likely that those initial excavation activities would result in significant increases in ambient noise levels until such time as the excavation equipment recesses as sufficient depth in the pit to introduce such shielding. Noise mitigation options are provided below to reduce potential noise impacts of the project to less than significant levels.

Because the degree of noise reduction required of each source to fully mitigate noise impacts at the affected receivers varies by location, the evaluation of mitigation measures is geared towards the most impacted receiver(s). The following source-specific noise mitigation measures are intended to not only reduce noise to a level below the applicable significance criteria for each receiver while the source is operating individually, but to also reduce noise impacts when noise from several sources is combined. As a result, although a given source may only require 5 dB of noise reduction to achieve the applicable criterion, when added to other sources, additional noise reduction may be required to maintain noise levels below those same thresholds.

In general, there are three primary avenues for noise mitigation: (1) treatment of the noise source; (2) treatment of the sensitive receiver; or (3) treatment of the path in between. Treatment of the noise source involves reducing the sound output of the various project components. Treatment of the receiver involves providing additional acoustical insulation of the affected residential structures (e.g., improved windows and doors, appropriate weather-stripping, other building facade upgrades, etc.). Treatment of the sound transmission path involves either increasing the length of the path through the creation of additional setbacks between the noise source and receiver, or constructing a physical barrier which intercepts line of sight between the noise source and receiver. The following section provides specific mitigation recommendations for the various aspects of the project identified as either individually, or collectively contributing to a significant noise impact at an existing residence.

Main Processing Plant Noise Mitigation

Although noise generated by main processing plant equipment is not individually predicted to exceed the project standards of significance at any existing residences in the project vicinity, when combined with other project noise sources it could contribute to an exceedance of the nighttime 40 dB Leq standard at Receptors 2 and 3. This degree of exceedance is very small, and likely within the tolerance of modeling assumptions. Nonetheless, in order to ensure satisfaction with the project standards of significance with respect to noise, the following specific measure is recommended to reduce main processing plant noise levels at the residences represented by Receptors 2 and 3.

A. Aggregate stockpiles shall be positioned so as to provide complete line-of-sight interception between the main processing plant equipment and residences represented by Receptors 2 and 3.

B. Back-up warning devices on all plant-area mobile equipment (i.e. front-loaders, dozers, etc.), should utilize radar or strobe-based warning mechanisms during nighttime hours provided such equipment complies with all regulatory requirements and can be safely utilized this facility. The noise reduction provided by this measure would reduce the potential for nuisance noise at the nearest residences.

Pre-Processing (Jaw Crushing) Noise Mitigation

As indicated in Table 8, noise generated by primary (jaw) crushing operations could individually exceed the project nighttime noise standard at Receptor 3, and could contribute to the cumulative exceedance of that standard at Receptors 4 and 5 when added to other project noise sources. The identified degree of exceedance is relatively small and potentially within the tolerance of modeling assumptions. Nonetheless, in order to ensure satisfaction with the project standards of significance with respect to noise, the following specific measure is recommended to reduce noise generated by processing area (jaw crushing) noise sources at the residences represented by Receptors 3, 4 and 5.

C. Aggregate stockpiles or earthen berms shall be positioned so as to provide complete line-of-sight interception between the jaw crusher and residences represented by Receptors 3, 4 and 5.

D. Back-up warning devices on all plant-area mobile equipment (i.e. front-loaders, dozers, etc.), should utilize radar or strobe-based warning mechanisms during nighttime hours provided such equipment complies with all regulatory requirements and can be safely utilized this facility. The noise reduction provided by this measure would reduce the potential for nuisance noise at the nearest residences.

Excavation Noise Mitigation

As shown in Table 8, initial excavation activities could result in exceedance of both daytime and nighttime noise level standards at residences represented by Receptors 5 and 6, either individually or when cumulatively combined with other project noise sources.

It is important to note that the excavation noise predictions shown in Table 8 do not account for shielding which will develop as mining depths increase. Specifically, the Table 8 predictions assume direct line of sight between the excavation noise sources and Receptor 6. As a result, the duration of time during which the exceedances identified in Table 8 would be limited. Once excavation equipment is recessed into the pit, the pit walls will provide substantial shielding of excavation equipment and noise at the nearest residences.

Shielding by pit walls will vary depending on the depth of the equipment in the pit, but would provide at least 5 dB once the pit walls intercept line of sight from noise source to receiver, and approximately 1 additional dB of noise reduction for each foot of depth thereafter. As a result, the noise impacts identified in Table 8 for Receptor 6 pertain to worst-case excavation locations and elevations, representing conditions which will be present for limited durations in each phase of excavation. Nonetheless, because such excavation operations are predicted to exceed the project significance criteria, potentially significant excavation-related noise impacts were identified for this project at residences represented by Receptors 5 and 6. The following specific measures are recommended to reduce this impact to a less than significant level:

E. Excavation activities with direct line of sight to Receptor 6 should be limited to daytime hours until that equipment has recessed a sufficient distance into the pit to lower excavation noise to a state of compliance with the project nighttime noise thresholds.

F. To the extent feasible, excavation activities which would have direct line of sight to Receptor 6 should start on the portion of the pit furthest from the that receptor to maintain the maximum degree of shielding by existing topography for the as long as possible.

Noise Mitigation for Cumulative Project Operations

As shown in Table 10, the cumulative contribution of noise from multiple sources could cause exceedance of the project standards of significance at some residences in the immediate project vicinity. The following measure is recommended to ensure that all project generated noise, whether considered individually or cumulatively, satisfied the project standards of significance:

G. The Operator will implement the above-described mitigation measures determined feasible at time of Project start-up and will perform supplemental noise monitoring to ensure that project mitigation reduces noise to levels below applicable noise standards.

Appendix A

Acoustical Terminology

Acoustics The science of sound.

Ambient Noise The distinctive acoustical characteristics of a given space consisting of all noise sources audible at that location. In many cases, the term ambient is used to describe an existing or pre-project condition such as the setting in an environmental noise study.

Attenuation The reduction of an acoustic signal.

A-Weighting A frequency-response adjustment of a sound level meter that conditions the output signal to approximate human response.

Decibel or dB Fundamental unit of sound, A Bell is defined as the logarithm of the ratio of the sound pressure squared over the reference pressure squared. A Decibel is one-tenth of a Bell.

CNEL Community Noise Equivalent Level. Defined as the 24-hour average noise level with noise occurring during evening hours (7 - 10 p.m.) weighted by a factor of three and nighttime hours weighted by a factor of 10 prior to averaging.

Frequency The measure of the rapidity of alterations of a periodic signal, expressed in cycles per second or hertz.

Ldn Day/Night Average Sound Level. Similar to CNEL but with no evening weighting.

Leq Equivalent or energy-averaged sound level.

Lmax The highest root-mean-square (RMS) sound level measured over a given period of time.

Loudness A subjective term for the sensation of the magnitude of sound.

Masking The amount (or the process) by which the threshold of audibility is for one sound is raised by the presence of another (masking) sound.

Noise Unwanted sound.

Peak Noise The level corresponding to the highest (not RMS) sound pressure measured over a given period of time. This term is often confused with the “Maximum” level, which is the highest RMS level.

RT_{60} The time it takes reverberant sound to decay by 60 dB once the source has been removed.

Sabin The unit of sound absorption. One square foot of material absorbing 100% of incident sound has an absorption of 1 sabin.

SEL A rating, in decibels, of a discrete event, such as an aircraft flyover or train passby, that compresses the total sound energy of the event into a 1-s time period.

Threshold of Hearing The lowest sound that can be perceived by the human auditory system, generally considered to be 0 dB for persons with perfect hearing.

Threshold of Pain Approximately 120 dB above the threshold of hearing.

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Appendix B-1

3M Shasta Lake Quarry
24hr Continuous Noise Monitoring at Site 1
October 28-29, 2009

Hour	Leq	Lmax	L50	L90
11:00				
12:00				
13:00				
14:00				
15:00				
16:00				
17:00	37	58	33	31
18:00	64	88	37	34
19:00	38	48	38	35
20:00	41	49	41	38
21:00	64	87	42	40
22:00	41	51	40	36
23:00	40	50	38	34
0:00	39	53	38	35
1:00	39	50	37	34
2:00	59	86	38	35
3:00	63	85	40	34
4:00	44	56	43	38
5:00	41	54	40	36
6:00	41	50	40	38
7:00	42	59	41	38
8:00	70	91	41	38
9:00	55	79	46	43
10:00	64	85	42	39

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	70.2	37.3	63.0	63.0	39.2	55.0
Lmax (Maximum)	91.1	47.9	71.5	86.3	49.6	59.5
L50 (Median)	46.3	32.8	40.0	43.0	37.5	39.4
L90 (Background)	43.2	30.9	37.3	38.0	33.6	35.3

Computed Ldn, dB	63.9*
% Daytime Energy	86%
% Nighttime Energy	14%

Anomalous data collected during 11 am to 4 pm hours not included in ambient calcs.

* Calculated using daytime average Leq of 63 and nighttime average Leq of 55

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Appendix B-2

3M Shasta Lake Quarry
24hr Continuous Noise Monitoring at Site 2
October 28-29, 2009

Hour	Leq	Lmax	L50	L90
11:00	40	54	38	35
12:00	41	57	37	34
13:00	37	62	35	33
14:00	42	65	36	33
15:00	45	62	39	35
16:00	38	50	37	35
17:00	39	58	36	34
18:00	44	63	40	37
19:00	39	56	38	36
20:00	38	51	38	35
21:00	43	59	40	37
22:00	39	54	38	35
23:00	37	47	37	34
0:00	37	45	36	33
1:00	36	48	35	32
2:00	38	58	35	31
3:00	46	63	35	32
4:00	38	50	38	34
5:00	38	48	37	34
6:00	39	52	38	35
7:00	43	54	42	38
8:00	46	64	42	39
9:00	43	59	42	40
10:00	43	59	41	39

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	46.4	36.8	42.3	45.5	36.2	39.8
Lmax (Maximum)	64.7	49.8	58.2	62.6	45.2	51.6
L50 (Median)	42.3	35.2	38.8	38.1	34.9	36.5
L90 (Background)	39.5	32.8	36.0	35.5	31.2	33.4

Computed Ldn, dB	46.7
% Daytime Energy	75%
% Nighttime Energy	25%

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Appendix B-3

3M Shasta Lake Quarry
24hr Continuous Noise Monitoring at Site 3
October 28-29, 2009

Hour	Leq	Lmax	L50	L90
13:00	35	52	31	27
14:00	52	80	37	30
15:00	42	61	31	27
16:00	32	52	29	26
17:00	35	52	33	29
18:00	42	62	30	26
19:00	31	51	29	26
20:00	32	42	31	27
21:00	42	63	28	25
22:00	27	36	26	24
23:00	26	40	24	23
0:00	24	40	23	22
1:00	24	33	23	21
2:00	33	56	23	21
3:00	43	62	27	23
4:00	26	38	25	24
5:00	26	34	26	24
6:00	32	41	31	27
7:00	32	44	31	28
8:00	49	66	32	29
9:00	34	59	31	29
10:00	41	62	32	28
11:00	36	50	35	30
12:00	39	59	30	29

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	52.0	30.9	43.3	43.4	24.3	34.9
Lmax (Maximum)	80.0	42.4	56.9	62.0	33.2	42.4
L50 (Median)	36.7	28.3	31.2	30.7	22.7	25.3
L90 (Background)	30.3	25.4	27.7	27.1	21.3	23.2

Computed Ldn, dB	44.0
% Daytime Energy	92%
% Nighttime Energy	8%

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Appendix B-4

3M Shasta Lake Quarry
24hr Continuous Noise Monitoring at Site 4
October 28-29, 2009

Hour	Leq	Lmax	L50	L90
14:00	50	74	32	28
15:00	38	57	30	26
16:00	38	60	31	24
17:00	37	61	27	24
18:00	38	59	29	27
19:00	32	56	28	27
20:00	31	59	29	27
21:00	36	60	31	30
22:00	33	53	30	29
23:00	31	46	30	25
0:00	26	45	25	23
1:00	25	38	25	23
2:00	31	53	26	23
3:00	31	51	27	24
4:00	33	51	32	30
5:00	33	50	33	31
6:00	33	53	30	27
7:00	37	58	30	28
8:00	37	56	34	31
9:00	39	60	32	29
10:00	40	60	36	33
11:00	39	54	38	35
12:00	42	60	33	28
13:00	37	53	33	29

Statistical Summary

	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	50.1	31.2	41.1	33.2	25.5	31.3
Lmax (Maximum)	74.3	52.8	59.0	52.9	38.3	48.8
L50 (Median)	37.7	26.7	31.5	32.5	24.6	28.6
L90 (Background)	34.9	23.7	28.4	30.7	22.8	26.0

Computed Ldn, dB	41.2
% Daytime Energy	94%
% Nighttime Energy	6%

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Appendix B-5

3M Shasta Lake Quarry
24hr Continuous Noise Monitoring at Site 5
October 28-29, 2009

Hour	Leq	Lmax	L50	L90
13:00	55	82	28	25
14:00	55	83	29	25
15:00	36	60	28	24
16:00	40	67	26	23
17:00	41	69	24	22
18:00	36	61	26	23
19:00	36	60	24	22
20:00	33	51	24	21
21:00	25	41	23	22
22:00	25	40	24	22
23:00	29	44	28	25
0:00	29	50	29	26
1:00	60	80	55	27
2:00	55	75	25	23
3:00	60	80	56	27
4:00	28	44	27	25
5:00	64	81	59	25
6:00	59	79	57	53
7:00	56	64	56	53
8:00	56	77	54	51
9:00	61	80	57	34
10:00	59	75	56	37
11:00	61	77	55	26
12:00	53	71	46	27

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	61.2	25.5	55.4	64.4	24.6	58.1
Lmax (Maximum)	83.1	41.1	67.8	81.3	40.4	63.7
L50 (Median)	57.5	23.1	37.0	59.4	24.2	40.0
L90 (Background)	52.7	20.9	29.0	53.3	22.4	28.2

Computed Ldn, dB	64.3
% Daytime Energy	47%
% Nighttime Energy	53%

Anomalous data collected during 1 am - 5 am hours & therefore data not used to assess ambient conditions.

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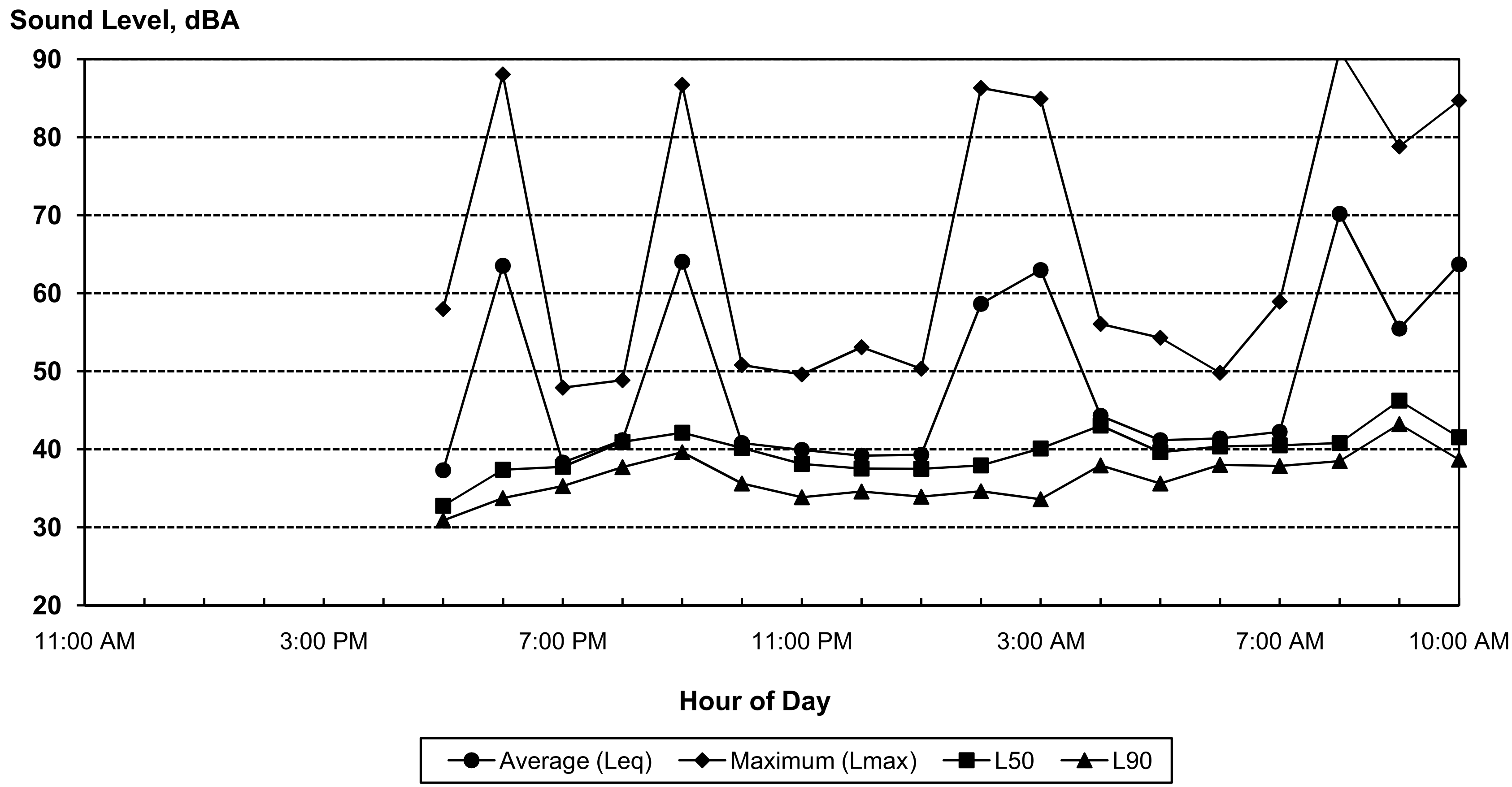
Appendix C-1
3M Shasta Lake Quarry
24hr Continuous Noise Monitoring at Site 1
October 28-29, 2009



Ldn: 63.9* dB

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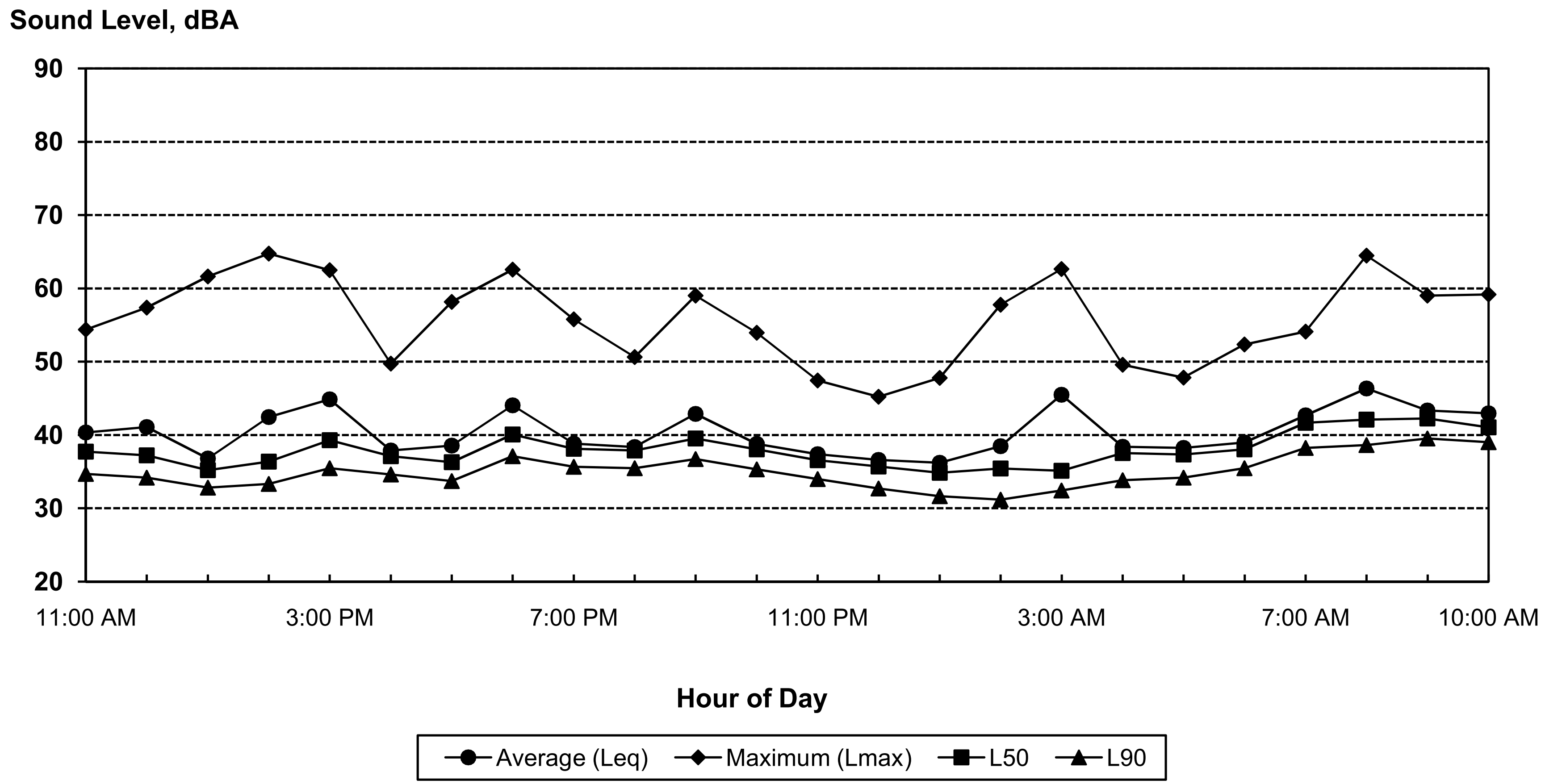
Appendix C-2
3M Shasta Lake Quarry
24hr Continuous Noise Monitoring at Site 2
October 28-29, 2009



Ldn: 47 dB

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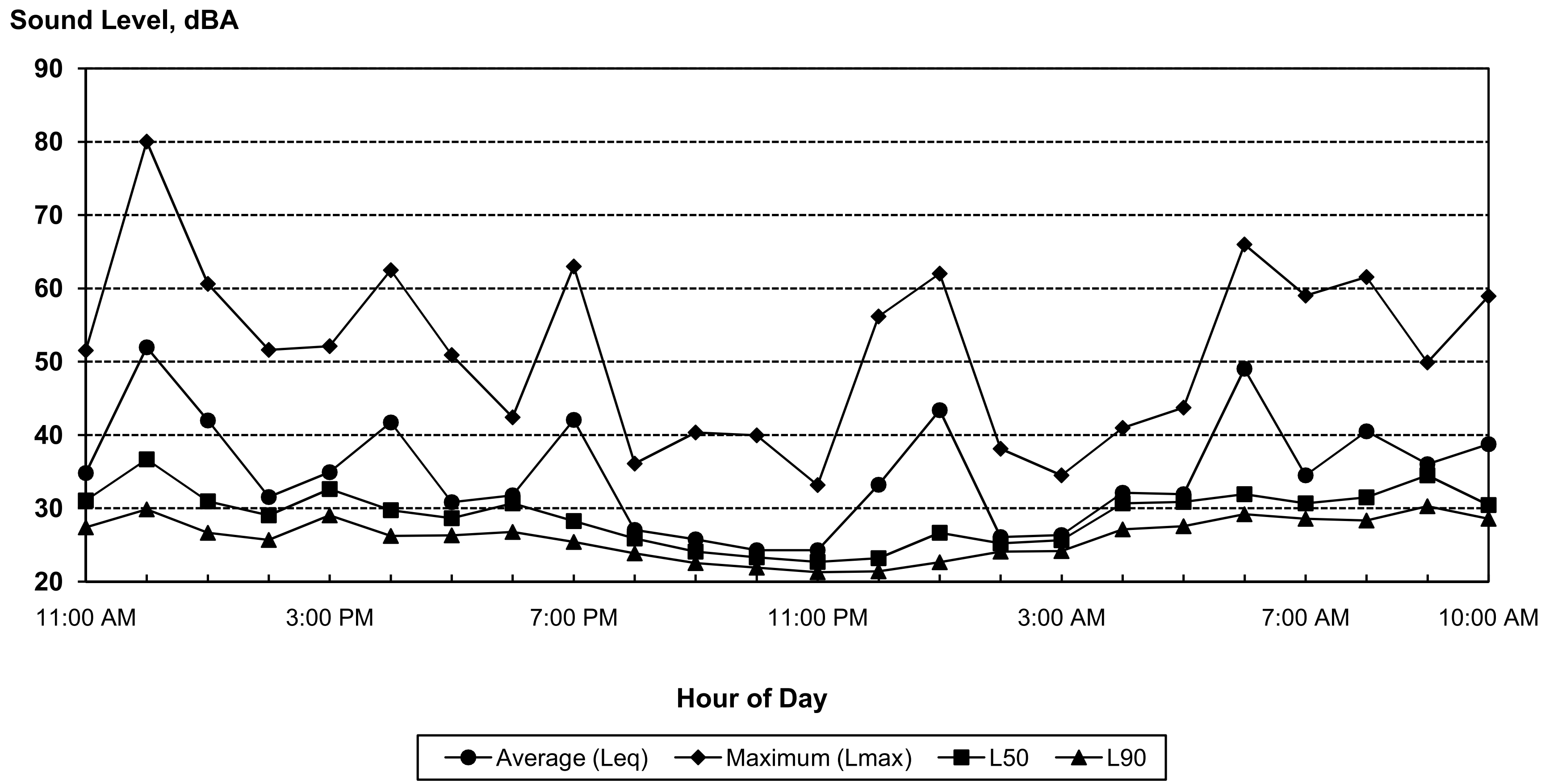
Appendix C-3
3M Shasta Lake Quarry
24hr Continuous Noise Monitoring at Site 3
October 28-29, 2009



Ldn: 44 dB

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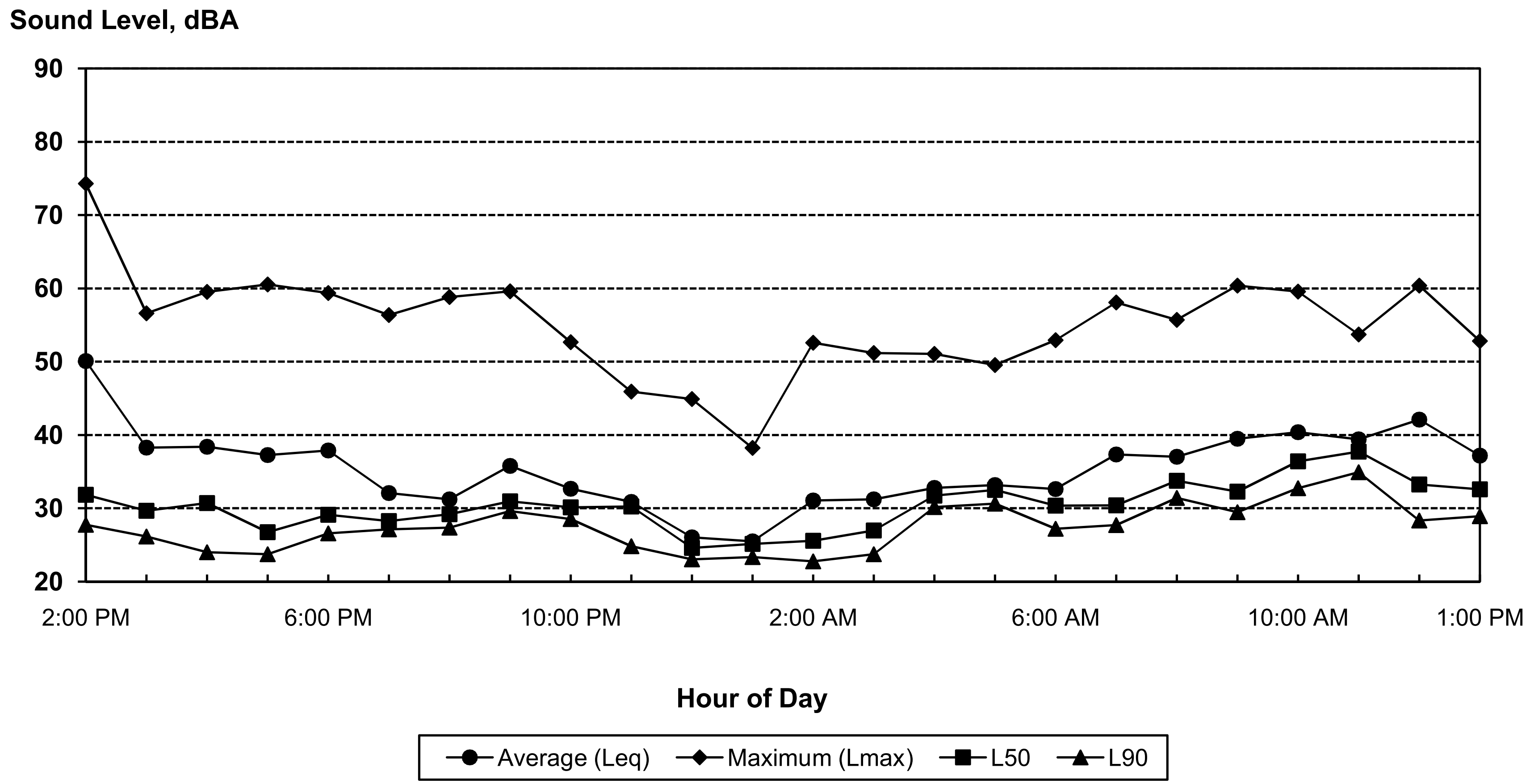
Appendix C-4
3M Shasta Lake Quarry
24hr Continuous Noise Monitoring at Site 4
October 28-29, 2009



Ldn: 41 dB

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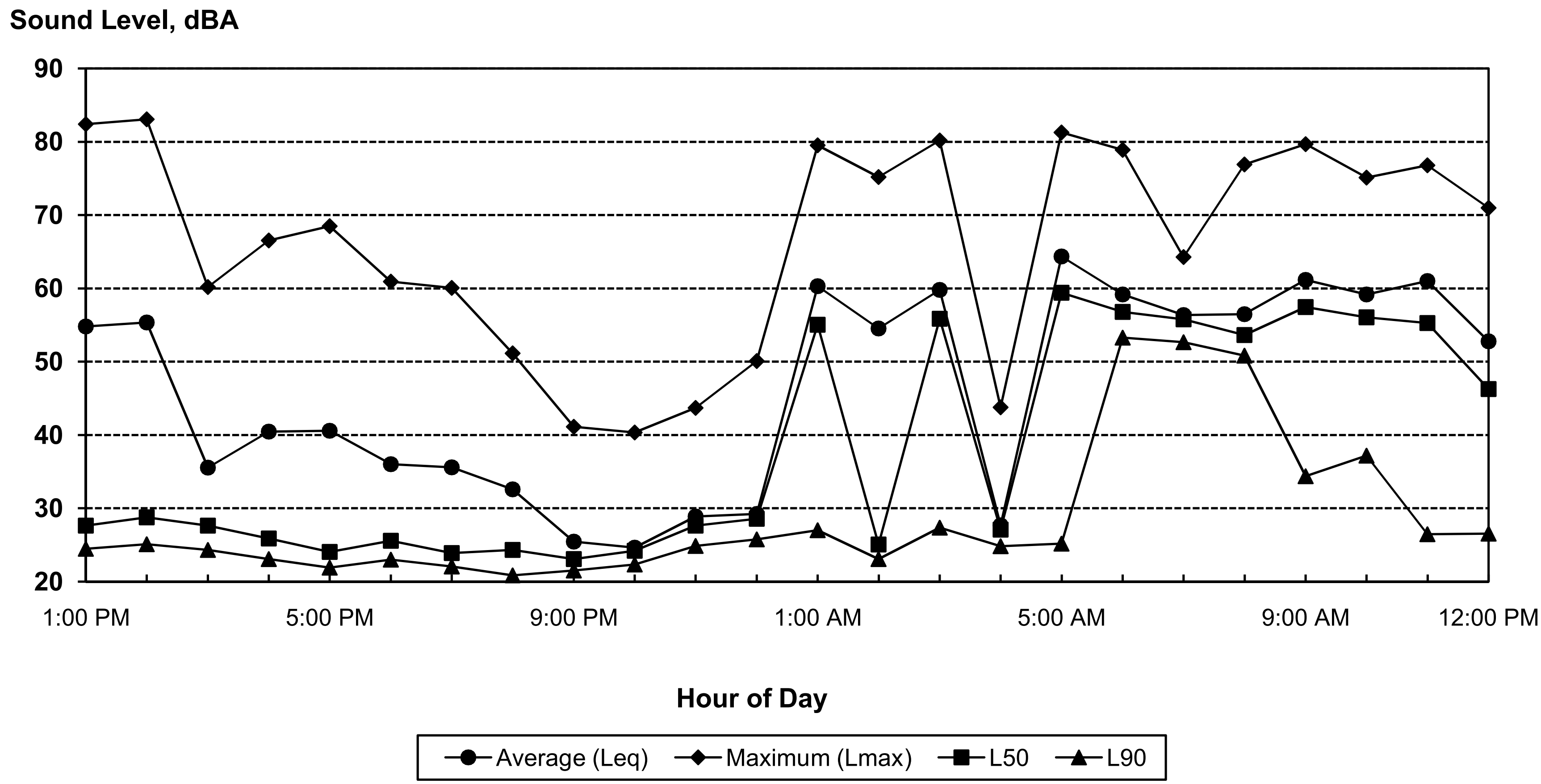
Appendix C-5
3M Shasta Lake Quarry
24hr Continuous Noise Monitoring at Site 5
October 28-29, 2009



Ldn: 64 dB

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Appendix D-1

FHWA-RD-77-108 Highway Traffic Noise Prediction Model

Data Input Sheet

Project #: 2009-067 3M Shasta Lake Quarry
Description: Existing
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)
1	Interstate 5	North of Old Oregon Trail	19,900	75		25	2	26	65	100	
2		Old Oregon Trail to SR 151	22,400	75		25	2	23	65	100	
3		SR 151 to SR 273	31,000	75		25	1	11	65	100	
4		SR 273 to SR 299	36,500	75		25	2	13	65	100	
5		SR 299 to SR 44	45,000	75		25	1	11	65	100	
6		South of SR 44	64,000	75		25	1	11	65	100	
7	State Route 151	West of Interstate 5	13,500	75		25	2	3	45	100	
8	State Route 273	South of Interstate 5	9,100	75		25	2	7	45	100	
9	State Route 299	East of Interstate 5	20,600	75		25	1	3	55	100	
10	State Route 44	East of Interstate 5	51,000	75		25	1	2	55	100	

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Appendix D-2

FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Data Input Sheet

Project #: 2009-067 3M Shasta Lake Quarry
Description: Project Only
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)
1	Interstate 5	North of Old Oregon Trail	24	80		20	0	95	60	100	
2		Old Oregon Trail to SR 151	465	80		20	0	95	60	100	
3		SR 151 to SR 273	391	80		20	0	95	60	100	
4		SR 273 to SR 299	210	80		20	0	95	60	100	
5		SR 299 to SR 44	196	80		20	0	95	60	100	
6		South of SR 44	49	80		20	0	95	60	100	
7	State Route 151	West of Interstate 5	73	80		20	0	95	45	100	
8	State Route 273	South of Interstate 5	171	80		20	0	95	45	100	
9	State Route 299	East of Interstate 5	15	80		20	0	95	55	100	
10	State Route 44	East of Interstate 5	147	80		20	0	95	55	100	
11	Project Haul Route	West of Wonderland Blvd	489	80		20	0	95	35	100	

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