Attachment I

Environmental Noise and Vibration Assessment

Environmental Noise & Vibration Assessment

Lehigh Permanente Quarry Project

Santa Clara County, California

BAC Job #2009-025

Prepared For:

Lehigh Southwest Cement Company
24001 Stevens Creek Boulevard
Cupertino, CA 95014

Prepared By:

Bollard Acoustical Consultants, Inc. (BAC)

Paul Bollard, President
INCE Board Certified

May 25, 2010

BOLLARD
Acoustical Consultants

Table of Contents

Executive Summary

An extensive analysis of potential noise and vibration impacts has been conducted for the proposed Lehigh-Permanente Project by Bollard Acoustical Consultants, Inc. (BAC), as documented in this report. The key components and conclusions of this noise and vibration analysis are as follows:

- Continuous ambient noise monitoring of 12 locations surrounding the project site for a period of 5 days at each location, including weekend periods.

- Short ambient vibration monitoring at the same 12 locations.

- Measurement of reference noise levels from each major noise-producing operation or equipment type within the project site, including the following:

    - Cement Plant
    - Rock Plant (crushers, screen decks, conveyors, hoppers, load-out, etc.)
    - Excavation Equipment (Front-loaders, rock drills, and Bulldozers – including backup warning devices)
    - Off-Road Haul Trucks (100 and 150 ton models)
    - Water Trucks
    - Blasting

- Prediction of project noise levels at 32 sensitive receptor locations surrounding the project area.

- Assessment of noise and vibration impacts at those sensitive receptors relative to locally adopted noise standards (Santa Clara County and the City of Cupertino), and relative to measured existing ambient noise levels.

- No project noise impacts were identified for any aspect of the project relative to adopted City of Cupertino or Santa Clara County noise standards.

- One (1) potentially significant noise impact was identified due to a projected increase in average levels (Leq) at one representative residential receptor location on the Monte Bello Ridge.

Introduction

The acoustical consulting firm of Bollard Acoustical Consultants, Inc. (BAC) has been retained by Lehigh Southwest Cement Company to assess potential noise and vibration impacts associated with the proposed Reclamation Plan Amendment and Conditional Use Permit Application for the Permanente Quarry (Project).

The Permanente Quarry (Quarry) is a limestone and aggregate mining operation in the unincorporated foothills of western Santa Clara County, approximately two miles west of the City of Cupertino. The Quarry occupies a portion of a 3,510-acre property owned by Hanson Permanente Cement, Inc., and is operated by Lehigh Southwest Cement Company (collectively, Lehigh).

The Quarry currently comprises approximately 537 acres of operational areas, which consist of surface mining excavations, overburden stockpiling, crushing and processing facilities, access roads, administrative offices and equipment storage. The Quarry also includes other predominantly undisturbed areas, either held in reserve for future mining or which buffer operations from adjacent land uses.

Mining operations take place subject to California's Surface Mining and Reclamation Act (SMARA). SMARA mandates that surface mining operations have an approved reclamation plan that describes how mined lands will be prepared for alternative post-mining uses, and how residual hazards will be addressed. Santa Clara County acts as lead agency under SMARA. The County approved the Quarry's current reclamation plan in March 1985, covering 330 acres.

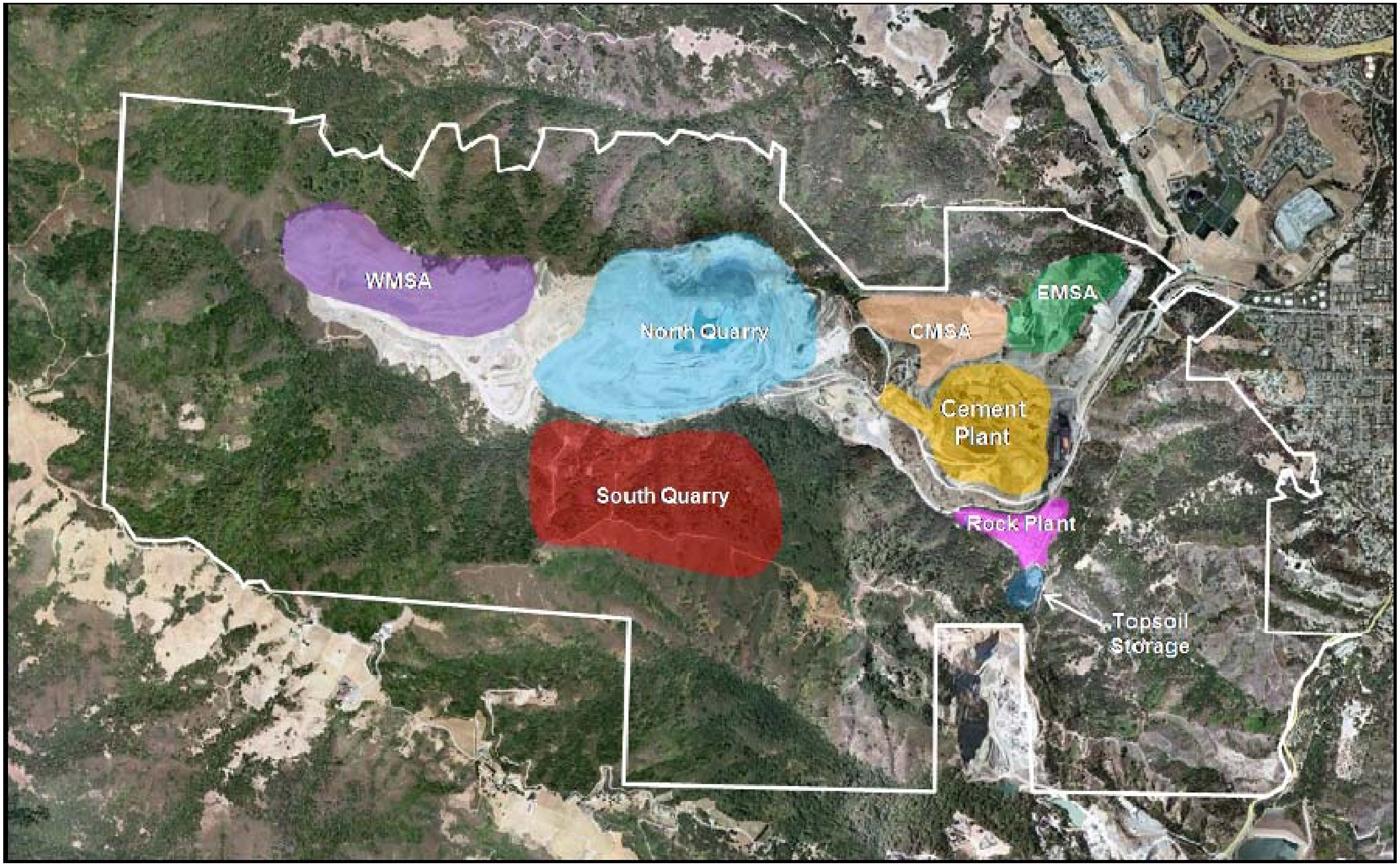
A cement manufacturing plant lies adjacent to the Quarry on the east. The cement plant also is owned and operated by Lehigh. The cement plant is a separately- permitted industrial use which is not considered part of the Quarry and is not subject to SMARA's requirements.

The project is the County's approval of an amendment to the Quarry's reclamation plan. The proposed amendment would broaden the reclamation plan, and associated reclamation requirements, to include all areas disturbed by mining activities, and lands scheduled to be disturbed by mining over approximately the next 20 years. If approved, the amendment would incorporate 1,105 acres of the 3,510-acre ownership. The proposed post-mining use for these areas is open space.

The project also is the County's approval of a Conditional Use Permit for certain future mining operations at the Quarry. The Conditional Use Permit would allow mineral extraction on approximately 117 acres of an approximately 206.5 acre area known as the South Quarry, located immediately south of existing extraction areas. Operations in the South Quarry would include mining, and material loading and hauling. Mined rock would be transported to existing facilities in other parts of the Quarry for processing. Mining in the South Quarry would occur for an estimated 20 years. The South Quarry is included in the proposed reclamation plan amendment and would be reclaimed according to the requirements therein.

The project vicinity and location of existing and proposed operations are shown by Figure 1.

Figure 1
Project Area Boundaries



Note: Locations of Lehigh operations shown in this figure are for display purposes and should be considered approximate.

Analysis Objectives

The objectives of this analysis are as follows:

- To provide background information pertaining to the effects of noise and vibration.
- To identify existing noise-sensitive land uses in the immediate project vicinity.
- To quantify existing ambient noise and vibration levels at those nearest sensitive land uses.
- To identify the significance thresholds for project-related noise and vibration impacts based on the California Environmental Quality Act (CEQA) guidelines, local Santa Clara County and City of Cupertino noise standards, and existing measured noise and vibration levels.
- To predict project-related noise and vibration levels at the nearest noise-sensitive areas.
- To identify impacts by comparison of project noise and vibration levels against the project standards of significance.
- To evaluate noise and vibration mitigation options where significant project-related impacts are identified.

Background on Noise and Vibration

Noise

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.

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 "ambient" 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.

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

Loudness Ratio Level	dBA	Example Noise Sources
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

Source: Bollard Acoustical Consultants, Inc.

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 reaction to vibration will depend on the amplitude and frequency, as well as their individual sensitivity to the phenomenon.

Vibration can be described in terms of acceleration, velocity, and 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 vibration levels associated with this project are not expected to be significant due to the relatively large distances between project equipment (sources) and acoustically sensitive receivers, an assessment of project-related vibration levels is address nonetheless.

Baseline Noise and Vibration Environments

Identification of Existing Sensitive Receivers

The project area boundaries are surrounded by a variety of uses, including residential, park (Rancho San Antonio County Park and Open Space Preserve), open space, an aggregate mining and processing operation (Stevens Creek Quarry), and a cemetery (Gates of Heaven).

BAC utilized aerial imagery and conducted site inspections to identify the nearest potentially affected sensitive receptors in the immediate and general project vicinity. A total of 32 receptor locations were selected to represent the nearest potentially affected sensitive receptors. The receptor locations were selected to be representative of ambient conditions at nearby residences, park areas, and the cemetery.

It should be noted that not every residence in the project vicinity was modeled in this analysis. Rather, some receptors were selected to be representative of groups of residences which are located in the same geographic area, or which experience similar noise exposure. The receptor locations evaluated in this analysis are shown on Figure 3.

Baseline Noise Environment

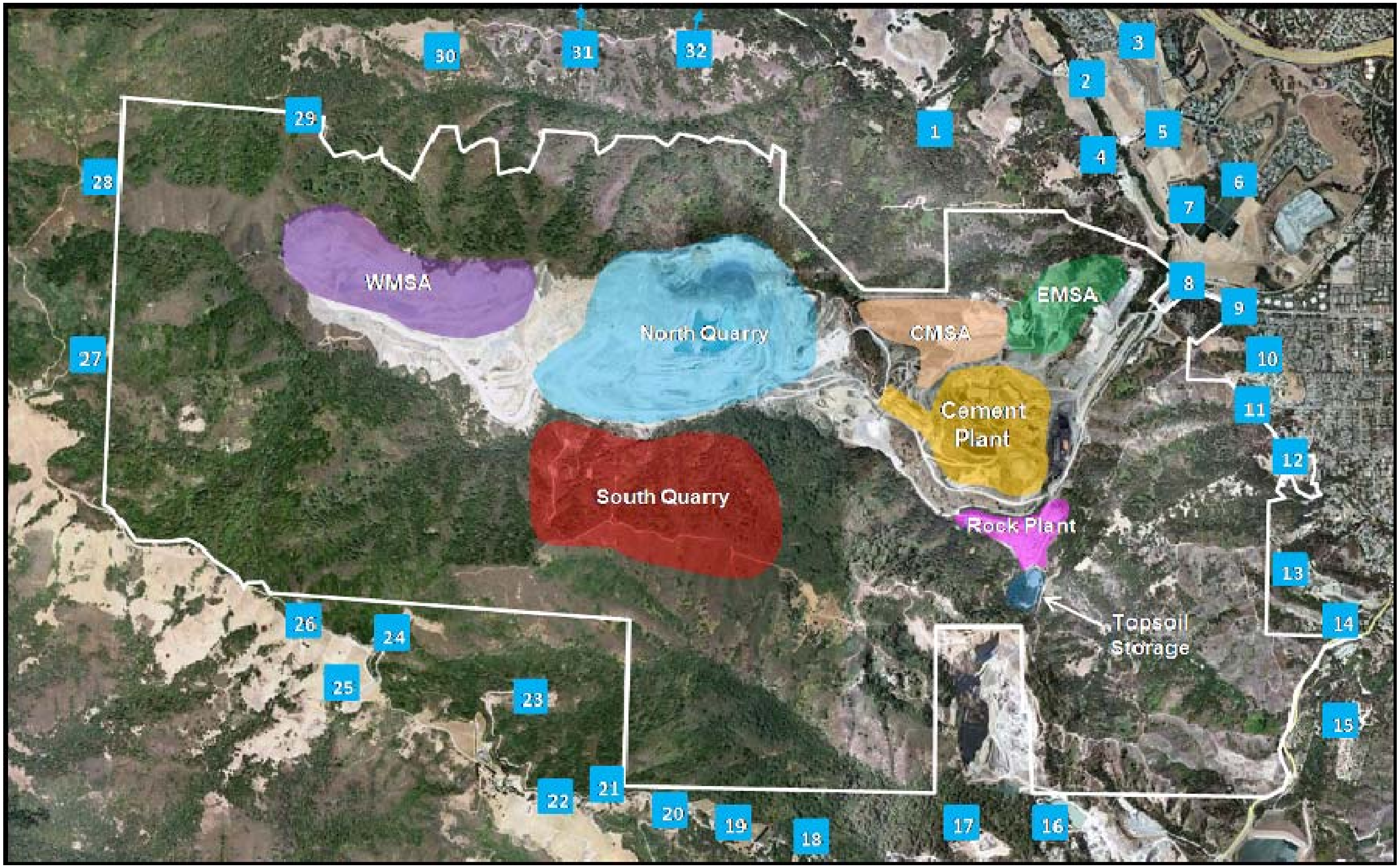
Given the size of the project study area (approximately 12 square miles), and the substantial topographic differences both within the project boundaries and at nearby receptor areas, the existing ambient noise environment in the project vicinity varies. To quantify the existing ambient noise environment in the project area at locations representative of sensitive receptor locations, continuous/long-term ambient noise level measurements were conducted at 12 locations surrounding the project site during the months of July and August, 2009. Continuous monitoring was conducted at each of the 12 locations for a period of 5 consecutive days, two of which were weekend periods.

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. Microphones were located at a height of 5 feet above ground and fitted with manufacturer's windscreens. Weather conditions present during the monitoring program were typical for the period. The equipment used meets all pertinent specifications of the American National Standards Institute for Type 1 (Precision) sound measurement equipment (ANSI S1.4).

The noise measurement locations are shown on Figure 4. Figures 5(a) and 5(b) show examples of noise monitoring locations utilized for this survey.

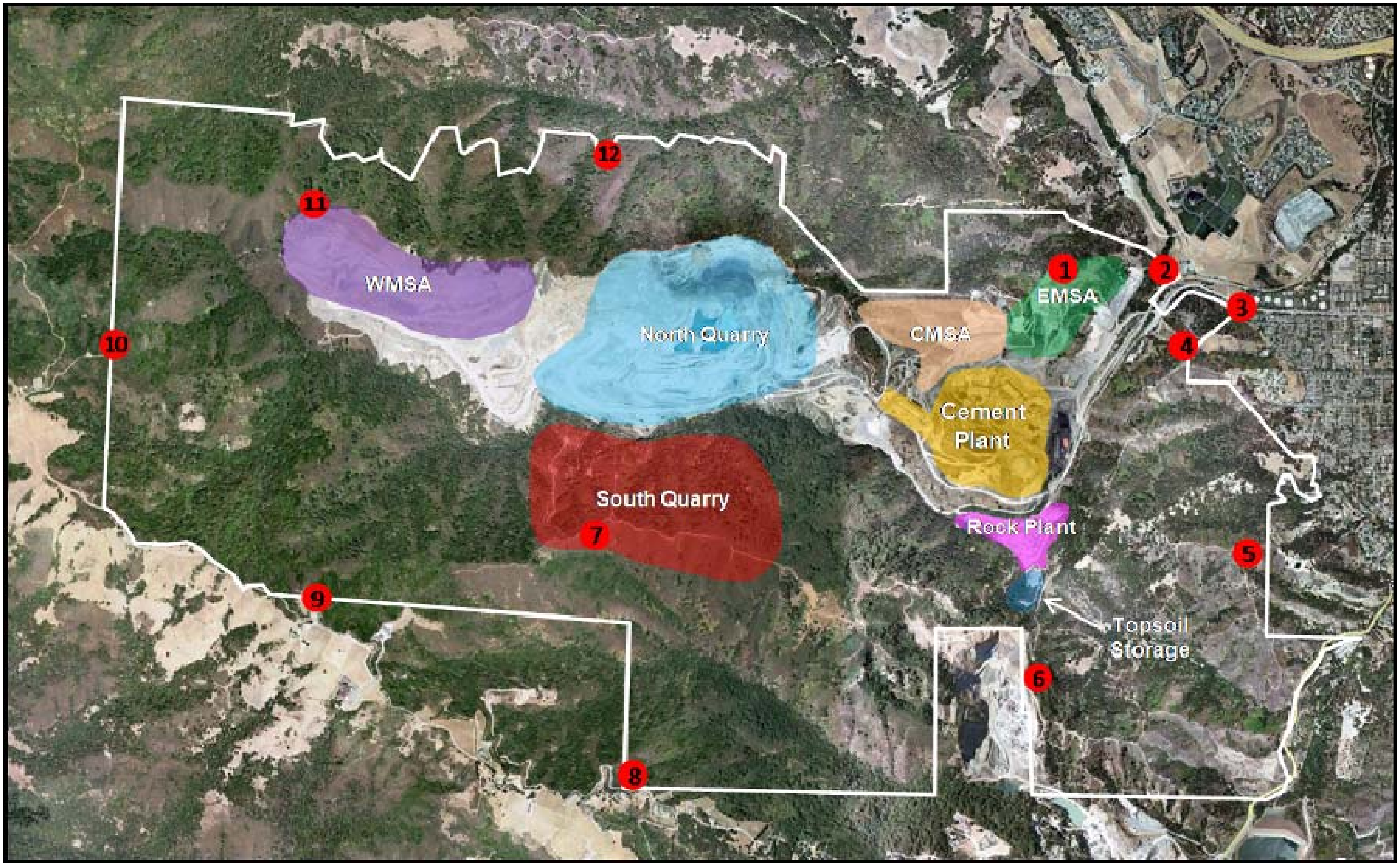
The results of the continuous noise measurement surveys are summarized in Tables 1 and 2, and presented graphically in Appendix A. Table 2 summarizes the computed day/night average level (Ldn) values for each site for both weekend and weekday periods. Table 2 summarizes measured hourly average ($Leq_{(h)}$) noise levels for both weekday and weekend periods, further broken down by daytime (7am-10pm) and nighttime (10 pm-7am) periods. Appendix A provides a graphic illustration of average noise levels at each measurement location over the course of a typical 24-hour period.

Figure 3
Project Area Noise Analysis Receptors



Note: Locations of Lehigh operations shown in this figure are for display purposes and should be considered approximate.

Figure 4
Long-Term Noise Monitoring locations



Note: Locations of Lehigh operations shown in this figure are for display purposes and should be considered approximate.

Figure 5(a)
Noise Monitoring Site Photo

Figure 5(b)
Vibration Monitoring Site Photo

Table 1
Ambient Noise Measurement Results – Day/Night Average Level (Ldn)
Lehigh Permanente Project – Santa Clara County, California

	Average Ldn[2]		
Site[1]	Weekend	Weekday	Typical Noise Sources Affecting Measured Levels[3]
1	54	55	Local & distant traffic, existing Lehigh Ops
2	52	56	Local traffic, Lehigh trucks and on-site operations.
3	55	64	Stevens Creek Boulevard traffic, Lehigh trucks
4	59	62	Local traffic, Lehigh trucks and on-site operations.
5	52	51	Distant traffic and distant quarry noise
6	50	51	Local quarry noise
7	54	56	Lehigh operations and distant traffic.
8	55	54	Local traffic primarily & distant quarry operations
9	45	47	Local traffic primarily & distant quarry operations
10	45	47	Natural sounds and distant quarry operations
11	50	51	Distant traffic and local quarry activities
12	49	48	Distant traffic and community park users.

1. Noise measurement sites are shown on Figure 5
2. Includes 2 weekend periods and 3 weekday periods. Each period represents 24 hours from midnight to midnight.
3. This information is not intended to represent a comprehensive list of all noise sources monitored.
4. Ldn values include 10 dB penalty for noise occurring during nighttime hours.

Table 2
Ambient Noise Measurement Results – Average Levels (Leq)
Lehigh Permanente Project – Santa Clara County, California

	Weekday		Weekend		Combined	
Site[1]	Day	Night	Day	Night	Day	Night
1	45	48	45	47	45	48
2	48	49	44	45	47	47
3	57	55	50	46	55	52
4	54	55	51	53	53	54
5	44	42	43	43	44	42
6	42	43	42	41	42	42
7	46	48	41	46	44	47
8	45	46	44	46	45	46
9	41	39	41	36	41	38
10	41	39	41	36	41	38
11	42	43	42	41	42	42
12	39	36	40	39	39	37

1. Noise measurement sites are shown on Figure 5
2. Includes 2 weekend periods and 3 weekday periods. Each period represents 24 hours from midnight to midnight.

Baseline Vibration Environment

The existing ambient vibration environment in the immediate project vicinity is typically very low, as would be expected in rural or suburban areas with no appreciable sources of local vibration. During blasting activities at the existing quarries, however, a very brief increase in local vibration can be expected depending on proximity to the blasting activity.

To quantify the typical existing ambient vibration environment in the immediate project vicinity, short-term ambient vibration measurements were conducted at each of the long-term noise monitoring locations shown in Figure 5. A Larson Davis Laboratories Model HVM vibration meter and a PCB Piezotronics Model 356B08 vibration transducer were used for the ambient vibration measurements. Because there were no identified sources of existing vibration in the project vicinity, measured vibration levels around the project perimeter were well below the threshold of perception. Specifically, peak particle velocities representing the sum of all peak vibration levels along the x, y and z axes, were measured to range from 0.001 inches/second to 0.021 inches/second.

Baseline Blasting Noise and Vibration Environment

On May 20, 2009, BAC conducted noise and vibration monitoring during a typical aggregate shot (blast) at the Quarry. The monitoring was conducted from a position on the north edge of the North Quarry, at a distance of approximately 1500 feet with direct line of site to the shot area. Weather conditions present during the shot were as follows: 70 degrees Fahrenheit, clear sky, 5-10mph north winds. Table 3 summarizes the noise and vibration data collected during the shot. Figure 6 illustrates the ambient noise and vibration monitoring location.

Table 3
Blast Monitoring Results
Permanente Quarry – May 20, 2009

Variable	Value
A-Weighted Maximum	67.0 dBA
Unweighted Peak Level	119.0 dB
Vmax-peak: Shot	0.1280 inches/second
Vmax-peak: Ambient	0.0018 inches/second
Distance	1,500 ft.
Holes Fired	36
Total Charge Weight	33,457 lbs.

Source: Bollard Acoustical Consultants

Figure 6 – Blast Monitoring Location

Criteria for Acceptable Noise and Vibration Exposure

California Environmental Quality Act (CEQA) Guidelines

The California Environmental Quality Act (CEQA), as applied by Santa Clara County, provides guidelines for use in assessing noise and vibration impacts associated with a project. Appendix G of the CEQA guidelines specifically state that a significant impact shall be identified if the project will result in any of the following:

- Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.
- Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels.
- A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project.
- A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.

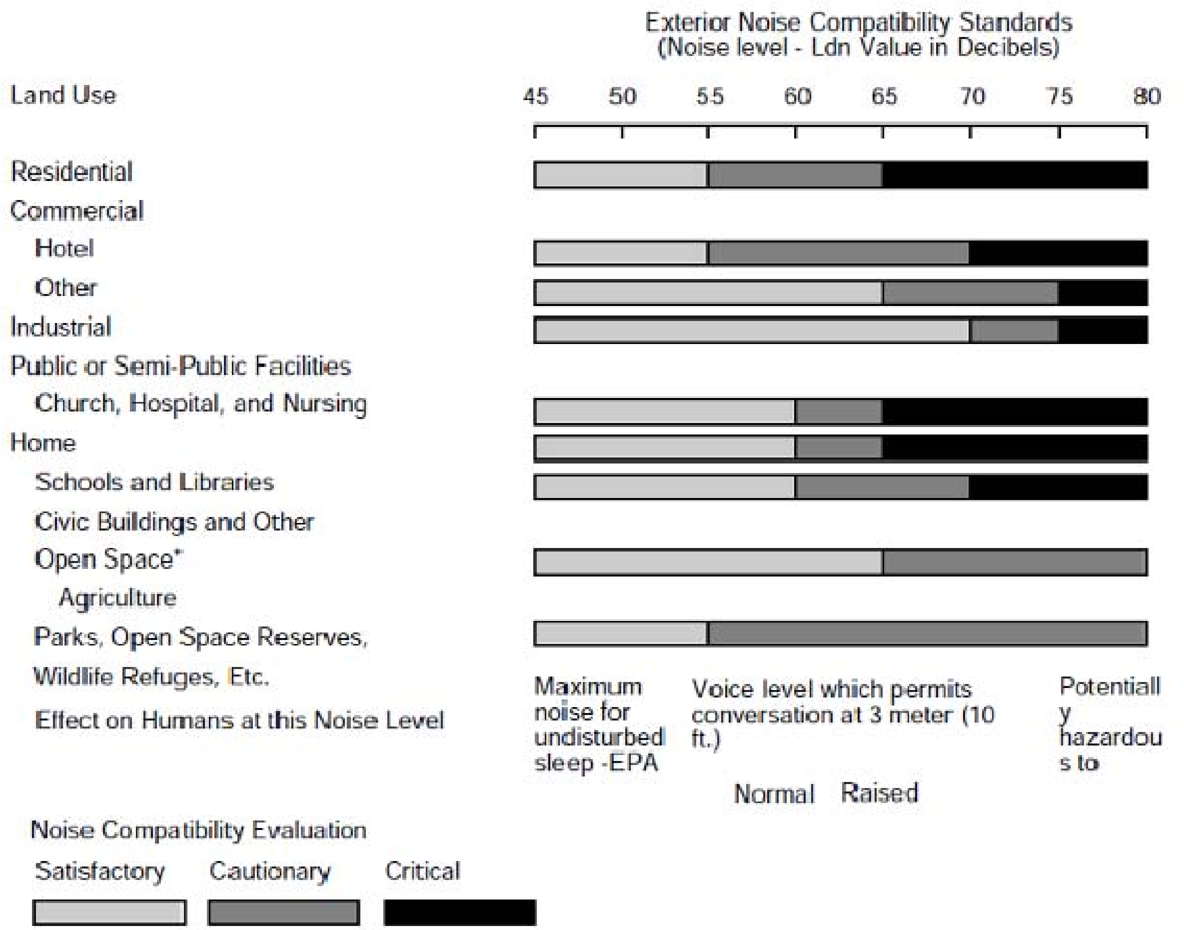
Local Noise Standards

Santa Clara County General Plan Noise Element and Ordinance Standards

The County of Santa Clara has adopted a Health and Safety Element as part of the General Plan and has adopted a noise ordinance. The guidelines contained in the Health and Safety Element of the Santa Clara County General Plan state that an exterior noise environment of 55 dB Ldn is considered satisfactory for residential uses.

For open space use, there are satisfactory and cautionary noise compatibility standards listed in the General Plan for Rural Unincorporated Areas, but no critical noise levels. Specifically, parks and open spaces are considered "satisfactory" in noise environments of 55 dB Ldn or less, and "cautionary" in exterior noise environments between 55 and 80 dB Ldn. The maximum level of noise which a new land use may impose on neighboring open space is the upper limit of the "Satisfactory Noise Level." The Santa Clara County General Plan Noise Compatibility Standards are provided in Figure 7.

Figure 7 – Santa Clara County Land Use Compatibility Chart



* For open space use, there are no critical noise levels listed. Homes in agricultural areas are not subject to the "Residential" standards. Public buildings in parks and open space areas shall meet noise standards as listed under "Public of Semi-Public facilities." For open space use, theximum level of noise which a new land use may impose on neighboring open space shall be the upper limit of the "Satisfactory Noise Level."

In addition to the County General Plan criteria, Chapter VIII, Section B11-152 of the Santa Clara County Code (Exterior Noise Limits), also establishes noise exposure limits which would be applicable to this project. Those criteria are summarized in Table 4. Please note that the criteria presented in Table 4 apply to one- and two-family residential properties. The daytime criteria would be increased by 5 dB for multi-family residential properties.

If the measured ambient noise exposure exceeds the L_{50}-L_2 criteria presented in Table 4, then the standard(s) will be increased in 5 dB increments to reflect the ambient noise level(s). Additionally, the standards will be reduced by 5 dB if the character of the intruding noise is tonal or contains significant speech or music content.

Table 4
Summary of Santa Clara County Municipal Code Noise Criteria
Applicable at One- and Two-Family Residential Properties

Duration Exceeded, Min.	Statistical Descriptor	Noise Level, dB	
		Daytime (7 a.m.-10 p.m.)	Nighttime (10 p.m.-7 a.m.)
30	L_{50}	50	45
15	L_{25}	55	50
5	L_{8}	60	55
1	L_{2}	65	60
Any	L_{max}	70	65

City of Cupertino General Plan Noise Element and Ordinance Standards

The City of Cupertino has adopted a Health and Safety Element as part of the General Plan and has adopted a noise ordinance. Policy 6-50 of the City of Cupertino General Plan states that Land Use Compatibility Chart of the City's Health and Safety Element and the City's Municipal Code shall be used in making land use decisions with respect to noise.

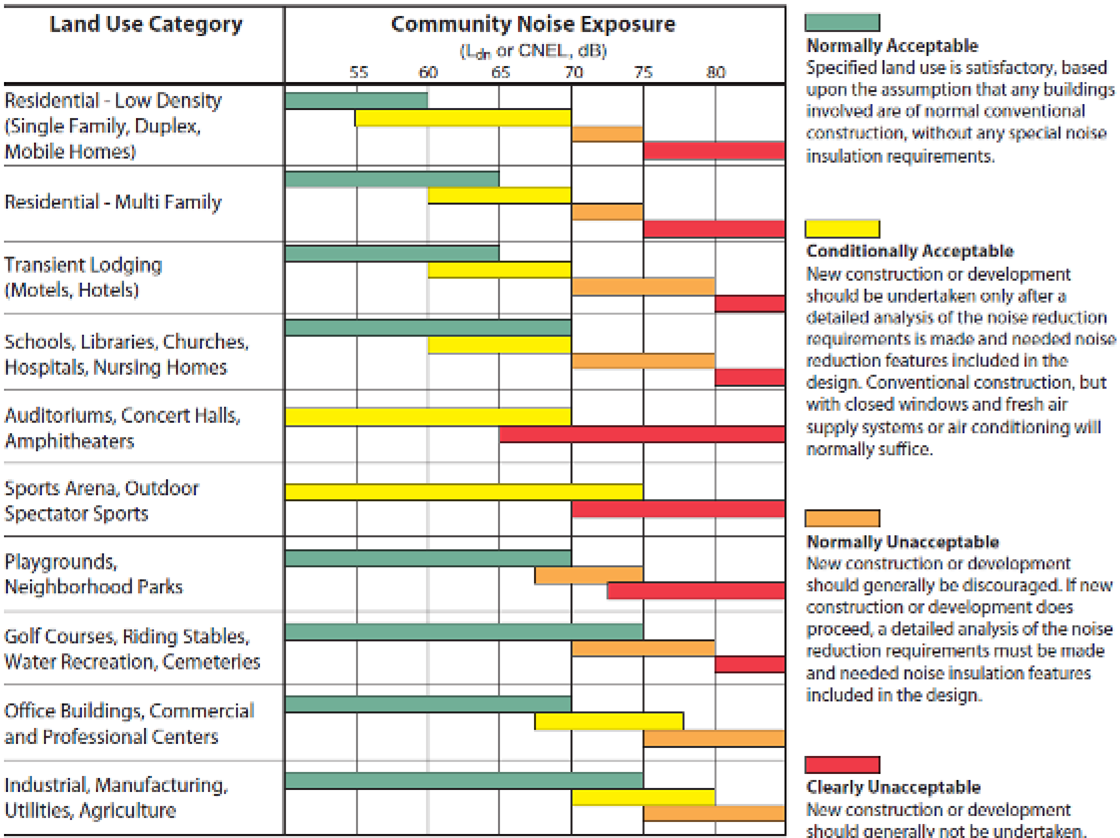
The Land Use Compatibility Chart identifies an exterior noise environment of up to 60 dB Ldn as being normally acceptable for residential uses, with an exterior noise environment up to 75 dB Ldn considered acceptable for cemeteries. Therefore, if noise levels generated by the project would cause the Ldn to exceed 60 dBA at any existing or proposed residences or 75 dB at the nearby cemetery, the impact would be considered significant. The City's Health and Safety Element Land Use Compatibility Chart is provided in Figure 8.

Title 10: Public Peace, Safety, and Morals – Chapter 10.48: Community Noise Control establishes the following daytime and nighttime "maximum" noise level criteria (Section 10.48.040).

- For residential uses, maximum daytime and nighttime noise exposure should not exceed 60 dB and 50 dB, respectively.
- For nonresidential uses, maximum daytime and nighttime noise exposure should not exceed 65 dB and 55 dB, respectively.

It is assumed that daytime refers to the hours of 7 a.m.-10 p.m. and nighttime refers to the hours of 10 p.m.-7 a.m. It is also assumed that the noise criteria represent an hourly-average noise exposure, or Hourly L_{eq}, and not an instantaneous "maximum" level, or L_{max}, as these standards would be overly restrictive and often unobtainable within common community environments.

Figure 8 – City of Cupertino Land Use Compatibility Chart



Source: State of California's *General Plan Guidelines*, 1998.

Noise Level Increase Criteria

As noted above in the discussion of CEQA guidelines, if a project results in a substantial permanent or temporary increase in ambient noise levels in the project vicinity above levels existing without the project, the noise impacts of the project are considered to be significant. The CEQA guidelines do not, however, define what constitutes a significant temporary or permanent increase.

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*).

The Federal Interagency Commission on Noise (FICON) has developed a graduated scale for use in the assessment 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 shown in Table 5, this project considers a 5 dB increase in noise levels due to a project as being significant 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. According to the FICON study, "if screening analysis shows that noise-sensitive areas will be at or above DNL 65 dB and will have an increase of DNL 1.5 or more, further analysis should be conducted." The FICON study also reported the following: "Every change in the noise environment does not necessarily impact public health and welfare."

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. Because every physical process creates noise, whether by the addition of a single vehicle on a roadway, or a tractor in an agricultural field, the use of audibility alone as a significance criterion would be unworkable. CEQA requires a substantial increase in noise levels before noise impacts are identified, not simply an audible change.

Since the development of the FICON standards shown in Table 5, those standards have been used with increasing frequency in noise impact evaluations, with some jurisdictions incorporating the FICON standards directly into their General Plan Noise Element policies. Due to the Federal research supporting the use of the FICON thresholds, and their acceptance in many EIR's which have been certified in recent years, the FICON thresholds are used in this analysis to determine the significance of project-related noise level increases.

Thresholds of Significance Applied to This Project

Thresholds Derived from Locally Adopted Noise Element and Noise Ordinance Standards

As described in the preceding sections, the noise standards of the City of Cupertino and the County of Santa Clara differ. In general, the County's Ldn-based standards applicable to residential uses are 5 dB lower than the City's standards (55 dB Ldn vs. 60 dB Ldn). With respect to hourly performance standards, the County standards are also 5 dB lower than the City's (55 dB L_{eq} vs. 60 dB L_{50} during daytime hours). The lower thresholds within the County may represent the more rural nature of the County lands versus the more urban nature of the City of Cupertino. In fact, the long-term noise surveys conducted for this project indicated that ambient noise conditions at the sites nearest to the City of Cupertino (Sites 1-5), were uniformly higher than at the sites nearest to Santa Clara County properties (Sites 6-12).

Although the 5 dB differences are consistent, the County hourly performance standards are specified in terms of hourly average noise levels (L_{eq}), whereas the City's comparable hourly performance standard is specified in term of median noise levels (L_{50}). Due to the exponential nature of the decibel scale, the measured hourly average noise level at a given location is always higher than the measured median noise level at the same location during the same hour. However, because project-generated noise was conservatively assumed to be present for the entire duration of any given hour, project noise exposure predicted in terms of average hourly levels (L_{eq}), would be effectively equivalent to median noise levels (L_{50}). As a result, the two are considered interchangeable for the purposes of this analysis.

- ***For this project, noise impacts are identified if the locally adopted noise standards of either the City of Cupertino or County of Santa Clara would be exceeded as a result of the project.***

Thresholds Derived from CEQA Guidelines Relative to Project-Related Increases Noise Over Baseline Conditions

As noted in the CEQA guidelines, a project's noise impacts must also be assessed relative to existing ambient noise conditions existing before the project. The Table 1 data indicate that, although existing 24-hour average ambient noise levels varied by monitoring site, baseline Ldn values typically ranged from the mid 40's through upper 50's, with two locations exceeding 60 dB Ldn during weekday periods (Measurement Sites 3 and 4). Using the FICON thresholds shown in Figure 5, significant noise impacts would be expected to result from the project if project-generated noise levels exceed baseline conditions by 5 dB at locations where measured Ldn values are below 60 dB Ldn, and by 3 dB where existing ambient noise conditions are between 60 and 65 dB Ldn.

The Table 2 data indicate that, although existing average hourly ambient noise levels varied by monitoring site, baseline Leq values typically ranged from the low 40's to mid 50's in the project area. Again using the FICON thresholds shown in Figure 5, significant noise impacts would be expected to result from the project if project-generated average hourly noise levels exceed baseline conditions by 5 dB Leq at locations where measured Ldn values are below 60 dB Ldn, and by 3 dB Leq where existing ambient noise conditions are between 60 and 65 dB Ldn.

- ***For this project, noise impacts are identified if the project causes an increase in Ldn or Leq values exceeding 5 dB at locations where existing Ldn values were measured to be below 60- dB, and***

- ***Noise impacts are identified if the project Ldn or Leq values exceed existing Ldn or Leq values by more than 3 dB at locations where existing Ldn values were measured to be between 60 and 65 dB Ldn.***

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. The recent Caltrans publication, *Transportation-and Construction-Induced Vibration Guidance Manual*, written for Caltrans by Jones & Stokes in June 2004, provides guidelines for acceptable vibration limits for transportation and construction projects in terms of the induced peak particle velocity (PPV). Those standards are reproduced below in Table 6.

Table 6
Guideline Vibration Damage Potential Threshold Criteria

Structure and Condition	Maximum PPV (in/sec)	
	Transient Sources[1]	Continuous or Frequent Intermittent Sources[2]
Extremely fragile historic buildings, ruins, ancient monuments	0.12	0.08
Fragile buildings	0.20	0.10
Historic and some old building	0.50	0.25
Older residential structures	0.50	0.30
New residential structures	1.00	0.50
Modern industrial/commercial building	2.00	0.50

Notes:
1. Transient sources create a single isolated vibration event, such as blasting or drop balls.
2. Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.

Chapter 6 of the Caltrans publication describes the threshold of perception for continuous sources of vibration (such as traffic), as ranging from 0.006 to 0.019 in./sec. It is important to note, however, that the threshold of perception for transient sources of vibration, such as vibration caused by discrete events like blasting, is higher than the threshold for continuous sources of vibration. The Caltrans Publication lists the distinctly perceptible threshold for transient vibration as 0.24 in./sec. (Table 6, page 15).

The current Caltrans research illustrates that there are different thresholds of perception for different types of vibration sources. Section XI(b) of Appendix G of the CEQA guidelines requires that a project result in exposure of persons to, or generation of, *excessive* groundborne vibration levels or groundborne noise levels, for the finding of a significant impact. Because the CEQA guidelines specifically mention “excessive” vibration, rather than just perceptible vibration, the standard of significance applied to this project for blast-induced vibration annoyance is 0.24 inches/second peak particle velocity.

Project Noise Impact Evaluation

Overview of Existing and Proposed Project Operations

Rock removal and processing operations at the Quarry has been ongoing for many years. As a result, it is important to distinguish those operations and sources of noise which will be introduced as a result of this project versus those which will not change.

For example, operations at the Rock Plant (see Figure 1 for location), currently exist and will continue regardless of the project. As a result, the noise generation of these activities will remain at current levels and are considered part of the baseline noise environment. Material storage activities also will continue using the same equipment and processes currently employed. Only the location of the mobile equipment will change over time as the storage process transfers from one phase into the next and as storage areas are reclaimed.

Accordingly, BAC's investigation, while comprehensive and site-wide in nature, emphasized the study of locations where equipment and operations will be introduced with implementation of the project. These consist of excavation activities within the proposed South Quarry, the reclamation of the Topsoil Storage Area (located to the immediate south of the existing rock plant), and the reclamation of the CMSA.

Proposed South Quarry Operations

Activities at the proposed South Quarry will consist of vegetation clearing, topsoil removal and storage, excavation in sequential phases over approximately 20 years, and concurrent and ultimate reclamation of the South Quarry. As with current excavation operations within the North Quarry, excavation within the proposed South Quarry will utilize blasting to free the mineral resource, after which bulldozers, front-loaders, and off-road haul trucks will be utilized to load and haul the excavated materials to the processing areas. Water trucks will also be used in the excavation area for dust control and rock drills will be utilized for blasting preparation. As with the existing operations at the Permanente facility, no restrictions on operating hours are proposed within the South Quarry area.

Proposed Topsoil Storage Area Reclamation

Operations at the Topsoil Storage Area (See Figure 2) will consist of temporary storage of topsoil materials from extraction areas, for eventual use in site reclamation activities. Operations will be similar to the storage of materials currently occurring within the WMSA and EMSA in that off-road haul trucks will be used to deposit the material and a bulldozer will be used to contour the grade of the stored material. Water trucks will also be used in the Topsoil Storage Area for dust control. The project effects relating to the Topsoil Storage Area occur in connection with the reclamation of that area. Reclamation work would consist primarily of finish grading the final ground surface using mechanized equipment, installation of erosion controls, application of topsoil, reseeding and planting activities, and maintenance and monitoring.

Proposed CMSA Reclamation

The project addresses the CMSA (generally above 775 feet above mean sea level). Reclamation of the adjacent EMSA to the east has been addressed by a separate reclamation plan amendment filed in April 2009. Reclamation in the CMSA consists of finish grading the EMSA slopes according to the final specified contours, application of topsoil, reseeding and revegetation with native species suitable for an open space end use, and reclamation maintenance and monitoring.

Methodology

To predict project-generated noise levels to the identified receptor locations, reference noise level data was first collected by BAC for each significant noise-producing activity, facility and equipment type currently in operation at the existing Permanente facility. That reference noise level data, along with digitized project base maps, existing and proposed site topography, and digitized source and receptor locations, were input into a state of the art three-dimensional sound propagation model called SoundPlan. The SoundPlan model then projected the reference noise levels from each source type and location to each of the 32 receptor locations, accounting for the effects of topographic shielding, ground attenuation, and atmospheric absorption.

Reference Noise Levels

Reference noise level monitoring was performed by BAC staff in May and June of 2009. The reference noise level data collection program was specifically conducted to isolate and quantify the noise emissions of each major noise-producing component of the Permanente facility. The reference noise level data are necessary to evaluate project noise impacts. For example, if it is known that front-loaders and off-road haul trucks will be utilized in the proposed South Quarry, impacts associated with those operations can be modeled by overlaying reference noise level data collected in the existing North Quarry at locations where such operations would take place within the South Quarry.

To achieve isolation of individual noise sources, a variety of noise monitoring locations was utilized for the reference noise surveys. For example, reference noise measurements of the existing rock plant were conducted from elevated positions within 300 feet of the processing plant equipment, whereas bulldozer reference data was collected within the existing North Quarry. Examples of operations monitored included loading of off-road haul trucks using front-loaders, movement of aggregate materials with bulldozers, and crushing/screening operations at the aggregate plant. Figure 9 illustrates a typical reference noise measurement location. Table 7 provides a summary of the reference noise measurement results.

Larson Davis Laboratories (LDL) Model 820 precision integrating sound level meters and a LDL 2900 frequency analyzer were used for the reference noise level measurements. The meters were calibrated before use with an LDL Model CAL200 acoustical calibrator to ensure the measurement accuracy. The equipment used meets all pertinent specifications of the American National Standards Institute for Type 1 sound level meters (ANSI S1.4).

Figure 9 – Representative Reference Noise Measurement Site

Table 7
Reference Noise Level Data at 100 feet.
Lehigh Permanente Facility – Santa Clara County, CA

Noise Source	Leq, dBA[1]	SEL, dBA[2]	Lmax, dBA
Cement Plant	80	n/a	85
Processing (Rock) Plant	82	n/a	85
Bulldozers	75	n/a	80
Front-Loaders	77	n/a	82
100 Ton Off-Road Haul Truck	n/a	90	81
150 Ton Off-Road Haul Truck	n/a	93	84
Water Truck	n/a	91	80
Rock Drill	77	n/a	82

Notes:

1. Leq values were quantified for equipment that operates in a more or less stationary position or within a limited area for extended periods.
2. SEL data were collected for sources of noise that were transient, such as passages of off-road haul trucks and water trucks. The SEL data was ultimately used with operational information to develop hourly average noise levels for the transient noise sources.

Table 7
Reference Noise Level Data at 100 feet.
Lehigh Permanente Facility – Santa Clara County, CA

Noise Source	Leq, dBA[1]	SEL, dBA[2]	Lmax, dBA
3. Source: Bollard Acoustical Consultants, Inc.			

Noise Source Locations

Digital base maps were used to assign noise source locations to each phase of the project. Figures 9 and 10 illustrate the placement of noise sources for the Phase 1 and Phase 5 Phase of project development, respectively. Each dot on Figures 10 and 11 represents more than one equipment type. For example, within the South Quarry Area, each source location (represented by the blue dot), consists of a bulldozer, a water truck, and a front-end loader filling off-road haul trucks (ten each of 100 and 150 ton off-road haul trucks), including the arrival and departure of each truck.

Because the location of excavation equipment will vary throughout the course of operations in each phase, several identical sources were assigned to each phase. For example, Figure 9 illustrates that nine (9) sources were located along the southern ridge of the South Quarry for the assessment of impacts during the Phase 5 excavation. However, excavation activities would typically occur at only one or two discrete locations at a time. Because it is clear, however, that Receptors 18 and 24, for example, will have different exposure to noise generated by excavation equipment in the South Quarry, it was necessary to include multiple sources in the analysis. This approach ensures that the worst-case topographic and distance relationships between noise source locations and sensitive receptors are analyzed. Despite several similar sources being modeled simultaneously, the analysis results present the worst-case results for each receptor. Similar assessments were performed for Phases 1-5.

Figure 10 – Noise Source Locations: Phase 1 Project

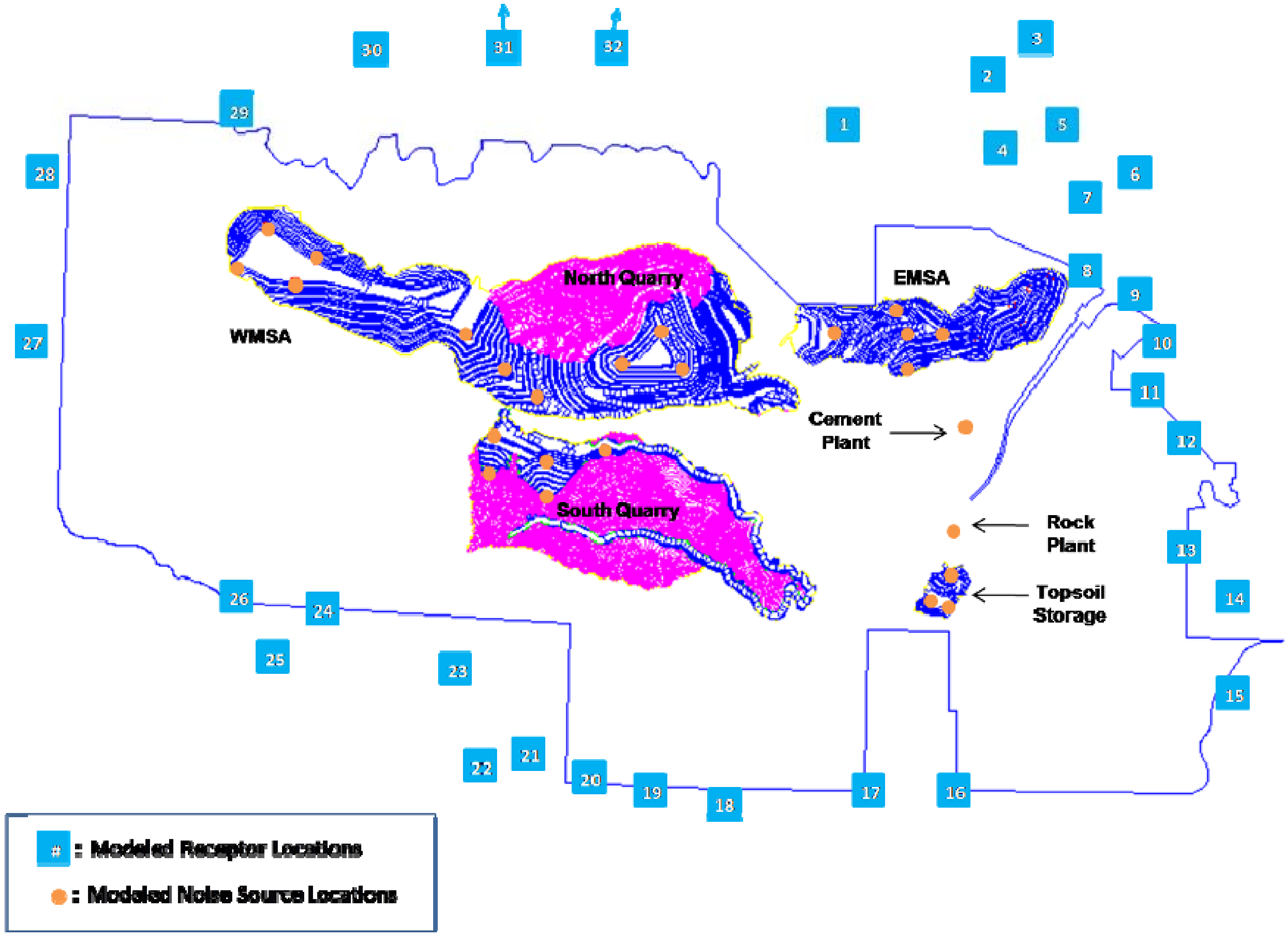
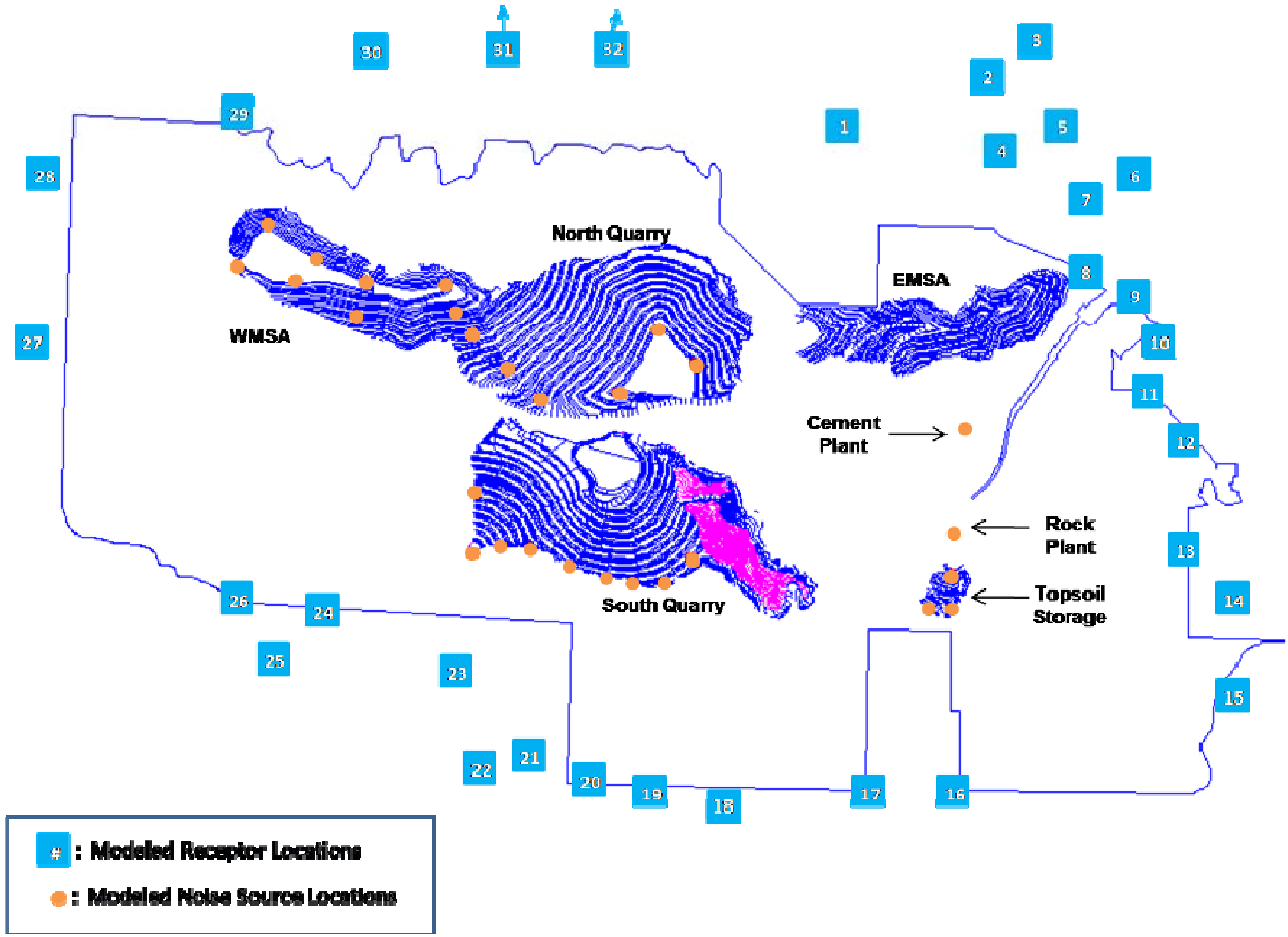


Figure 11 – Noise Source Locations: Phase 5 Conditions



Predicted Noise Levels and Identified Noise Impacts

The results of the SoundPlan modeling exercise are provided in Table 8 in terms of hourly average noise levels (L_{eq}), and Table 9 in term so day/night Average Levels (L_{dn}). The Table 8 and 9 results are based on the assumption that existing and proposed activities would occur continuously for an entire hour (L_{eq}) and an entire day (L_{dn}), respectively.

The Table 8 data indicate that the project could result in potentially significant noise impacts at one (1) receptor (R23) relative to hourly project standards of significance. Specifically, during excavation operations in the proposed south quarry, potentially significant noise impacts could result at the nearest residence located immediately south (R23). As a result, noise mitigation is recommended for this potentially significant impact. Mitigation options are discussed in the next section.

The Table 9 data indicate that the project would not result in significant noise impacts at any receptor locations relative to the adopted City of Cupertino and Santa Clara County exterior noise level standards. As a result, no noise mitigation is warranted for project noise levels relative to these adopted noise standards.

Table 8
Predicted Average Noise Levels (Leq, dBA) at Study Area Receptors
Lehigh Permanente Facility – Santa Clara County, CA

Receptor[1]	Location	Threshold[2] (day/night)	Existing Ambient Levels[3]	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5
1	County	50/45	40-45	37	37	30	31	31
2	City	55/50	45-55	41	41	32	33	33
3	City	55/50	45-55	39	39	29	30	30
4	City	55/50	45-55	38	38	33	34	34
5	City	55/50	45-55	43	42	38	39	39
6	City	55/50	45-55	45	45	43	44	44
7	City	55/50	45-50	44	44	43	43	43
8	City	55/50	45-55	44	44	43	43	43
9	City	55/50	45-55	28	28	25	26	26
10	City	55/50	45-55	31	31	27	29	29
11	City	55/50	45-55	37	36	33	34	34
12	City	55/50	45-55	31	30	24	27	27
13	City	55/50	45-55	35	35	34	34	34
14	City	55/50	45-55	22	21	21	24	24
15	County	50/45	45-55	30	30	29	33	33
16	County	50/45	45-55	30	32	32	32	32
17	County	50/45	45-55	35	38	38	32	38
18	County	50/45	45-50	35	41	40	42	43
19	County	50/45	45-50	39	43	44	45	45
20	County	50/45	45-50	28	31	31	32	32
21	County	50/45	45-50	29	32	32	32	32
22	County	50/45	45-50	33	36	35	35	35
23	County	50/45	40-45	37	46	43	47	47
24	County	50/45	40-45	41	43	41	43	43
25	County	50/45	40-45	22	24	23	24	25
26	County	50/45	40-45	40	41	39	41	41
27	County	50/45	40+/-	41	41	40	41	41
28	County	50/45	40+/-	42	42	42	42	42
29	County	50/45	40+/-	20	20	20	20	20
30	County	50/45	40+/-	43	43	43	43	43
31	City	55/50	45-55	37	37	36	36	36
32	City	55/50	45-55	39	39	36	36	36

Notes:
1. Receptor locations are identified on Figure 3.
2. These thresholds represent both average (Leq) and Median (L50) noise levels, and are the adopted City and County standards for residential uses.
3. Ambient levels were estimated for each receptor location based on the results of the long-term noise surveys and other local characteristics of the receptor location.
4. Shaded cells represent locations where project noise levels would either exceed the applicable City of Cupertino or Santa Clara County noise standards shown in Column 3, or result in a substantial increase over existing ambient conditions. A substantial increase is defined as either 5 dB or 3 dB, depending on existing ambient conditions.

Table 9
Predicted Day/Night Average Noise Levels (Ldn, dBA) at Study Area Receptors
Lehigh Permanente Facility – Santa Clara County, CA

Receptor[1]	Location	Ldn Threshold	Existing Ambient Level[3]	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5
1	County	55	50+	43	43	36	37	37
2	City	60	55+/-	47	47	38	39	39
3	City	60	55+/-	45	45	35	36	36
4	City	60	50+	44	44	39	40	40
5	City	60	55+/-	49	48	44	45	45
6	City	60	50+	51	51	49	50	50
7	City	60	50+	50	50	49	49	49
8	City	60	55 +/-	50	50	49	49	49
9	City	60	55-60	34	34	31	32	32
10	City	60	50-55	37	37	33	35	35
11	City	60	50-55	43	42	39	40	40
12	City	60	50-55	37	36	30	33	33
13	City	60	50-55	41	41	40	40	40
14	City	60	50-55	28	27	27	30	30
15	County	55	50-55	36	36	35	39	39
16	County	55	55 +/-	36	38	38	38	38
17	County	55	55 +/-	41	44	44	38	44
18	County	55	50+	41	47	46	48	49
19	County	55	50+	45	49	50	51	51
20	County	55	50+	34	37	37	38	38
21	County	55	50-55	35	38	38	38	38
22	County	55	50-55	39	42	41	41	41
23	County	55	50-55	43	52	49	53	53
24	County	55	45-50	47	49	47	49	49
25	County	55	45-50	28	30	29	30	31
26	County	55	45-50	46	47	45	47	47
27	County	55	45-50	47	47	46	47	47
28	County	55	45-50	48	48	48	48	48
29	County	55	45-50	26	26	26	26	26
30	County	55	45-50	49	49	49	49	49
31	City	60	50+	43	43	42	42	42
32	City	60	50+	45	45	42	42	42

Notes:

1. Receptor locations are identified on Figure 3.
2. Shaded cells represent locations where project noise levels would either exceed the applicable City or County Ldn Standards, or result in a substantial increase in ambient noise levels. A substantial increase is defined as either 5 dB or 3 dB, depending on existing ambient conditions.
3. Ambient levels were estimated for each receptor location based on the results of the long-term noise surveys and other local characteristics of the receptor location.

Analysis of Atmospheric Effects on Sound Propagation

In an ideal, homogeneous, atmosphere, the sound pressure of a point source of noise decreases at a rate of 6 dB per doubling of distance from the noise source. This 6-dB decrease is due to spherical spreading of sound as it radiates away from the source. Due to atmospheric conditions and the presence of obstacles, the sound pressure levels measured outdoors are typically lower than those predicted from spherical spreading alone.

The important factors that affect sound propagation are sound absorption in the air, presence of barriers and ground cover, the effect of wind and temperature gradients, and the acoustic effect of the presence of the ground. These factors tend to be interrelated in that the effect of one will be dependent on the presence of the others.

Wind Effects

During windy conditions over open level ground, wind gradients can develop. This is due to the friction between the moving air and the ground. Due to these gradients, the speed of sound varies with height above ground. This condition tends to refract, or bend, sound waves upward or downward, depending on whether the receiver is upwind or downwind from the source.

At locations upwind from the sound source, wind gradients bend sound rays upward, thereby reducing sound levels at the receiver. Conversely, downwind locations will experience higher sound levels due to wind gradients bending sound rays downward.

Analysis of 3-5 years of wind data obtained from www.wunderground.com at two weather monitoring stations in the area (Cupertino and Los Altos), indicates that local wind direction in the project area varies, and that average wind-speeds tend to be less than 10 mph. It is recognized that wind speeds in the project vicinity do periodically exceed 10 mph. During such windy conditions, however, ambient noise levels also increase due to the effects of wind passing through trees, over grasslands, and around structures. Once wind speeds exceed 10 mph, these effects become apparent, and ambient noise levels increase proportionately with wind speeds. This distinction is important because noise impacts evaluated for this project are identified relative to ambient noise levels. So while occasional windy conditions will tend to increase project-related noise levels in the down-wind direction, at wind speeds exceeding 10 mph, this increase is expected to be masked by noise generated by the wind itself. In addition, because wind speeds and directions vary in the project area, under certain wind conditions noise levels will be slightly lower at some receptor locations and slightly higher at others. When the wind direction is reversed, the opposite will occur. So while it is recognized that wind will cause actual noise levels to vary from those predicted in Tables 8 and 9, the net effect of such conditions on an annual average condition is considered to be negligible.

Temperature Gradient Effects

Temperature gradients are generated due to heat exchange between the ground and the atmosphere. As with wind gradients, temperature gradients tend to refract, or bend, sound waves upward or downward, depending on whether the gradient is positive or negative.

During normal temperature lapses, air temperature decreases with increasing elevation. During these conditions, such as would typically be present on a clear, calm day, warmer air near the ground can cause sound waves to bend upward, thus decreasing sound levels. Conversely, on a clear calm night, air temperatures can become inverted, and sound will tend to focus and bend toward the ground.

It is recognized that temperature gradients can have a noticeable effect on the propagation of sound over large distances. The presence of temperature inversions does not, however, automatically mean that significant increases in noise levels will be observed at large distances from the noise source. Critical factors in estimating the effects of temperature inversions on sound propagation include the elevation of the top of the inversion (the point at which a normal temperature lapse resumes), and the intensity of the gradient (the change in temperatures between the ceiling of the inversion and the ground).

The elevation of the top, or ceiling, of the temperature inversion is important in that it is this boundary layer which is believed to be responsible for the reflection of sound back towards the ground. As the elevation of the inversion ceiling increases, the intensity of the sound incident upon the inversion boundary decreases (due to normal spherical spreading), and the angle of sound incidence is increased. As the angle of incidence is increased, a larger percentage of the sound is transmitted through the boundary layer, thus resulting in a smaller percentage being reflected back towards the ground. Temperature inversion conditions have the greatest effect on audibility at ground level when the top of the inversion is less than approximately 1,000 feet above the ground. This statement is consistent with the theory regarding the angle of sound incident upon the inversion layer.

The intensity of the temperature inversion is as important to the propagation of sound as the ceiling of the inversion. Inversions with greater differentials between the ground and the inversion ceiling will result in higher noise levels at larger distances from the sound source. This is because the intensity of the temperature gradient essentially defines the strength of the sound reflecting layer.

The noise level increase associated with inversion conditions is expected to be approximately 5 dB for typical inversion conditions (1.8 C / 100 m). Because such conditions do not represent annual average atmospherics in the project area, the overall effect of temperature gradients on noise levels received at the nearest sensitive receptors is expected to be insignificant. Nonetheless, it is recognized that, under certain atmospheric conditions, temperature gradients will cause noise the project (and other sources such as distant freeway traffic), to be higher or lower than the values predicted in Tables 8 and 9.

Project Vibration Impact Evaluation

This section focuses in the assessment of potential impacts associated with project-generated vibration. With the exception of blasting activities, the project does not propose the introduction of appreciable sources of vibration into areas where such vibration is not being generated. Nonetheless, vibration generated by heavy earthmoving equipment is evaluated in this section, in addition to blast-generated vibration.

Heavy Earthmoving Equipment Vibration Levels

To quantify reference vibration levels generated by heavy equipment which currently operates at the Permanente facility, and which will be utilized during the proposed operations, short-term vibration measurements were conducted by BAC staff in June of 2009. A Larson Davis Laboratories Model HVM vibration meter and a PCB Piezotronics Model 356B08 vibration transducer were used for the reference vibration measurements. Peak particle velocities representing the sum of all peak vibration levels along the x, y and z axes, were measured during the survey. Table 3 summarizes the noise and vibration data collected during the shot. Figure 7 illustrates the ambient noise and vibration monitoring location.

Table 10
Reference Heavy Equipment Vibration Measurement Results
Lehigh Permanente Facility – Santa Clara County, CA

Vibration Source	Measurement Distance, ft.	Peak Particle Velocity (in/sec)
Bulldozers	35	0.0209
Front-Loaders	100	0.0047
100 Ton Off-Road Haul Truck	80	0.0059
150 Ton Off-Road Haul Truck	100	0.0062
Water Truck	100	0.0070
Rock Drill	50	0.0187

The vibration measurement results shown in Table 10 indicate that heavy equipment-generated vibration levels were below the thresholds for annoyance and damage to structures even at the very close measurement locations. As a result, at receptors located thousands of feet from the proposed operations, project vibration levels generated by heavy earthmoving equipment are expected to be well below the threshold of perception, and no adverse vibration impacts are identified.

Project Blasting Impact Evaluation

Noise generated by aggregate shots is variable, depending on the amount of charge-material used, the number of holes and the depth of those holes, timing delays, and other factors. There tends to be misconceptions regarding what a quarry "shot" looks and sounds like, due in part to the types of explosions which are frequently seen in movies. In reality, aggregate shots are designed to transfer the energy of the shot into the ground, rather than have it vent into the atmosphere.

As noted previously in this analysis, reference vibration measurements were conducted during a typical blasting operation at the Quarry on May 20, 2009. The monitoring was conducted from a position on the north edge of the North Quarry pit, at a distance of approximately 1500 feet with direct line of site to the shot area. As noted in Table 3, the measured vibration level of the shot was 0.1280 inches per second, peak particle velocity. The measured level is below the thresholds at which the onset of annoyance or damage to structures can be expected (See Table 6). Because the nearest existing sensitive receptors to the proposed South Quarry area would be more than 1,500 feet from blasting areas, blast-induced vibration levels are predicted to be lower at those receptors than the reference level reported in Table 3. As a result, no adverse vibration impacts are anticipated to occur as a result of the project.

Recommendations for Mitigation Measures

With the exception of Receptor 23, no exceedance of any of the City of Cupertino or Santa Clara noise standards (both Ldn and Leq based standards), are identified for this project (please refer to Tables 8 and 9). As a result, no significant noise impacts have been identified relative to adopted City and County noise policy and standards at any receptors other than Receptor 23. At Receptor 23, no exceedance of the Santa Clara County 55 dB Ldn standard is predicted (see Table 9), but excavation activities during Phases 2, 4 and 5 could cause average noise levels to exceed the 45 dB Leq nighttime standard of Santa Clara County. As a result, noise mitigation should be considered for this potentially significant noise impact.

Relative to existing ambient noise conditions, a potentially significant noise increase is projected at Receptor 23 due to proposed project operations. Specifically, at Receptor 23, daytime and nighttime excavation operations in the proposed South Quarry within approximately 3,000 feet could result in hourly average noise levels (Leq) of 46-47 dB Leq, compared with ambient conditions of 40-45 dB Leq. As a result, the 5 dB project threshold of significance could be exceeded at this location. This impact is considered potentially significant because the predicted levels of 46-47 due to the project are only 1-2 dB over the 5 dB threshold of significance established for this receptor based on ambient noise monitoring results. Because a difference of 1-2 dB is likely within the tolerance of the noise-prediction model accuracy, noise monitoring is recommended to confirm the existence, or non-existence, of project noise impacts at this receptor. No other potentially significant noise impacts were identified relative to existing ambient noise conditions at any of the other receptors evaluated in this study. Nonetheless, because the project could result in a potentially significant increase in noise levels at Receptor 23, consideration of noise mitigation measures at this receptor is warranted.

In general, there are three primary avenues for reducing noise levels: treatment of the noise source, treatment of the sensitive receiver, or 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. 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 utilization of a physical barrier which intercepts line of sight between the noise source and receiver.

The following specific measures are recommended to address the potential noise impacts identified above with respect to Receptor 23 on Montebello Ridge associated to ensure that noise levels remain within acceptable limits. These options for reducing noise levels should not be considered exhaustive, as other options for treatment of either the source, receptor, and/or path may be available as well.

1. Upon commencement of unshielded daytime excavation operations within 3000 feet of the Montebello Ridge Residences, noise level measurements shall be conducted at representative locations to ensure that project excavation activities comply with the applicable regulatory standards.

2. Limit excavation operations within 3000 unshielded feet of Monte Bello Road residences unless operations utilize earthmoving equipment with lower reference noise levels than those indicated in Table 7.

Figure 12 – Recommended Nighttime Excavation Setback Line