Appendix L

NOISE AND VIBRATION ANALYSIS REPORT

PROPOSED RANCHO LA HABRA DEVELOPMENT
CITY OF LA HABRA, CALIFORNIA

PREPARED FOR

LENNAR
15131 Alton Parkway, Suite 365
Irvine, California 92618

PREPARED BY

A/E Tech LLC

IRVINE, CALIFORNIA

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1. INTRODUCTION

The proposed Rancho La Habra project is a mixed-use development to be constructed on the land currently occupied by the Westridge Golf Course located east of Beach Boulevard and west of South Idaho Street in the City of La Habra (see Figure 1). The project would include 277 single-family homes, 145 multi-family units, open space, trails, public parks, and either a maximum of 20,000 square feet of retail and restaurant uses or 49 additional multi-family dwelling units adjacent to Beach Boulevard and the existing Westridge Plaza (471 total dwelling units). Since the proposed project site is adjoining existing noise-sensitive land uses and primarily consists of noise sensitive uses that are subject to noise from existing traffic and commercial noise sources, a noise study has been prepared to quantify the existing noise environment in the vicinity of the project site, to determine whether noise levels from construction and future use of the project cause a significant impact in the noise environment or exceed acceptable limits as defined by the City's noise regulations, to evaluate cumulative impacts due to future growth in the project area, and to provide recommendations for noise mitigation as may be required.

2. FUNDAMENTALS OF NOISE AND VIBRATION

2.1 Noise

Sound pressure can be measured in units of micro Newtons per square meter ($\mu N/m^2$) called micro Pascals (µPa). One µPa is approximately one-hundred-billionth of the normal atmospheric pressure. The pressure of a very loud sound may be 200,000,000 µPa, or 10,000,000 times the pressure of the weakest audible sound (20 µPa). Expressing sound levels in terms of µPa would be cumbersome because of this wide range. As such, sound pressure levels (SPL) are described in logarithmic units of ratios of actual sound pressures to a reference pressure squared. These units are called bels, named after Alexander G. Bell. To provide a finer resolution, a bel is subdivided into decibels (deci- or tenth of a bel), abbreviated dB.

Appendix A provides a description of the acoustical terminology used in this report. Unless otherwise stated, all sound levels reported are A-weighted sound pressure levels in decibels (dBA). The A-weighting approximates how humans actually hear sounds by de-emphasizing lower-frequency sounds below 1,000 hertz (1 kilohertz [kHz]) and higher-frequency sounds above 4 kHz, and emphasizing sounds between 1 kHz and 4 kHz. A-weighting is the measure most commonly used for traffic and environmental noise throughout the world. Most community noise standards utilize A-weighting because it accurately reflects human hearing and thereby provides for a high degree of correlation with human annoyance and health effects.

Figure 1
Project Location

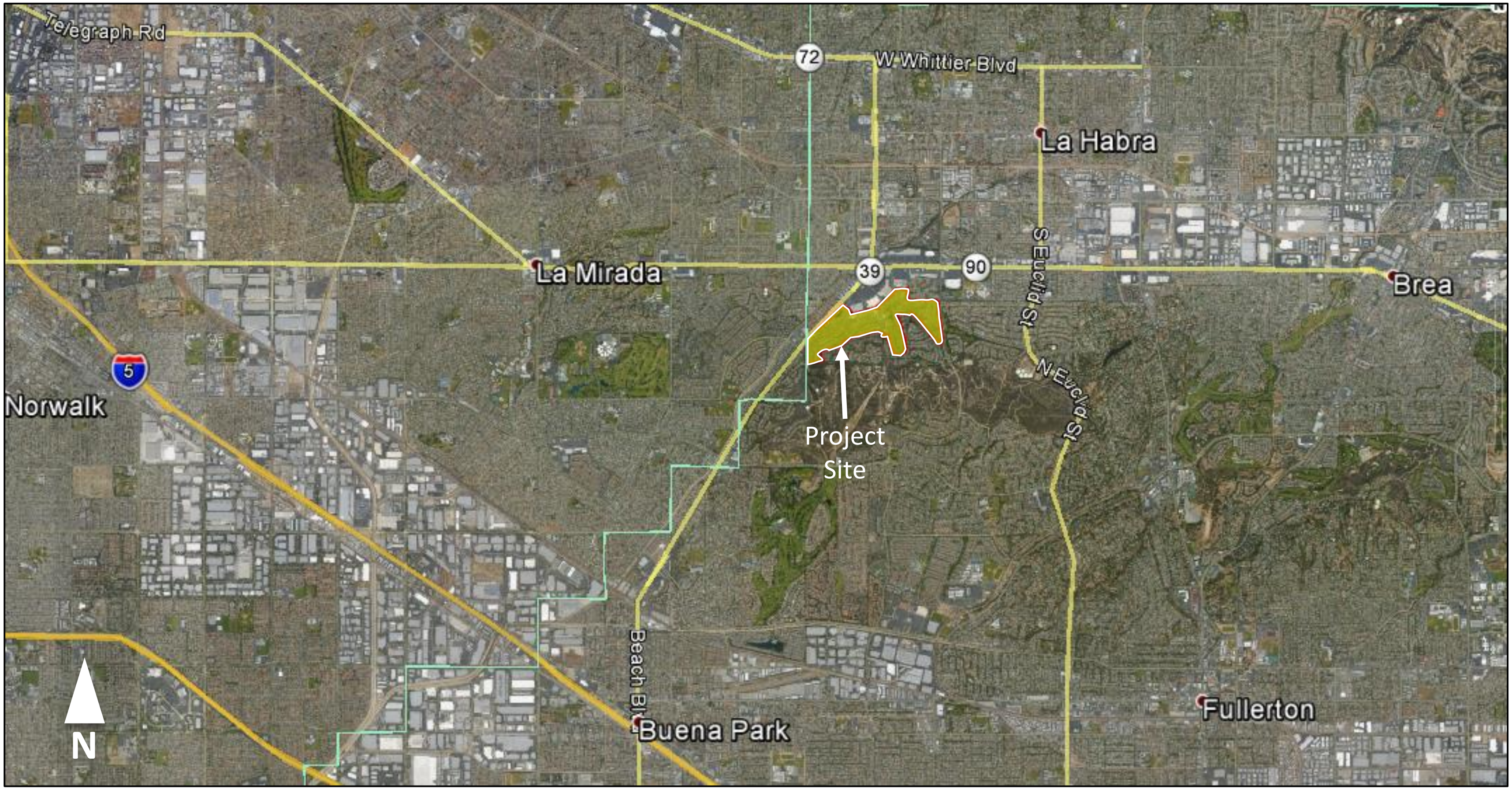


Table 1 shows the noise levels of common sounds measured in the environment and in industry and their effects.

TABLE 1

TYPICAL SOUND LEVELS MEASURED IN THE ENVIRONMENT

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	110	Rock band
Jet flyover at 1,000 feet		
	100	
Gas lawnmower at 3 feet		
	90	
Diesel truck at 50 feet at 50 mph		Food blender at 3 feet
	80	Garbage disposal at 3 feet
Noisy urban area, daytime		
Gas lawnmower, 100 feet	70	Vacuum cleaner at 10 feet
Commercial area		Normal speech at 3 feet
Heavy traffic at 300 feet	60	
		Large business office
Quiet urban daytime	50	Dishwasher in next room
Quiet urban nighttime	40	Theater, large conference room (background)
Quiet suburban nighttime		
	30	Library
Quiet rural nighttime		Bedroom at night, concert hall (background)
	20	
		Broadcast/recording studio
	10	
	0	

Source: Caltrans, 2013

The actual impact of noise is not a function of loudness alone. The time of day noise occurs and duration of the noise are also important. In addition, frequency content (pitch) of the noise, and its onset rate (i.e., whether it is impulsive) affect people's reactions to the noise. Higher pitch sounds are typically more easily audible to an average human, and therefore, tend to be more annoying. A pure tone sound can be perceived more easily by humans than a variable-pitch sound of the same intensity. Furthermore, an impulsive noise with a very quick onset rate, such as a hammer drop or pile driving noise, can be more disturbing than a regular noise because of its startle effect.

Most noise that lasts for more than a few seconds is variable in its intensity. Consequently, a variety of noise descriptors, such as L_{eq}, L_{min}, L_{max}, L_n, and CNEL (or L_{dn}), are used to quantify noise levels. While the existing background noise measurements conducted in and around the project area have been conducted in term of various metrics, the primary noise descriptors used for this study are the average noise level (L_{eq}) and the Community Noise Equivalent Level (CNEL).

The L_{eq} is the equivalent steady-state sound level that, within a stated period of time, would contain the same acoustical energy as the time-varying sound level during the same period. The L_{eq} (h) is the energy-average of the A-weighted sound levels, occurring during a 1-hour period, in decibels (i.e., a 1-hour L_{eq}). CNEL is the average A-weighted noise level during a 24-hour day, obtained after addition of 5 decibels in the evening from 7:00 p.m. to 10:00 p.m. and addition of 10 decibels to sound levels measured in the night between 10:00 p.m. and 7:00 a.m.

From the source to the receiver, noise changes both in level and frequency spectrum. The most obvious is the decrease in noise as the distance from the source increases.

The manner in which noise decreases with distance depends on:

- Geometric spreading from point and line sources
- Ground absorption
- Atmospheric effects and refraction
- Shielding by natural and man-made features, noise barriers, diffraction, and reflection

Sounds from a small localized source (approximating a "point" source) radiates uniformly outward as it travels away from the source in a spherical pattern. The sound level decreases or drops-off at a rate of 6 dBA for each doubling of the distance (6 dBA/DD). However, highway traffic noise is not a single, stationary point source of sound. The movement of the vehicles makes the source of the sound appear to emanate from a line (line source) rather than a point when viewed over some time interval.

Changes in noise levels are typically perceived by the human ear as follows:

- A 3-dBA change is barely perceptible.
- A 5-dBA change is readily perceptible.
- A 10-dBA change is perceived as a doubling or halving of noise.

For determination of significance of noise impacts in a given environment, noise level changes brought about by a specific project (or set of projects) are often evaluated in the context of preexisting noise conditions in that environment. For quieter existing noise environments, as opposed to already noisy environments, project-induced noise level changes are allowed to be higher before the project causes a significant impact.

2.2 Vibration

When the ground is subject to vibration from a source, such as heavy construction machinery, a disturbance propagates away from the vibration source. The ground vibration waves created are similar to those that propagate in water when a stone is dropped into the water.

When the ground is subject to vibratory impact, vibration waves propagate outward from the source of impact. These waves encounter an increasingly large volume of material in the ground as they travel outward, and the energy density in each wave decreases with distance from the source. This decrease in energy density and the associated decrease in displacement amplitude is called spreading loss (or vibration attenuation).

The quantities that are used to describe vibratory motion include displacement, velocity, and acceleration. In describing vibration in the ground and in structures, the concepts of particle displacement, velocity, and acceleration are used to describe how the ground or structure responds to excitation. Vibratory motion is commonly described by identifying the peak particle velocity (PPV) or peak particle acceleration (PPA). Velocity is measured in inches per second (in/sec) or millimeters per second (mm/sec). Acceleration is measured in in/sec per second (in/sec^2), mm/sec per second (mm/sec^2), or relative to the acceleration of gravity (g) (32.2 feet [ft.]/sec^2).

Soil and subsurface conditions are known to have a strong influence on the levels of ground-borne vibration. Among the most important factors are the stiffness and internal damping of the soil and the depth to bedrock. Experience with ground-borne vibration is that vibration propagation is more efficient in stiff clay soils, and shallow rock seems to concentrate the vibration energy close to the surface and can result in ground-borne vibration problems at large distances from the source. Factors such as layering of the soil and depth to water table can have significant effects on the propagation of ground-borne vibration.

When the ground surfaces of the excitation source and the receiver are at different elevations, much of the vibration energy carried through waves causing surface displacement of the ground dissipates. This results in weaker vibratory motion at the receiver than if the receiver were at the same elevation as the source.

3. APPLICABLE NOISE CRITERIA

3.1 City of La Habra Noise Element of the General Plan

The City of La Habra Noise Element of the General Plan (City of La Habra, 2014) establishes land use compatibility criteria in terms of the Community Noise Equivalent Level (CNEL) and average noise level (L_{eq}) for residential developments, including residential uses. The City has adopted a land use compatibility threshold of 60 dB CNEL as "clearly compatible" with exterior areas of noise-sensitive land uses, including residential developments (see Table 2 below).

Table 2

City of La Habra Land Use Compatibility with Community Noise Environments

CATEGORIES	USES	CNEL <55	55-60	60-65	65-70	70-75	75-80	CNEL >80
Residential	Single Family, Duplex, Multiple Family	A	A	B	B	C	D	D
	Mobile Home	A	A	B	C	C	D	D
Commercial Regional, District	Hotel, Motel, Transient Lodging	A	A	B	B	C	C	D
Commercial Regional, Village District, Special	Commercial Retail, Bank, Restaurant, Movie Theater	A	A	A	A	B	B	C
Commercial, Industrial, Institutional	Office Building, Research and Development, Professional Offices, City Office Building	A	A	A	B	B	C	D
Commercial Recreation Institutional Civic Center	Amphitheater, Concert Hall, Auditorium, Meeting Hall	B	B	C	C	D	D	D
Commercial Recreation	Children's Amusement Park, Miniature Golf, Course, Go-cart Track, Equestrian Center, Sports Club	A	A	A	B	B	D	D
Commercial General, Special Industrial, Institutional	Automobile Service Station, Auto Dealership, Manufacturing, Warehousing, Wholesale, Utilities	A	A	A	A	B	B	B
Institutional General	Hospital, Church, Library, Schools' Classroom, Day Care	A	A	B	C	C	D	D

Table 2

City of La Habra Land Use Compatibility with Community Noise Environments

CATEGORIES	USES	CNEL <55	55-60	60-65	65-70	70-75	75-80	CNEL >80
Open Space	Parks	A	A	A	B	C	D	D
	Golf Course, Cemeteries, Nature Centers, Wildlife Reserves, Wildlife Habitat	A	A	A	A	B	C	C
Agriculture	Agriculture	A	A	A	A	A	A	A

Source: City of La Habra General Plan, Table 7-1

INTERPRETATION:
Zone A Clearly Compatible: Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction without any noise insulation requirements.

Zone B Compatible with Mitigation: New construction or development should be undertaken only after detailed noise analysis of the noise reduction requirements are made and needed noise insulation features in the design are determined. Conventional construction, with closed windows and fresh air supply systems or air conditioning, will normally suffice. Note that residential uses are prohibited with Airport CNEL greater than 65.

Zone C Normally Incompatible: New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of noise reduction requirements must be made and needed noise insulation features included in the design.

Zone D Clearly Incompatible: New construction or development should generally not be undertaken.

The City requires attenuation for residential development where the projected exterior or interior noise levels exceed those shown in Table 3 (Residential Exterior and Interior Noise Standards).

Table 3

City of La Habra
Residential Exterior and Interior Noise Standards

	Exterior Noise Levels	Interior Noise Levels
7:00 am to 10:00 pm	55 dBA	55 dBA
10:00 pm to 7:00 am	50 dBA	45 dBA

Source: City of La Habra, La Habra Municipal Code, Noise Ordinance Section 9.32.050 and Section 9.32.060

3.2 City of La Habra Municipal Code

The City of La Habra General Plan noise standards focus on defining appropriate locations for various land uses (residential in this case), while the noise standards in the Municipal Code focus on control of noise generators. Chapter 9.32 of the City of La Habra Municipal Code pertains to noise control within the City's boundaries. The purpose of this chapter of the Municipal Code is that "in order to control unnecessary, excessive and annoying sounds emanating from areas of the City, it is declared to be the policy of the city to prohibit such sounds generated from all sources as specified in the ordinance codified in this chapter. It is determined that certain sound levels are detrimental to the public health, welfare and safety, and contrary to public interest, therefore, the city council does ordain and declare that creating, maintaining, causing or allowing to create, maintain or cause any noise in a manner prohibited by or not in conformity with the provisions of this chapter, is a public nuisance and shall be punishable as such."

The City's Municipal Code Sections 9.32.050 and 9.32.060 indicate that the noise standards listed in Table 3, above, apply to all residential properties, and the Code further elaborates that:

"It is unlawful for any person at any location within the incorporated area of the city to create any noise, or to allow the creation of any noise on property owned, leased, occupied or otherwise controlled by such person, which causes the noise level, when measured on any other residential property either incorporated or unincorporated, to exceed:

1. The noise standard for a cumulative period of more than thirty minutes in any hour; or
2. The noise standard plus five dB(A) for a cumulative period of more than fifteen minutes in any hour; or
3. The noise standard plus ten dB(A) for a cumulative period of more than five minutes in any hour; or
4. The noise standard plus fifteen dB(A) for a cumulative period of more than one minute in any hour; or
5. The noise standard plus twenty dB(A) for any period of time.

Also, in the event the ambient noise level exceeds any of the five noise limit categories set forth above, the cumulative period applicable to the category shall be increased to reflect the ambient noise level. Furthermore, the maximum permissible noise level shall never exceed the maximum ambient noise level.

Each of the noise limits specified in Table 3 shall be reduced by five dB(A) for impact or simple tone noises, or for noises consisting of speech or music."

The Municipal Code, in Section 9.32.070, exempts from its noise limits "noise sources associated with construction, repair, remodeling, or grading of any real property, provided said activities do not take place between the hours of 8:00 p.m. and 7:00 a.m. weekdays, including Saturday or at any time on Sunday or a federal holiday." Construction noise generated outside of the exempt hours specified by the Code would be subject to the City's noise standards described above. Construction of the proposed project will only take place Monday through Saturday from 8 a.m. to 5 p.m. during times exempted by the City code (see Section 6.1.4 of this report for details).

3.3 CEQA Significance Thresholds

According to the current California Environmental Quality Act (CEQA) guidelines, noise impacts are considered potentially significant if they cause:

a. 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.

b. Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels.

c. A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project.

d. A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.

Therefore, noise impacts are considered significant if:

1. They create violations of noise standards, or,
2. They substantially worsen an already excessive noise environment, or,
3. They substantially increase an existing quiet environment even if noise standards are not violated by the proposed action.

As previously outlined, changes in noise levels are typically perceived by the human ear as follows:

- A 3-dBA change is barely perceptible.
- A 5-dBA change is readily perceptible.
- A 10-dBA change is perceived as a doubling or halving of noise.

For determination of significance of noise impacts in a given environment, noise level changes brought about by a specific project (or set of projects) are often evaluated in the context of preexisting noise conditions in that environment and the type of land use affected. For quieter existing noise environments, as opposed to already noisy environments, long-term project-induced noise level changes are allowed to be higher before the project causes a significant impact. Noise level changes most frequently utilized for determination of significance of long-term impacts at residential locations range from 10 dB for quiet rural areas, to 3 dB to 5 dB for urban areas with noisier settings, to even 1.5 dB for locations exposed to higher noise levels (such as homes within the 65-dB CNEL contour of an airport). For residential land uses, such changes in noise levels are often measured in terms of 24-hour average noise metrics (i.e., CNEL or L_{dn}). Thresholds similar to these are already adopted by Federal (such as Federal Transit Administration and Federal Aviation Administration), State, and Local jurisdictions. Although the City of La Habra has not specifically adopted such thresholds, CEQA requires that a noise study adequately assess noise level increases caused by a project for determination of its impacts on the environment.

From data in Chapter 5 of this report it is apparent that existing 24-hour average background sound levels, in terms of CNEL, at exterior areas of representative nearest homes to the project site are in the range of 52 to 55 dB. At such levels, a 5-dB increase may be utilized as a threshold of significant impact (FICON, 1992). However, for a conservative assessment of permanent operational impacts from Rancho La Habra, including its traffic noise effects, a 3-dB increase in CNEL is employed as the threshold of significant noise impact. Traffic noise during peak traffic hours at first rows of noise-sensitive uses along area roadways causes higher noise levels (i.e., in the range of 65 to 70 dB L_{eq} or higher). Therefore, for assessment of significance of traffic noise impacts during peak-hour periods, a significance threshold of 1.5 dB increase is applied. In summary, a project traffic noise increase at any noise-sensitive location of either 3 dB in CNEL or 1.5 dB in L_{eq} during the peak traffic hour is determined to result in a significant noise impact.

Construction noise, while a short-term condition, follows the same guidance that in quieter conditions a larger increase in dB may occur before triggering an impact compared to more noisy conditions where a smaller increase in noise levels can lead to a temporary impact. Existing noise levels at the project site are relatively low, therefore, the threshold for construction noise is tied to noise levels that would cause a physical change in the environment. Given existing noise levels, an increase of 10 dB in hourly L_{eq} would begin to cause interference with normal communication speech for people outdoors using their backyards. A smaller increase in short-term noise levels of 5 dB would be noticeable, but not cause a physical disruption to normal behavior. Therefore, to be conservative, the threshold applied for short-term construction noise is a 5-dB hourly L_{eq} increase over existing daytime background noise levels.

In summary, if the Project construction or operation result in either noise levels exceeding the

City’s applicable noise standards or noise level increases exceeding the above-outlined significance thresholds, there would be significant impacts.

4. METHODOLOGY

4.1 Noise

To quantify the existing noise environment in the vicinity of the project site, a noise measurement survey consisting of long-term (24-hour) and short-term (20-minute) noise measurements was conducted at 16 locations representative of noise-sensitive receivers nearest to the project site (see Figure 2). The noise measurements consisted of 24-hour measurements at three of the 16 monitoring sites (located near the north and south parts of the project site), and short-term measurements at all 16 sites representing other noise-sensitive uses surrounding the project site. The purpose of the 24-hour measurements was to capture variations in background noise levels during the day and night hours and CNEL values typical of the adjoining existing homes in the area. The short-term noise levels were conducted in order to quantify existing background noise levels at representative noise-sensitive locations around the project site during the daytime hours when future construction activities would occur.

Characteristic noise sources are typically identified with land use intensification such as that proposed for the development of the proposed Rancho La Habra project. Construction activities, especially construction heavy equipment and traffic, will create short-term noise increases near the project site. Such impacts would be important for nearby noise-sensitive receptors, such as any existing residential uses. Upon completion of project construction, project-related traffic will cause an incremental increase in area-wide noise levels throughout the project area. Traffic noise impacts are analyzed to insure that the project does not adversely impact the acoustic environment of the surrounding community.

For assessment of potential future noise impacts due to the proposed project, temporary noise exposure during the construction phase and permanent noise effects due to existing and projected future traffic on area roadways and additional traffic generated by the project are evaluated. In addition, noise from the Westridge Plaza retail center at locations of the nearest future proposed homes to the retail center are evaluated through utilization of the measured existing noise levels from noise generating activities and sources within the commercial center.

Noise levels due to construction of the proposed project are estimated based upon available reference noise level data from construction equipment (FHWA, 2006), distance between construction activities and nearest representative noise-sensitive receiver locations, and shielding effects of local terrain, where applicable.

Traffic noise levels were evaluated using the Federal Highway Administration (FHWA) Traffic Noise Model (TNM) version 2.5 computer program. TNM is the latest analytical method developed for roadway traffic noise prediction. The model is based upon reference energy emission levels for automobiles, medium trucks (2 axles), heavy trucks (3 or more axles), buses and motorcycles, with consideration given to vehicle volume, speed, roadway configuration, distance to the receiver, atmospheric conditions, and the acoustical characteristics of the site. TNM was developed to predict hourly Leq values for free-flowing and interrupted-flow traffic conditions.

Traffic data used in the noise model were developed from the traffic impact study data provided by the project traffic consultant (LLG, 2019). Projected future peak-hour and daily traffic volumes with and without the project, for both project completion year (2023) and area buildout year (2035), on all area roadways affected by the project were utilized in TNM to assess changes in noise exposure of noise-sensitive uses due to traffic changes induced by the proposed project. The traffic noise evaluation also assesses the cumulative noise effects as it includes all future non-project and project-related traffic volumes.

To assess future traffic noise exposure at proposed front-row homes within the project site along South Idaho Street and South Beach Boulevard, traffic noise models were developed using the TNM. To validate the use of these models in accurately predicting traffic noise levels, existing traffic noise measurements and traffic counts were conducted concurrently, and the traffic count data were used in the model to compare the calculated noise levels in the model to measured noise levels obtained in the field. The results of such comparisons indicate that the model can be used for accurate prediction of noise levels within the project site.

4.2 Vibration

Ground vibration propagation tests were conducted at two predetermined locations within the project site in order to determine the level of ground attenuation affecting vibration events that may occur during the construction phase of the project. The two test locations were identified because they represent the two predominant geologic conditions within the project site. One test location is near the existing homes along Lemon Tree Drive, northeast of the project site, and the second test location is at the toe of the slope west of the existing Westridge community homes along the west side of South Hagen Street.

The vibration tests at each location included simultaneous collection of ground vibration data from a seismic event (i.e., a 200-lb weight drop) at predetermined distances of 12.5, 25, 50, and 100 feet from the vibration impact location, and comparing the measured vibration levels at these four distances to each other for determination of local ground attenuation. Once the local ground vibration attenuation rate is determined, it is then applied to reference vibration levels from construction machinery, obtained from the Federal Transit Administration's *Transit Noise and Vibration Impact Assessment* (FTA, 2006), to predict the levels of construction vibration at sensitive locations adjoining the project site.

5. SETTING

The project site is located east of Beach Boulevard, west of Idaho Street, and south of Imperial Highway in the City of La Habra in Orange County. Figure 1 is an aerial of the project site, currently operated as the Westridge Golf Course, and the surrounding land uses. The Project site, which encompasses approximately 151 acres, currently supports a privately-owned golf course known as the Westridge Golf Course. Although privately owned, the 18-hole Westridge Golf Course is open to the public. Additional amenities include a lighted driving range with an upper and lower deck; and clubhouse with a pro shop, bar, and banquet rooms.

Single-family residential development within the Westridge residential community abuts the Project site to the south. Beach Boulevard abuts the western property boundary of the project site; and multiple-family residential development is located west of that arterial roadway. Westridge Plaza, a 695,000 square foot retail/commercial center at the southeast corner of Beach Boulevard and Imperial Highway, and a single-family residential subdivision south of Olive Tree Drive, adjoin the property to the north. Idaho Street borders the Westridge Golf Course on the east; and the Vista Del Valle public park and single-family residential land uses are located east of Idaho Street.

5.1 Existing Noise Environment

5.1.1 Ambient Noise Measurements

The sources of noise currently affecting the project site include local vehicular traffic on Beach Boulevard on the west and South Idaho Street on the east, noise from merchandise deliveries to the retail stores in the Westridge Plaza located along the north side of the project site, occasional distant aircraft overflights, occasional mowing activities within the Westridge Golf Course, and other natural sounds, such as those from birds.

Existing ambient noise levels in the project environs were quantified based upon three long-term (24-hour) and 16 short-term (20-minute) noise level measurements conducted at locations representative of the nearest noise-sensitive uses in the vicinity of the project site and proposed future homes within the project site. The noise monitoring locations are depicted on Figure 2. Long-term noise monitoring locations are designated as LT-1, LT-2, and LT-3 and short-term noise monitoring locations are shown as locations ST-1 through ST-16. Following are brief descriptions of the noise monitoring locations:

LT-1: This 24-hour noise monitoring site is located near the backyard fence of a residence on West Casper Court within the Westridge Community. The purpose of choosing this site is to capture day and night noise levels representative of the existing residences along the south side in western half of the project site.

LT-2: This 24-hour noise monitoring site is located at the north edge of the existing driving range, and represents background noise levels in areas of the project site nearest to the Westridge Plaza shopping center located north of the project site.

LT-3: This 24-hour noise monitoring site is located near the backyard of the residence at 1450 Pine Tree Court, near the 2nd tee of the golf course. This site represents the background sound levels at homes at the ends of the Pine Tree Court and Lemon Tree Drive cul-de-sacs.

Short-term noise monitoring was also conducted for the purpose of quantifying daytime noise levels at noise-sensitive locations surrounding the project site during times when future construction activities would take place. Descriptions of the short-term noise monitoring locations are as follows:

ST-1: This short-term location is near the southwest corner of the project site and is representative of the existing residences near Nicklaus Avenue overlooking the golf course.

ST-2: This short-term location is at the same location as the long-term monitoring site LT-1, which represents the existing residences along the south side of the project site.

ST-3: This short-term monitoring site is located near the 18th hole tee within the golf course, and is representative of background sound levels in the backyards of existing homes along the north side of West Snead Street.

Figure 2
Ambient Noise Measurement Locations
Proposed Rancho La Habra Development

ST-# Noise Monitoring Location

TECH

ST-4: This short-term monitoring location represents the backyards of homes along the east side of South Floyd Court overlooking the 9th hole of the golf course.

ST-5: This short-term monitoring location represents the backyards of homes along the west side of South Hagen Street overlooking the 8th hole of the golf course.

ST-6: This short-term monitoring location represents the backyards of homes along the east side of South Runyan Street overlooking the 4th and 5th hole of the golf course.

ST-7: This short-term monitoring location represents the backyards of homes along the east side of South Watson Street and is near the far southeast corner of the golf course property.

ST-8: This short-term monitoring location represents the backyards of homes along the south side of Rain Tree Drive, near the northeast corner of the golf course.

ST-9: This short-term monitoring location is in the northeast part of the golf course and represents the backyards of homes along the south side of Lemon Tree Drive.

ST-10: This short-term monitoring location is at the same location as the long-term monitoring site LT-3, representing homes at the ends of Pine Tree Court and Lemon Tree Drive cul-de-sacs. .

ST-11: This short-term monitoring site is located near the main entry road to the golf course behind the Walmart store in Westridge Plaza, and it represents the background sound levels at the proposed future homes closest to this commercial use.

ST-12: This short-term monitoring location is at the same location as the long-term monitoring site LT-2, which represents background noise levels in areas of the project site nearest to the Westridge Plaza shopping.

ST-13: This short-term monitoring site is near the northwest corner of the golf course, adjacent to the Sam's Club gas station. The purpose of the measurements at this location is to determine the level of noise exposure to the commercial activities and traffic noise from the commercial parking area and from Beach Boulevard.

ST-14: This short-term monitoring location is near the north entry gate to the Hillsborough Park apartments on the west side of Beach Boulevard, across from the golf course. The monitoring site is at the setback of the first row of apartments facing Beach Boulevard and the golf course.

ST-15: This short-term noise monitoring location is adjacent to (immediately south of) the backyard of the residence at 940 Teakwood Avenue. The measurement at this location is representative of daytime background sound levels at exterior of first row of single-family homes east of the Vista Del Valle Park.

ST-16: This short-term noise monitoring location is at the west property fence of the home located at the west end of the Oak Hills Court cul-de-sac, and represents the single-family homes east of South Idaho Street and south of Vista Del Valle Park.

Instrumentation utilized for the measurement of existing noise levels included a Bruel & Kjaer (B&K) Model 2236 sound level meter equipped with a B&K Type 4188 ½" microphone. The instrumentation was calibrated prior to and following each measurement with a B&K Type 4138 acoustical calibrator to ensure the accuracy of the measurements. All measurement equipment complies with applicable specifications of the American National Standards Institute (ANSI) and the International Electrotechnical Commission (IEC) for the Type I (precision) sound level meters. The microphone was located on a tripod at 5 feet above the ground.

The background noise level measurements were conducted during several time periods between Wednesday, July 22, 2015 and Friday, September 4, 2015 at the locations noted on Figure 2. The noise measurements at the long-term monitoring locations included hourly average background noise level (L_{eq}), L_{10} (level exceeded 10 percent of the time), L_{50} (level exceeded 50 percent of the time), and L_{90} (level exceeded 90 percent of the time). At each of the short-term monitoring locations, the measurements included one to three 15-minute continuous sample of background noise, for which L_{eq}, L_{min} (minimum sound level), and L_{max} (maximum sound level) were recorded. These measurements are deemed to be adequate to depict typical daytime noise levels (i.e., during times when construction would occur) at each of the representative monitoring locations. Appendix B depicts photographs of the noise monitors at each of the long-term and short-term monitoring locations.

Tables 4, 5, and 6 summarize the measured background noise levels at long-term (24-hour) sites LT-1, LT-2, and LT-3. For each of these locations, the 24-hour CNEL is also calculated and shown in their related tables. The measured background sound levels reported in these tables may be compared to the noise level standards of the City to determine if existing noise levels exceed the City's applicable noise level criteria.

From the measured existing background sound level data at the three long-term locations, it is apparent that measured existing CNEL values at all three 24-hour monitoring locations are in compliance with the City’s land use compatibility threshold of 60 dB CNEL for residential uses.

Table 4

Rancho La Habra 24-hour Noise Monitoring Results
Site LT-1
July 22-23, 2015

Measurement Start Time	Measured Sound Levels, dBA				City Standard (L_{50})
	L_{eq}	L_{10}	L_{50}	L_{90}	
18:00	51.0	52.5	50.5	47.5	55
19:00	51.0	52.5	50.5	47.0	55
20:00	49.9	52.5	49.5	44.5	55
21:00	49.8	52.0	49.5	45.5	55
22:00	48.8	50.5	48.5	45.0	50
23:00	48.5	50.0	48.0	45.0	50
0:00	46.6	48.5	46.0	43.0	50
1:00	45.1	47.0	44.5	41.5	50
2:00	48.8	47.0	45.5	41.5	50
3:00	44.5	46.5	44.0	40.5	50
4:00	45.0	47.0	44.5	42.0	50
5:00	49.3	52.0	49.0	44.5	50
6:00	51.3	53.5	51.0	47.5	50
7:00	53.0	55.0	52.5	48.5	55
8:00	51.5	53.5	51.0	47.0	55
9:00	50.0	52.5	49.5	46.0	55
10:00	49.3	51.5	49.0	44.0	55
11:00	48.5	51.0	48.0	43.0	55
12:00	49.8	52.0	49.5	43.5	55
13:00	50.0	52.5	49.5	44.5	55
14:00	51.2	53.5	51.0	45.5	55
15:00	50.2	52.0	50.0	45.5	55
16:00	49.2	51.0	49.0	45.0	55
17:00	50.0	52.0	49.5	44.0	55
CNEL	55.3				
Source: A/E Tech LLC					

Table 5

Rancho La Habra 24-hour Noise Monitoring Results
Site LT-2
September 3-4, 2015

Measurement Start Time	Measured Sound Levels, dBA				City Standard (L_{50})
	L_{eq}	L_{10}	L_{50}	L_{90}	
14:00	45.3	47.0	45.0	42.0	55
15:00	45.2	47.0	45.0	42.0	55
16:00	48.1	49.5	47.5	40.5	55
17:00	43.3	45.0	43.0	40.5	55
18:00	45.3	46.5	45.0	42.0	55
19:00	45.5	46.5	45.0	43.5	55
20:00	51.1	51.5	50.5	48.0	55
21:00	49.3	47.5	49.0	45.0	55
22:00	49.5	49.5	49.0	44.5	50
23:00	46.0	47.0	45.5	44.5	50
0:00	45.6	46.5	45.0	44.0	50
1:00	44.2	45.0	43.5	42.5	50
2:00	43.9	44.5	43.5	42.5	50
3:00	43.6	44.0	43.0	42.5	50
4:00	42.4	43.5	42.0	40.5	50
5:00	46.5	47.0	46.0	41.5	50
6:00	45.1	47.0	44.5	39.5	50
7:00	44.6	47.0	44.0	38.5	55
8:00	61.6	55.0	49.0	43.0	55
9:00	56.8	53.5	47.0	40.5	55
10:00	56.1	58.0	50.5	42.5	55
11:00	56.5	57.0	50.5	43.5	55
12:00	54.6	57.5	50.0	42.5	55
13:00	59.0	57.0	50.5	44.0	55
CNEL	55.3				
Source: A/E Tech LLC					

Table 6

Rancho La Habra 24-hour Noise Monitoring Results
Site LT-3
September 2-3, 2015

Measurement Start Time	Measured Sound Levels, dBA				City Standard (L_{50})
	L_{eq}	L_{10}	L_{50}	L_{90}	
13:00	44.3	45.5	43.5	40.0	55
14:00	43.0	44.5	42.5	39.5	55
15:00	43.2	45.0	43.0	40.0	55
16:00	46.1	47.5	43.0	38.5	55
17:00	41.3	43.0	41.0	38.5	55
18:00	43.3	44.5	43.0	40.0	55
19:00	43.5	44.5	43.0	41.5	55
20:00	49.1	49.5	48.0	46.0	55
21:00	47.3	45.5	44.5	43.0	55
22:00	47.5	47.5	45.5	42.5	50
23:00	44.0	45.0	44.0	42.5	50
0:00	43.6	44.5	43.5	42.0	50
1:00	42.2	43.0	42.0	40.5	50
2:00	41.9	43.0	41.5	40.5	50
3:00	41.6	42.0	41.5	40.5	50
4:00	40.4	41.5	40.0	38.5	50
5:00	44.5	45.0	43.5	39.5	50
6:00	43.1	45.0	41.5	37.5	50
7:00	42.6	45.0	42.0	36.5	55
8:00	59.6	53.0	48.0	41.0	55
9:00	40.3	42.0	40.0	37.0	55
10:00	42.1	44.5	42.0	39.0	55
11:00	41.3	43.5	41.0	38.0	55
12:00	41.4	42.5	41.0	38.5	55
CNEL	51.9				
Source: A/E Tech LLC					

At location LT-1, hourly average sound levels during both daytime and nighttime hours are generally below the City's L_{50} (level exceeded for 30 minutes in any hour) exterior noise standards of 55 and 50 dB, respectively. At all three long-term monitoring locations LT-1, representing existing homes south of the golf course, LT-2, near the northern boundary of the golf course, and LT-3, representative of existing homes along the northeastern boundary of the golf course, the background sound levels during both daytime and nighttime hours appear to be in compliance with the City's L_{50} noise level limit. At LT-2, the higher measured ambient noise levels during the morning and early afternoon hours are suspected to be due to truck deliveries and other activities within the Westridge Plaza shopping center. The highest measured noise level at LT-3 occurred between the hours of 8:00 a.m. to 9:00 a.m. This is also due to commercial activities within the Westridge Plaza shopping center.

Summary of the noise levels measured during the short-term sampling effort is shown in Table 7. The results of short-term background noise measurements indicate that existing daytime noise levels at the noise-sensitive receivers bordering the interior areas of the project site, away from the arterial streets and the commercial uses, are below the noise standard of 55 dB hourly L_{50} applied by the City of La Habra Municipal Code and General Plan Noise Element for residential and other noise-sensitive areas. At existing noise-sensitive locations closest to South Idaho Street (represented by ST-7) and along Beach Boulevard (represented by ST-14), traffic noise levels exceed the City's daytime hourly noise standard. At location ST-13, in the northwest corner of the golf course, existing daytime noise levels are at or slightly above the City's standard due to noise from the commercial center and Beach Boulevard.

TABLE 7

Summary of Measured Short-Term Background Noise Levels (dB)
Rancho La Habra Development Project

Monitoring Location	Date	Start Time	Duration (minutes)	Leq	Lmin	Lmax	L_{25}	L_{50}	L_{90}
ST-1	7/22/15	8:57 a.m.	15	48.0	41.3	59.7	48.0	46.5	43.0
ST-2	7/22/15	9:29 a.m.	15	51.6	44.3	57.2	52.5	50.5	47.0
ST-3	7/22/15	12:39 p.m.	15	45.1	39.7	50.7	46.0	44.5	41.5
ST-4	7/22/15	10:53 a.m.	15	40.8	34.6	55.0	40.5	39.0	36.0
ST-5	7/22/15	11:20 a.m.	15	45.6	39.9	52.3	46.5	45.0	42.5
ST-6	7/22/15	11:52 a.m.	15	47.6	38.1	59.4	48.5	46.5	40.0
ST-7	7/22/15	12:19 p.m.	15	59.3	45.4	70.3	60.5	58.0	51.5

TABLE 7

Summary of Measured Short-Term Background Noise Levels (dB)
Rancho La Habra Development Project

Monitoring Location	Date	Start Time	Duration (minutes)	Leq	Lmin	Lmax	L_{25}	L_{50}	L_{90}
ST-8	7/22/15	12:43 p.m.	15	49.7	42.2	62.7	49.5	47.5	45.0
ST-9	7/22/15	1:08 p.m.	15	44.8	34.8	59.7	43.0	41.0	39.0
ST-10	7/22/15	1:35 p.m.	15	46.0	36.0	59.1	46.0	43.0	39.0
ST-11	8/5/15	2:35 p.m.	15	50.8	39.6	70.4	49.0	45.5	41.5
		2:51 p.m.	15	51.3	40.1	64.1	51.5	46.5	42.0
		3:07 p.m.	15	53.4	39.1	73.1	52.5	48.0	40.5
ST-12	8/5/15	1:33 p.m.	15	53.7	39.0	74.2	47.5	44.0	41.0
		1:51 p.m.	15	45.3	40.0	58.4	45.5	43.5	41.0
		2:07 p.m.	15	45.3	40.0	62.7	45.5	44.0	41.5
ST-13	8/5/15	3:32 p.m.	15	56.0	53.2	71.6	56.0	55.0	54.0
		3:48 p.m.	15	56.1	53.0	70.2	56.0	55.0	54.0
		4:04 p.m.	15	56.5	53.7	64.4	56.5	56.0	54.5
ST-14	9/4/15	2:15 p.m.	10	67.8	---	---	72.0 (L_{10})	---	52.0
		2:25 p.m.	10	68.5	---	---		---	48.5
ST-15	7/24/15	12:30 p.m.	15	52.7	38.5	69.7	53.0	50.5	43.0
ST-16	7/24/15	1:15 p.m.	15	56.0	34.9	65.0	57.5	53.0	43.5

Note: The applicable City of La Habra daytime standard is an L_{50} of 55 dB.
Source: A/E Tech LLC

5.1.2 Traffic Noise Measurements

Short-term noise level measurements (15 minutes in duration) were conducted within the project site on Friday, July 17, 2015 in order to determine the existing traffic noise levels and validate the TNM in estimating traffic noise levels within the Project site. Measurement equipment consisted of a Bruel & Kjaer (B&K) Type 2236 precision sound-level meter equipped with a B&K 4188 ½-inch microphone. A B&K Model 4138 acoustical calibrator was used to calibrate the sound-level meter before and after each measurement to ensure the accuracy of the measurements. All instrumentation comply with the requirements of the American National Standards Institute (ANSI) and International Electrotechnical Commission (IEC) for Type I (precision) sound-level equipment.

During the morning and early afternoon of July 17, when the measurements were taken, weather conditions were generally calm to slightly breezy (2 to 8 miles per hour) with overcast to clearing skies. Temperatures ranged between 65 degrees Fahrenheit (°F) and 85°F. On May 3, the skies were clear and temperatures were between 70°F and 80°F.

Traffic noise level measurements were conducted at four locations within the project site, two locations in the east side of the project site along South Idaho Street and two locations in the west side of the project site close to Beach Boulevard. The noise monitoring locations are shown as T-1 through T-4 on Figures 3-A and 3-B, and photographs of the traffic noise monitoring are attached in Appendix C of this report. The traffic noise monitoring sites are described as follows:

T-1: This site is located at the top of the berm along the eastern property line of the Westridge Golf Course, near the northeast corner of the project site. The monitoring location is at a distance of approximately 85 feet from the Idaho Street centerline, and elevated about 10 feet above the roadway pavement elevation.

T-2: This site is located at the top of the berm along the eastern property line of the Westridge Golf Course, towards the southeast corner of the project site. The monitoring location is at a distance of 86 feet from the Idaho Street centerline, and elevated about 10 feet above the roadway pavement elevation.

T-3: This site is located near the top of the slope of the Westridge Golf Course west border, just southwest of the existing water pond. The monitoring location is at a distance of approximately 120 feet from the Beach Boulevard centerline, and elevated approximately 8 to 10 feet above the roadway pavement elevation.

T-4: This site is located in the western part of the project site, approximately 260 feet east of traffic noise measurement location T-3. The purpose of including this location in the traffic noise monitoring effort is to assess and validate the attenuating effects of local terrain on traffic noise from Beach Boulevard.

In addition to documenting existing traffic noise levels, the purpose of the traffic noise level measurements is to validate the use of TNM in accurately predicting traffic noise exposure within the project site. Therefore, concurrent counts of traffic on Beach Boulevard and South Idaho Street were conducted during the noise level measurements. The results of the traffic noise level measurements and concurrent traffic counts are summarized in Table 8.

Figure 3-A
Traffic Noise Measurement Locations
Along South Idaho Street

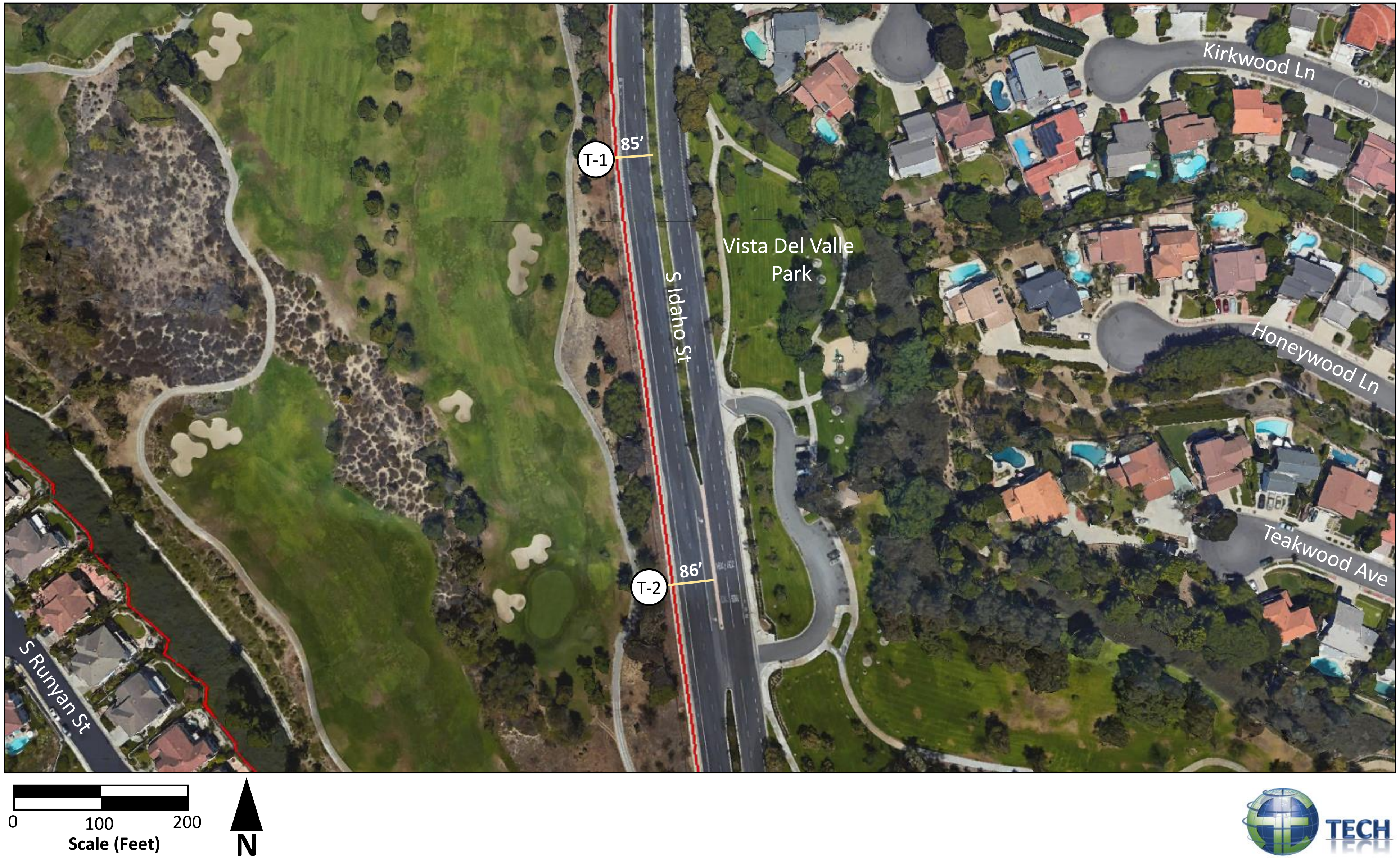


Figure 3-B
Traffic Noise Measurement Locations
Along South Beach Boulevard

TABLE 8

Measured Traffic Noise Levels (dB)
Rancho La Habra Residential Development Project
July 17, 2015

Monitor Location	Start Time	Measured Sound Level			Traffic Counts (15 minutes)					
					Southbound			Northbound		
		Leq	Lmin	Lmax	A	MT	HT	A	MT	HT
T-1	8:12 a.m.	62.5	41.0	74.4	98	0	0	106	0	0
	8:30 a.m.	64.3	40.7	82.6	109	0	0	100	1	0
T-2	9:09 a.m.	63.2	40.1	80.4	91	0	0	83	0	0
	9:26 a.m.	62.3	41.3	72.7	73	0	0	107	0	0
T-3	12:21 p.m.	59.6	40.4	74.1	437	4	2	432	7	4
T-4	12:42 p.m.	52.7	39.4	64.6	429	5	1	449	3	4

A = Automobiles MT = Medium Trucks HT = Heavy Trucks

Source: A/E Tech LLC

Existing roadway geometry, number of vehicles counted during the noise measurement periods, and existing terrain features with potential for shielding were entered into the noise model. Table 9 is a summary of noise levels obtained during the traffic noise measurements and their comparison to levels predicted by the TNM.

TABLE 9

Comparison of Measured and Modeled Traffic Noise Levels (dB)

Measurement Location	Measured L_{eq}	Modeled L_{eq}	Modeled minus Measured L_{eq}
T-1	62.5	63.1	+0.6
	64.3	63.6	-0.7
T-2	63.2	63.1	-0.1
	62.3	62.9	+0.6
T-3	59.6	60.0	+0.4
T-4	52.7	53.3	+0.6

Source: A/E Tech LLC

The last column of Table 9 depicts the differences between the measured and modeled noise levels. At all four noise monitoring locations, the difference between measured and modeled noise levels are within +/- 1 dBA, which depicts very close agreement between the two levels. This close agreement verifies the accuracy of the TNM in predicting traffic noise levels in areas near each of the roadways.

5.1.3 Commercial Noise Measurements

Additional noise measurements were conducted near sites ST-11 and ST-12 to obtain noise levels associated with the delivery and movement of goods at or near the delivery bays of the stores within the Westridge Plaza. Proposed commercial uses within the project site would have similar activities that would contribute to future noise levels.

Table 10 summarizes the results of the commercial source noise levels within the project site. Also, at long-term noise monitoring locations LT-2 and LT-3, which are representative of nearest existing and future homes to the Westridge Plaza, the highest measured hourly Leq values are 60 and 62 dBA, respectively (see Tables 5 and 6). These levels are the highest noise levels from commercial activities at these receivers and indicate the level of noise exposure to such activities.

TABLE 10

Measured Commercial Activities Noise Levels (dB)

Source	Approximate Distance to Source (feet)	Instantaneous Noise Level Range
Forklift	200	55-60
Cart/Pallet Drops	200	70-75
Heavy Truck Backing into Delivery Bay	150-300	70-75
Heavy Truck Idling	150	60-65
PA Speaker	300	55
Source: A/E Tech LLC		

6. FUTURE NOISE IMPACTS

Future noise impacts from the proposed project would include short-term, temporary effects during the construction phase of the project and permanent effects resulting from increased traffic brought on the local roadway system by the proposed project. This section describes the methods, data, and findings of the construction, traffic, and commercial noise analyses performed to determine the level of impacts, and whether predicted noise exposure would be in compliance with the City's applicable noise criteria.

6.1 Construction Noise

During the construction of the proposed project, overall noise levels would vary based on the level of construction activity, the types of equipment used, when the equipment is being operated, and the distance from construction activities to noise-sensitive receivers. Construction of the proposed project will include several components generally consisting of demolition, excavation and crushing, site preparation, grading, infrastructure installation, and buildings construction. The beginning construction phases will include demolition of existing buildings, removal of hardscape and pathways within the golf course, crushing of concrete debris, and mass grading and excavation, and finishing grading of the site. The project construction schedule, as shown by Table 11, shows the timelines and durations for various phases of the project construction.

TABLE 11

Construction Phasing Schedule

Phase Name	Phase Type	Phase Start Date	Phase Final Date	Number of Days/Week	Number of Days	Phase Description
Demolition	Demolition	08/03/2020	08/19/2020	5	13	Demolition of golf course buildings, pathways, etc.
Crushing	Grading	08/03/2020	10/09/2020	5	50	Crushing of concrete debris
Site Preparation	Site Preparation	08/20/2020	11/25/2020	6	70	Site preparation
Mass Grading	Grading	11/26/2020	06/23/2021	6	150	Mass grading, excavation, infill
Finishing Grading	Grading	03/01/2021	07/22/2021	6	104	Finishing grading
Building Construction	Building Construction	10/01/2021	08/13/2026	6	1270	
Paving	Paving	10/01/2021	08/13/2026	5	1270	
Architectural Coating	Architectural Coating	10/01/2021	08/13/2026	5	1270	
Revision: August 2019						

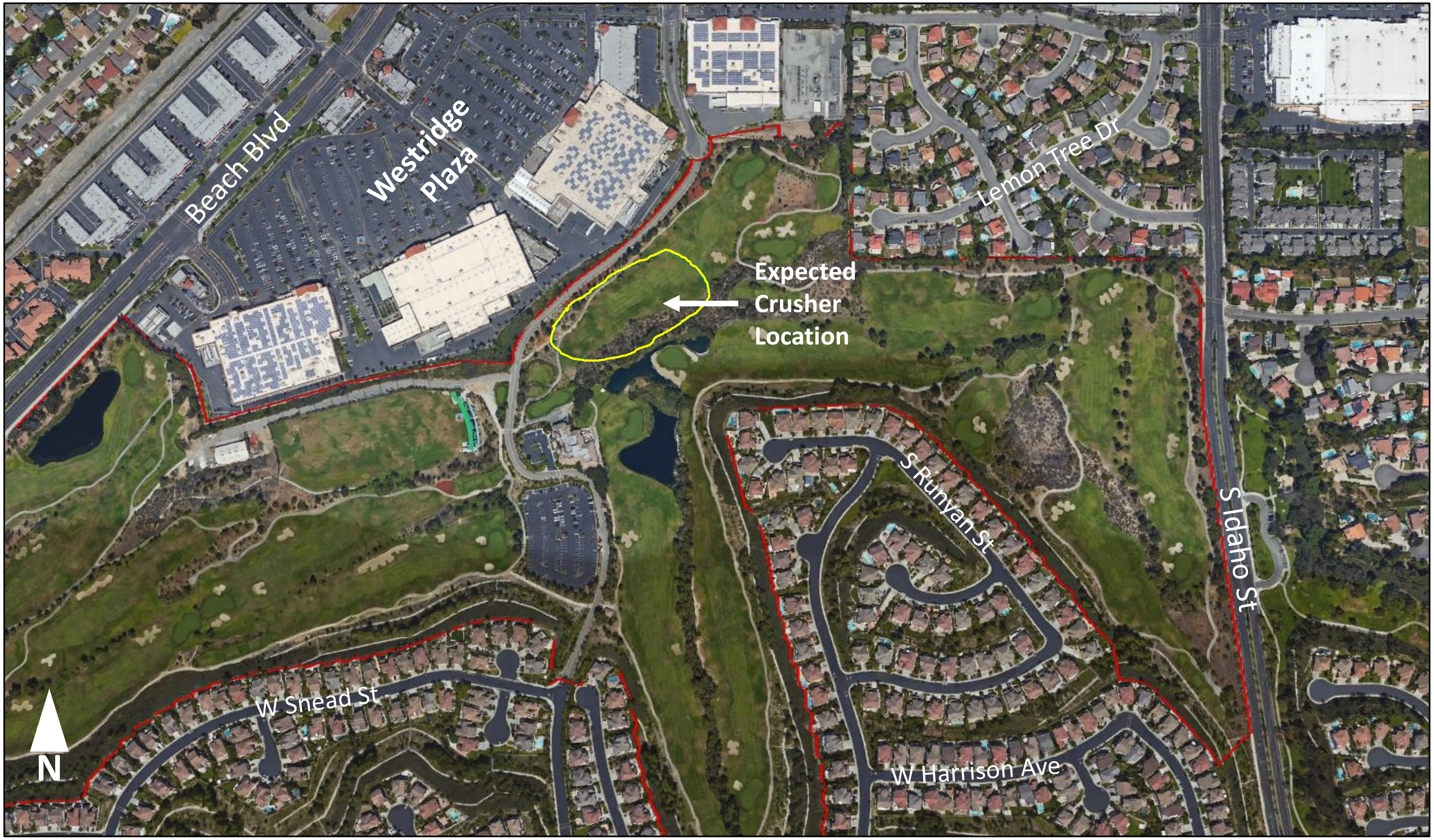
Based on the construction schedule information presented in Table 11, there are three distinct time periods when project construction would occur. In the first phase, noise from demolition, crushing, and site preparation will be combined. In the second phase, grading activities would present the main sources of construction noise. In the last phase, noise exposure would be caused by buildings and infrastructure construction. The sections below describe the anticipated noise impacts resulting from each of these three phases.

6.1.1 Demolition and Crushing Noise Levels

It is proposed that the first phase of construction include creating a temporary aggregate plant on the project site to crush excavated material, concrete, asphalt, and rocks into suitable size aggregate to use as base. The aggregate crushing plant would be located along the south side of the entry road into the existing golf course, as shown in Figure 4.

Construction equipment utilized for demolition of buildings and hardscape will include loaders, dozers, articulated hauler, excavators, and other industrial equipment. The crushing and screening plant will include a crusher, screen, conveyors, receiving hopper, grizzly, and jaw crusher. Crushing operations duration would be approximately 50 working days over an approximately three-month span.

Figure 4
Expected Crusher Location



TECH

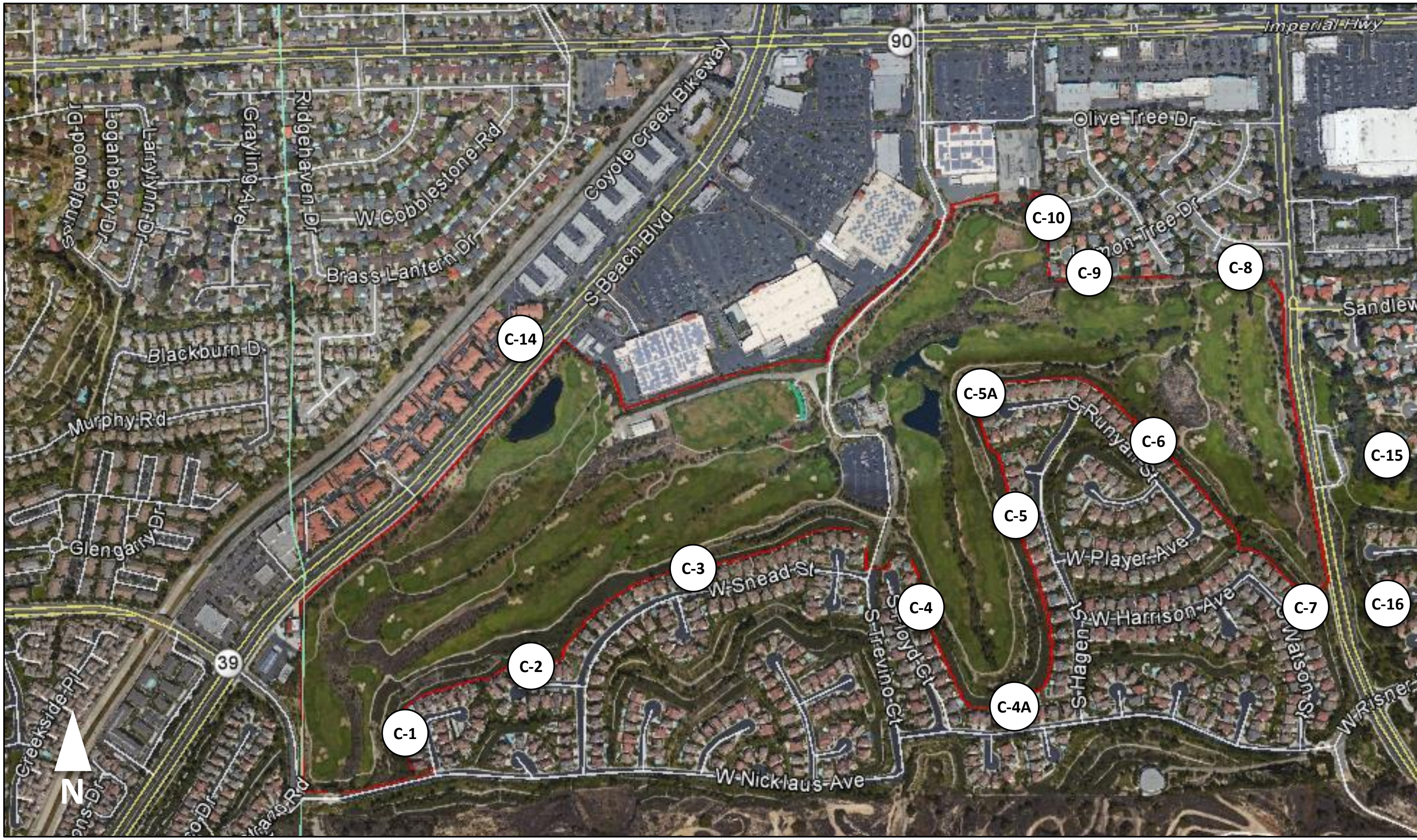
Typical construction equipment noise level data were obtained from the Roadway Construction Noise Model developed by FHWA (FHWA, 2006).   The noise database utilized for estimating construction noise levels includes maximum noise levels from each piece of machinery at a reference distance of 50 feet.

For each construction equipment, the L_{eq} is estimated using its reference noise level and usage factor combined with the distance to the receiver and local shielding factors, if applicable. Distance attenuation effect on noise levels from a construction point source is 6 dB per doubling of distance. Construction noise level calculations for the demolition, excavation, and crushing phase are shown in Appendix D.

Noise levels at representative noise-sensitive receivers, shown in Figure 5, were estimated for the combined demolition and crushing operations. Table 12 summarizes the average hourly noise level (L_{eq}) estimates from the demolition, excavation, and crushing operations, and compares them to existing background noise levels. It is important to note that these construction noise level estimates represent “worst-case” situations when all equipment would be operating simultaneously and without interruptions.

From estimated noise level increases shown in Table 12, it is apparent that the combined demolition and crushing activities would result in significant increases in daytime noise levels at adjoining residential uses represented by sites C-2 through C-5 along the south side of the project site and at exterior of existing homes north of the project site that are represented by sites C-8 through C-10.

Figure 5
Construction Noise Receiver Locations
Proposed Rancho La Habra Development



C-# Noise Receiver Location

TECH

TABLE 12

**Comparison of Estimated Construction to Existing Background Noise Levels (dB)
Demolition and Crushing Operations
Proposed Rancho La Habra Development Project**

Receiver Location	Demolition L_{eq}	Crushing L_{eq}	Combined Construction L_{eq}	Existing L_{eq}	Combined Construction + Existing L_{eq}	Estimated Increase over Existing L_{eq}
C-1	43	32	43	48	49	1
C-2	56	49	57	49	58	9
C-3	61	57	62	45	62	17
C-4	46	59	59	42	59	17
C-5	56	60	61	46	61	15
C-5A	59	67	68	46	68	22
C-6	33	44	44	48	49	1
C-7	30	34	35	59	59	-0-
C-8	51	57	58	50	59	9
C-9	54	62	63	45	63	18
C-10	54	63	64	40	64	24
C-14	55	50	56	68	68	-0-
C-15	39	49	49	53	54	1
C-16	28	38	38	56	56	-0-

Shaded cells indicate locations where significant increases above a 5-dB significance threshold would occur.

Source: A/E Tech LLC

6.1.2 Grading Noise Levels

The highest construction noise levels are expected to occur during times when mass grading and finishing grading activities occur. Grading of the project site would take place in three distinct physical areas within the project site. The grading areas are depicted by Figure 6, and described as follows:

- Area 1 will be the eastern portion of the project site. This area is bounded by the east project boundary along South Idaho Street, and the easternmost bluff on which the existing

Westridge Community homes along South Runyan Street are located. The north limit of this area is along the southern property boundaries of existing homes along Lemon Tree Drive and Rain Tree Drive. The western limit of this area is a straight north-south line at the western edge of the property at the western end of Lemon Tree Drive.

- Area 2 starts at the western edge of Area 1 and extends east to the existing entry road into the golf course. This area is bounded to the north by the existing commercial properties and to the south by the residential bluff of the Westridge Community. To the south of the above area, grading would include limited site preparation for recreational uses in the proposed City Park. Estimated grading operations are to be completed within the same timeframes.
- Area 3 will include all areas within the project site that are located west of the existing entry road into the golf course.

Mass grading of Area 1 would take place over a period of 30 working days. Area 2 would also be graded over a period of 30 working days. Grading of Area 3 would take 100 working days to complete.

Typical construction equipment noise level data were obtained from the Roadway Construction Noise Model developed by FHWA (FHWA, 2006). The noise database utilized for estimating construction noise levels includes maximum noise levels from each piece of machinery at a reference distance of 50 feet.

The equipment to be utilized during the peak grading activities period include six (6) scrapers, one tractor, one dozer, and three water trucks. In the future City Park area, two tractors/loaders and one water truck are expected to be utilized for precision grading. Noise levels at representative noise-sensitive receivers, shown in Figure 5, were estimated for each grading phase by using the equipment reference noise levels in a noise model developed for each of the three grading areas. Each noise model takes into account the maximum number of runs per hour for each piece of machinery in the given grading area, locations of noise-sensitive receivers, and noise attenuation due to distance and local shielding effects.

Table 13 summarizes the mass grading noise level estimates in terms of hourly L_{eq} for each grading area and compares the overall resultant noise levels to the existing background noise levels at each receiver location. These noise levels are based on a conservative assumption of non-stop grading activities by multiple construction equipment in each area during a full construction day. Therefore, because of variations in intensity of grading activities, it is likely that such noise levels would not persist for the full scheduled duration of mass grading. A more likely scenario is that construction noise levels would diminish in intensity towards the later months of mass grading as these operations wind down.

Figure 6
Project Grading Areas
Proposed Rancho La Habra Development

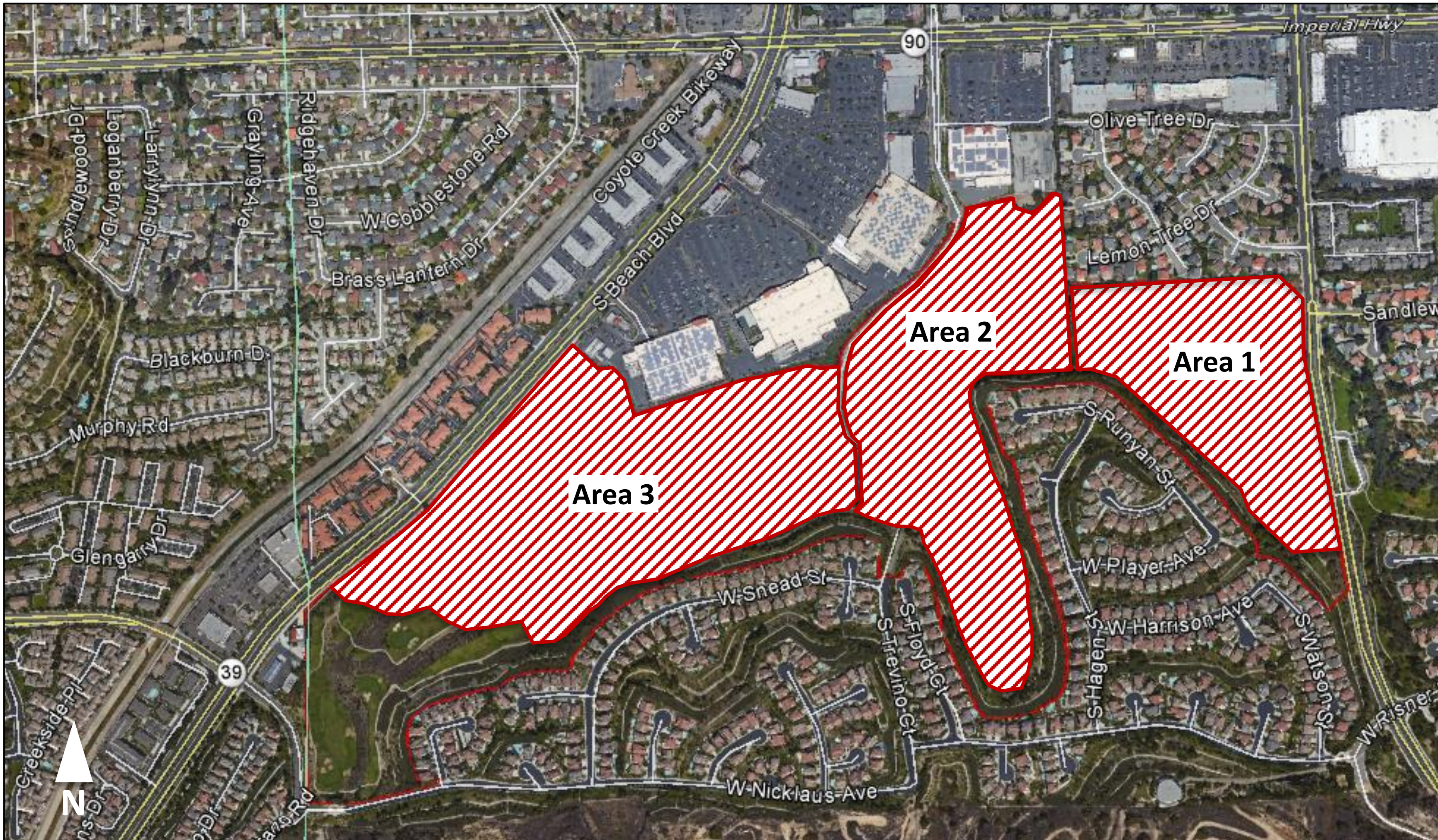


TABLE 13

Comparison of Estimated Construction to Existing Noise Levels (dB)
Grading Operations
Proposed Rancho La Habra Development Project

Receiver Location	Construction (Grading) L_{eq}	Existing L_{eq}	Combined Construction + Existing L_{eq}	Estimated Increase over Existing
Area 1				
C-1	23	48	48	-0-
C-2	39	49	49	-0-
C-3	40	45	46	1
C-4	41	42	45	3
C-5	37	46	47	1
C-5A	39	46	47	1
C-6	70	48	70	22
C-7	60	59	63	4
C-8	70	50	70	20
C-9	71	45	71	26
C-10	59	40	59	19
C-14	42	68	68	-0-
C-15	61	53	62	9
C-16	58	56	60	4
Area 2				
C-1	29	48	48	-0-
C-2	50	49	53	3
C-3	55	45	56	11
C-4	65	42	65	23
C-4A	63	42	63	21
C-5	64	46	64	18
C-5A	69	46	69	23
C-6	52	48	53	5
C-7	45	59	59	0
C-8	55	50	56	6

TABLE 13

Comparison of Estimated Construction to Existing Noise Levels (dB)
Grading Operations
Proposed Rancho La Habra Development Project

Receiver Location	Construction (Grading) L_{eq}	Existing L_{eq}	Combined Construction + Existing L_{eq}	Estimated Increase over Existing
C-9	64	45	64	19
C-10	70	40	70	30
C-14	50	68	68	0
C-15	51	53	55	2
C-16	44	56	56	0
Area 3				
C-1	55	48	56	8
C-2	64	49	64	15
C-3	65	45	65	20
C-4	35	42	43	1
C-5	51	46	52	6
C-5A	55	46	56	10
C-6	34	48	48	-0-
C-7	32	59	59	-0-
C-8	42	50	51	1
C-9	45	45	48	3
C-10	48	40	49	9
C-14	62	68	69	1
C-15	33	53	53	-0-
C-16	33	56	56	-0-

Shaded cells indicate locations where significant increases above a 5-dB threshold are estimated.

Source: A/E Tech LLC

Comparison of the combined construction and background noise levels to those existing at each location shows that grading operations would result in significant noise level increases at the exterior areas of homes nearest to each grading area.

6.1.3 Infrastructure and Building Construction

Construction of infrastructure, building site preparations, and fill slope settlement within the project site would commence towards the end of the mass grading phase. Infrastructure improvements, including storm drains, water and sewer mains, and streets would be installed over an approximately six- to eight-month period. Construction of residential structures would begin approximately one month after the mass grading phase and would be completed within approximately 30 months. Infrastructure installations and buildings construction would be more subdued than the grading/crushing activities in terms of both the number of equipment and level of intensity of construction.

Table 14 summarizes the noise level estimates from the combined infrastructure installation and building construction activities. As shown, construction noise levels during this period of construction would be lower than those during the grading phase. Nonetheless, construction noise would still be audible and exceed the existing background sound levels at the majority of the adjoining noise-sensitive land uses depending on the location and nature of construction at any given time.

Estimated construction noise levels in Tables 12, 13, and 14 were compared to the measured existing background noise levels in Tables 4 through 7 (see Section 5.1.1). Although construction activities would occur only during daytime hours exempted from the City's Code, construction noise levels during this phase would be clearly audible and exceed the established significance threshold at the exterior areas of adjoining homes in the Westridge community and homes located immediately north of the project site. The only neighboring locations where construction noise levels would not cause significant increases in noise levels would be at existing homes located east of South Idaho Street and west of Beach Boulevard.

TABLE 14

Estimated Construction Noise Levels (Hourly Leq, dB)
Combined Infrastructure and Building Construction
Proposed Rancho La Habra Development Project

Receiver Location	Infrastructure and Building Construction	Existing	Combined Construction + Existing	Estimated Increase over Existing
C-1	49	48	52	4
C-2	58	49	59	10
C-3	62	45	62	17
C-4	52	42	52	10
C-5	54	46	55	9
C-5A	61	48	61	13
C-6	61	48	61	13
C-7	54	59	60	1
C-8	61	50	61	11
C-9	61	45	61	16
C-10	58	40	58	18
C-14	59	68	69	1
C-15	55	53	57	4
C-16	52	56	57	1

Shaded cells indicate locations where significant increases above a 5-dB threshold would occur.

Source: A/E Tech

6.1.4 Construction Traffic Noise

During the construction of the proposed project, vehicular traffic on local roadways will increase due to use of personal vehicles by construction employees and hauling trucks transporting materials and equipment to and from the project site. Such increases in traffic volumes would result in increased traffic noise levels along the local roadways utilized by traffic associated with the project.

Approximately 25 workers will be onsite during these stages of construction. Operations will include the following:

Demolition/Crushing

- A six-day work week (Monday through Friday from 7:00 a.m. to 5:00 p.m.).
- The demolition/crushing phase is anticipated to last approximately 50 days (see Table 11).
- Maximum of 24 daily truck trips (i.e. 12 trucks) for export of any unusable material found.

Grading/Excavation

- A five-day work week (Monday through Friday from 7:00 a.m. to 5:00 p.m.).
- The grading/excavation phase is anticipated to last approximately 260 days.
- Approximately 15,000 cy of imported fill, associated with construction of retaining walls, will require hauling as follows:
    - 15 cy truck carrying capacity
    - 1,000 loaded trips in and 1,000 empty trips out
    - 100 trucks per day (200 trips)
    - Daily trips spaced out over an 8-hour work day
    - 10 days for import

Site Preparation/Installation of Infrastructure

- A five-day work week (Monday through Friday from 7:00 a.m. to 5:00 p.m.).
- The site preparation/infrastructure phase is anticipated to last approximately 120 days.

Based on the proposed construction schedule overlap may occur for approximately 20 working days between the Grading/Excavation stage described above and the Building Construction stage described as follows.

Building Construction

- A six-day work week (Monday through Saturday from 7:00 AM to 5:00 PM).
- The building construction phase is anticipated to last approximately four years.
- An approximate total of 200 workers will be on the site during the most intensive periods of construction.

In addition to the aforementioned assumptions for each construction component, the following assumptions were utilized for truck trips and employee trips:

- Each truckload requires an inbound trip and an outbound trip.
- Unlike other traffic on local area roadways, construction truck trips would not necessarily follow peak-hour patterns and would rather be randomly spread throughout each workday. Therefore, the daily number of truck trips was averaged over an 8-hour workday to obtain the number of peak hour truck trips (50 percent entering and 50 percent exiting).
- Each worker would make 2 trips per day (one during the AM peak hour and one during the PM peak hour).

The construction traffic route during the Demolition/Crushing stage, Grading/Excavation stage, and Site Preparation/Installation of Infrastructure stage would be South La Habra Hills Drive via Imperial Highway. This is because there is no existing access to the project site on Beach Boulevard or South Idaho Street. During the Building Construction stage, half of the construction traffic would travel to and from the project site on the above route and the remaining half would utilize Beach Boulevard.

Potential increases in traffic noise exposure due to vehicle trips generated during construction phases with the highest traffic volumes were evaluated using existing traffic volumes on local roadways leading to the project site and adding the highest anticipated construction traffic volumes to the existing volumes. The traffic data were utilized in the TNM to evaluate the differences in hourly average traffic noise level (Leq) between the existing and existing with construction AM peak-hour conditions. AM peak-hour was used for the analysis because it presents lower existing total traffic volumes than PM peak-hour on the roadways of interest, and would therefore result in higher increases in noise levels due to addition of construction traffic.

Based on the construction traffic assumptions, during the most intensive construction activities, a total of 125 employee automobiles would travel to the project site in the AM peak-hour and 13 trucks would arrive at and depart from the project site during this hour. For a "worst-case" analysis, all of the construction traffic is assumed to be split evenly between Imperial Highway and Beach Boulevard west of the project site.

Table 15 summarizes the comparison of calculated existing AM peak-hour L_{eq} values between the baseline and existing with construction conditions. As shown in Table 15, the proposed project construction truck traffic would cause increases in hourly traffic noise level of only up to 0.2 dB at the exterior of apartments along the west side of Beach Boulevard and at exterior of homes along Imperial Highway. Such increases in traffic noise would not be noticeable during daytime construction hours.

TABLE 15

Comparison of AM Peak-Hour Traffic Leq (dB)
Between Existing and Existing with Construction Conditions
Proposed Rancho La Habra Residential Development Project

Roadway Segment	AM Peak-hour Traffic Volume		Predicted Peak-hour Traffic Noise Level at 100 ft from Roadway Centerline		
	Existing	With Construction	Existing	With Construction	Noise Level Change
EB Imperial Hwy - West of Beach Blvd.	1,177	1,184	68.4	68.6	+0.2
WB Imperial Hwy - West of Beach Blvd.	1,730	1,800			
SB Beach Blvd. - South of Imperial Hwy	2,294	2,300	72.5	72.6	+0.1
NB Beach Blvd. - South of Imperial Hwy	1,761	1,829			

Based on the construction traffic assumptions, a total of 125 employee automobiles would travel to the project site in the AM peak-hour and 13 trucks would arrive at and depart from the project site during this hour. Construction traffic is assumed to be split evenly between Imperial Highway and Beach Boulevard west of the project site.

Sources: LLG, 2019
A/E Tech LLC

On an average daily basis, the project construction during its most intense periods would increase the average daily traffic (ADT) volume by 515 vehicle trips, including 250 employee vehicle trips and 265 heavy truck trips in and out of the project site. Noise effect of this increase in ADT on the CNEL at noise-sensitive locations along area roadways would be an increase of 0.1 dB or less. Therefore, increase in traffic CNEL along area roadways would not be noticeable at nearby noise-sensitive locations during the construction phase of the proposed project.

6.2 Project-Related Operational Noise

Long-term noise effects of the proposed project on neighboring noise-sensitive uses would be due to increased vehicular traffic on the local roadways generated by the proposed project. This analysis quantifies noise effects of increased traffic on local roadways due to the proposed project by comparing the forecast future traffic noise levels along area roadways without the project to those with the project.

6.2.1 Project-related Traffic Noise

The proposed project will add traffic to the local roadway system on a daily basis. Future vehicular traffic generated by the project would utilize the local area roadway network for accessing the project site. Potential increases in traffic noise exposure due to vehicle trips generated by the proposed project were evaluated using forecast peak-hour and ADT volumes on local roadways in the project opening year (Year 2023) and buildout conditions (Year 2035) with and without the proposed project.

With- and without-project buildout year (2035) AM and PM peak-hour traffic volumes and ADT volumes on the project area roadway network were obtained from the Traffic Impact Analysis prepared for the project (LLG, 2019). Vehicle composition data, including breakdown of automobiles, medium trucks (2-axle), and heavy trucks (3 or more axles), were derived from the California Department of Transportation (Caltrans) data and assumptions applied to the types of arterial roads in the project area (as defined by the City of La Habra General Plan, Circulation Element).

The traffic data were utilized in the FHWA TNM version 2.5 to evaluate differences in hourly average (L_{eq}) and daily (CNEL) traffic noise levels between the with- and without-project scenarios. Table 16 summarizes comparisons of calculated 2035 peak-hour L_{eq} values between the with-project and without-project scenarios at a set distance of 100 feet from the centerline of each road in the project area during AM and PM peak traffic hours.

From data in Table 16, it is apparent that the proposed project would cause virtually no change in noise levels in the buildout year (zero to 0.3 dB). Therefore, project traffic would not result in noticeable changes in traffic noise at noise-sensitive uses along area roadways during peak traffic hours, and such impacts would not be significant.

On a daily basis, the proposed project would increase the ADT volume on South Idaho Street, between Imperial Highway and Sandlewood Avenue, by 698 vehicles and on Beach Boulevard, between Imperial Highway and Hillsborough Park Apartments, by 3,203 total vehicles. In project buildout year (2035), the ADT would increase from 24,051 vehicles to 24,749 vehicles on South Idaho Street between Sandlewood Avenue and Imperial Highway. Noise effect of such an increase in daily volumes on the CNEL at locations along the roadway would only be a 0.1 dB increase. On Beach Boulevard between Imperial Highway and Hillsborough Park, the ADT in 2035 would increase from 65,172 vehicles to 68,375 vehicles as a result of the project. This would also result in only a 0.1 dB increase in CNEL along Beach Boulevard. Therefore, increase in daily average traffic noise levels would also be insignificant.

TABLE 16

Comparison of Forecast Buildout 2035 Traffic Noise Levels With and Without the Proposed Rancho La Habra Development Project

Roadway Segment	AM Peak Hour						PM Peak Hour					
	2035 Buildout		2035 Buildout + Project		Difference		2035 Buildout		2035 Buildout + Project		Difference	
	SB/EB	NB/WB	SB/EB	NB/WB	SB/EB	NB/WB	SB/EB	NB/WB	SB/EB	NB/WB	SB/EB	NB/WB
Imperial Highway												
West of Valley View	69.9	70.6	70.0	70.7	0.1	0.1	70.2	69.9	70.3	70.0	0.1	0.1
Valley View Ave. to La Mirada Blvd.	70.6	71.1	70.8	71.1	0.2	0.0	70.6	70.5	70.6	70.5	0.0	0.0
La Mirada Blvd. to Santa Gertrudes Ave.	70.9	71.4	70.9	71.4	0.0	0.0	70.9	70.9	71.0	70.9	0.1	0.0
Santa Gertrudes Ave. to 1st Ave.	70.7	71.0	70.8	71.1	0.1	0.1	70.8	70.7	70.9	70.8	0.1	0.1
1st Ave. to Beach Blvd.	70.8	71.0	70.9	71.1	0.1	0.1	70.7	70.8	70.9	70.9	0.2	0.1
Beach Blvd. to La Habra Hills Dr.	71.6	71.5	71.7	71.6	0.1	0.1	71.1	71.1	71.3	71.3	0.2	0.2
La Habra Hills Dr. to Idaho St.	71.4	71.3	71.5	71.3	0.1	0.0	70.9	71.0	71.1	71.1	0.2	0.1
Idaho St. to Walnut St.	72.6	72.4	72.6	72.5	0.0	0.1	72.3	72.4	72.4	72.5	0.1	0.1
Walnut St. to Euclid St.	72.5	72.4	72.6	72.4	0.1	0.0	72.2	72.5	72.3	72.6	0.1	0.1
Euclid St. to Harbor Blvd.	73.1	72.9	73.1	72.9	0.0	0.0	72.4	72.7	72.4	72.8	0.0	0.1
East of Harbor Blvd.	71.9	71.8	72.0	71.9	0.1	0.1	71.5	71.8	71.6	71.8	0.1	0.0
Beach Blvd.												
Artesia Blvd. to Malvern Ave.	69.7	70.5	69.8	70.5	0.1	0.0	69.5	70.8	69.6	70.9	0.1	0.1
Malvern Ave. to Rosecrans Ave.	72.7	72.3	72.8	72.4	0.1	0.1	72.5	72.8	72.6	73.0	0.1	0.2
Rosecrans Ave. to Hillsborough Dr.	73.9	73.7	74.1	73.8	0.2	0.1	73.4	74.0	73.6	74.2	0.2	0.2
Hillsborough Dr. to Hillsborough Park Apts.	72.3	72.5	72.5	72.7	0.2	0.2	72.5	73.1	72.7	73.2	0.2	0.1
Hillsborough Park Apts. to Imperial Hwy	73.2	73.2	73.3	73.3	0.1	0.1	73.2	73.6	73.4	73.7	0.2	0.1
Imperial Hwy to Lambert Rd.	71.1	70.4	71.1	70.5	0.0	0.1	71.7	71.6	71.7	71.6	0.0	0.0
Lambert Rd. to La Habra Blvd.	70.5	70.2	70.6	70.3	0.1	0.1	70.4	70.6	70.4	70.7	0.0	0.1
La Habra Blvd. to Whittier Blvd.	69.8	69.3	69.9	69.4	0.1	0.1	69.9	70.0	69.9	70.1	0.0	0.1

TABLE 16

Comparison of Forecast Buildout 2035 Traffic Noise Levels With and Without the Proposed Rancho La Habra Development Project

Roadway Segment	AM Peak Hour						PM Peak Hour					
	2035 Buildout		2035 Buildout + Project		Difference		2035 Buildout		2035 Buildout + Project		Difference	
	SB/EB	NB/WB	SB/EB	NB/WB	SB/EB	NB/WB	SB/EB	NB/WB	SB/EB	NB/WB	SB/EB	NB/WB
Artesia Blvd.												
West of Beach Blvd.	67.5	67.7	67.6	67.7	0.1	0.0	68.1	67.9	68.2	67.9	0.1	0.0
Beach Blvd. to Gilbert St.	66.2	66.3	66.2	66.3	0.0	0.0	66.6	66.5	66.6	66.5	0.0	0.0
Malvern Avenue												
West of Beach Blvd.	68.4	69.0	68.4	69.0	0.0	0.0	68.3	68.9	68.3	69.0	0.0	0.1
Beach Blvd. to Gilbert St.	68.2	68.1	68.3	68.1	0.1	0.0	68.3	68.6	68.4	68.6	0.1	0.0
Gilbert St. to Euclid St.	67.8	68.1	67.9	68.1	0.1	0.0	68.2	68.8	68.2	68.8	0.0	0.0
Euclid St. to Harbor Blvd.	67.2	66.8	67.2	66.8	0.0	0.0	67.1	67.4	67.2	67.4	0.1	0.0
Rosecrans Avenue												
West of Beach Blvd.	68.2	67.6	68.2	67.7	0.0	0.1	68.2	67.5	68.3	67.5	0.1	0.0
Beach Blvd. to Gilbert St.	67.8	67.5	67.9	67.5	0.1	0.0	67.5	67.3	67.7	67.5	0.2	0.2
Gilbert St. to Euclid St.	66.5	67.1	66.6	67.1	0.1	0.0	65.5	66.9	65.5	67.0	0.0	0.1
Lambert Road												
Wall St. to Beach Blvd.	68.1	68.0	68.1	68.1	0.0	0.1	68.3	68.5	68.3	68.5	0.0	0.0
Beach Blvd. to Idaho St.	68.1	68.1	68.1	68.1	0.0	0.0	68.7	69.2	68.7	69.2	0.0	0.0
Idaho St. to Euclid St.	68.2	68.1	68.2	68.1	0.0	0.0	68.6	69.1	68.6	69.1	0.0	0.0
Euclid St. to Harbor Blvd.	67.7	67.4	67.7	67.4	0.0	0.0	68.5	69.2	68.5	69.2	0.0	0.0
East of Harbor Blvd.	68.4	68.1	68.4	68.1	0.0	0.0	68.9	69.7	68.9	69.8	0.0	0.1
La Habra Blvd.												
West of Beach Blvd.	65.4	65.7	65.4	65.7	0.0	0.0	66.2	66.0	66.2	66.0	0.0	0.0
East of Beach Blvd.	65.6	65.8	65.7	65.8	0.1	0.0	66.5	66.1	66.5	66.1	0.0	0.0

TABLE 16

Comparison of Forecast Buildout 2035 Traffic Noise Levels
With and Without the Proposed Rancho La Habra Development Project

Roadway Segment	AM Peak Hour						PM Peak Hour					
	2035 Buildout		2035 Buildout + Project		Difference		2035 Buildout		2035 Buildout + Project		Difference	
	SB/EB	NB/WB	SB/EB	NB/WB	SB/EB	NB/WB	SB/EB	NB/WB	SB/EB	NB/WB	SB/EB	NB/WB
Whittier Blvd.												
West of Beach Blvd.	67.7	67.7	67.7	67.7	0.0	0.0	67.8	67.8	67.9	67.8	0.1	0.0
East of Beach Blvd.	68.4	68.8	68.4	68.8	0.0	0.0	69.3	69.2	69.3	69.2	0.0	0.0
Valley View Avenue												
South of Imperial Hwy	68.5	68.4	68.5	68.4	0.0	0.0	68.5	68.6	68.5	68.6	0.0	0.0
North of Imperial Hwy	65.1	64.6	65.1	64.6	0.0	0.0	64.7	64.7	64.7	64.7	0.0	0.0
La Mirada Boulevard												
South of Imperial Hwy	68.2	67.7	68.2	67.7	0.0	0.0	67.3	67.2	67.3	67.2	0.0	0.0
North of Imperial Hwy	67.6	66.9	67.6	66.9	0.0	0.0	66.6	66.5	66.6	66.5	0.0	0.0
Santa Gertrudes Avenue												
South of Imperial Hwy	65.4	65.2	65.4	65.2	0.0	0.0	66.2	66.7	66.2	66.7	0.0	0.0
North of Imperial Hwy	64.8	64.4	64.8	64.4	0.0	0.0	65.8	66.3	65.8	66.3	0.0	0.0
1st Avenue												
South of Imperial Hwy	55.2	55.2	55.2	55.3	0.0	0.1	55.4	55.3	55.5	55.4	0.1	0.1
North of Imperial Hwy	62.4	62.1	62.4	62.2	0.0	0.1	61.7	61.9	61.7	61.9	0.0	0.0
Gilbert Street												
South of Malvern Ave.	67.7	68.1	67.7	68.2	0.0	0.1	67.4	68.7	67.5	68.7	0.1	0.0
Malvern Ave. to Rosecrans Ave.	66.5	66.3	66.6	66.3	0.1	0.0	66.7	67.2	66.8	67.3	0.1	0.1
Idaho Street												
Rosecrans Ave. to Sandlewood Ave.	66.8	66.0	67.1	66.2	0.3	0.2	67.4	67.5	67.5	67.6	0.1	0.1
Sandlewood Ave. to Imperial Hwy	67.9	67.6	68.0	67.7	0.1	0.1	68.0	68.3	68.1	68.4	0.1	0.1

TABLE 16

Comparison of Forecast Buildout 2035 Traffic Noise Levels With and Without the Proposed Rancho La Habra Development Project

Roadway Segment	AM Peak Hour						PM Peak Hour					
	2035 Buildout		2035 Buildout + Project		Difference		2035 Buildout		2035 Buildout + Project		Difference	
	SB/EB	NB/WB	SB/EB	NB/WB	SB/EB	NB/WB	SB/EB	NB/WB	SB/EB	NB/WB	SB/EB	NB/WB
Idaho Street												
Imperial Hwy to Lambert St.	65.9	65.4	65.9	65.4	0.0	0.0	66.2	66.4	66.3	66.4	0.1	0.0
North of Lambert St.	64.9	64.3	64.9	64.3	0.0	0.0	65.0	65.2	65.0	65.3	0.0	0.1
Euclid Street												
Commonwealth Ave. to Malvern Ave.	65.9	65.6	65.9	65.7	0.0	0.1	65.9	66.0	65.9	66.0	0.0	0.0
Malvern Ave. to Rosecrans Ave.	66.6	66.9	66.6	66.9	0.0	0.0	66.2	67.6	66.3	67.6	0.1	0.0
Rosecrans Ave. to Sandlewood Ave.	69.9	67.1	69.9	67.1	0.0	0.0	69.8	68.1	69.9	68.2	0.1	0.1
Sandlewood Ave. to Imperial Hwy	68.8	67.2	68.8	67.3	0.0	0.1	68.4	67.5	68.5	67.6	0.1	0.1
Imperial Hwy to Lambert St.	67.0	66.7	67.0	66.7	0.0	0.0	65.4	65.8	65.4	65.8	0.0	0.0
North of Lambert St.	65.8	65.3	65.8	65.3	0.0	0.0	65.9	66.2	65.9	66.2	0.0	0.0
Harbor Boulevard												
South of Imperial Hwy	70.7	70.2	70.7	70.2	0.0	0.0	70.1	70.4	70.1	70.4	0.0	0.0
Imperial Hwy to Lambert St.	69.6	69.0	69.6	69.1	0.0	0.1	69.4	69.5	69.4	69.6	0.0	0.1
North of Lambert St.	69.5	68.5	69.6	68.5	0.1	0.0	69.8	69.7	69.8	69.7	0.0	0.0

Source: A/E Tech LLC

6.2.2 Project-related Commercial Noise

Addition of a retail store and a restaurant to the northwest part of the project site would introduce additional noise sources to the east side of the commercial buildings, where delivery bays and other noise-generating sources would be located. These areas are located nearly 1,000 feet from the nearest existing homes within the Westridge Community. Because commercial noise levels at the nearest residential uses south of the project site would be more than 10 dB below existing background noise levels, noise effects from the potential new commercial sources on the nearest existing noise-sensitive land uses would be negligible and indistinguishable from sounds already in the area. Furthermore, cumulative noise from traffic on Beach Boulevard and other existing commercial sources will be at levels which would not change by the introduction of these new noise sources.

6.3 Future Noise Impacts on the Project

6.3.1 Exterior Noise

Noise exposure at the exterior areas of proposed future homes within the Project would be primarily due to vehicular traffic movements on South Idaho Street and Beach Boulevard and commercial activities along the south side of Westridge Plaza shopping center and back side of potential new commercial uses to be added by the project.

Future (2035) with-project traffic data and future Project site topography and proposed lot plans were utilized in the TNM models developed for the project for assessment of future traffic noise levels within the project site. The selected analysis locations include the backyards of first row of single-family homes along South Idaho Street and the exterior of first row of multi-family uses and nearest single-family homes along Beach Boulevard. The representative future noise-sensitive locations where traffic noise levels are evaluated are shown by Figures 7-A and 7-B.

A conservative day/evening/night ADT split of 85%/5%/10% was utilized for a "worst-case" estimation of CNEL for future buildout plus project traffic conditions. PM peak hour traffic volumes were used for calculation of highest hourly noise levels. Table 17 summarizes the results of the traffic noise analysis in terms of the PM peak-hour L_{eq} and estimated CNEL at the selected receiver locations.

From data in Table 17 it is apparent that the calculated future peak-hour traffic noise levels at first-floor exterior areas of both the multi-family and single-family homes along Beach Boulevard would exceed the City of La Habra exterior noise standards for residential uses. The predicted traffic noise levels at the exterior areas of nearest multi-family homes to Beach Boulevard would also exceed the land use compatibility threshold of 60 dB CNEL.

Figure 7-A
Traffic Noise Analysis Locations
Along South Idaho Street

Figure 7-B
Traffic Noise Analysis Locations
Along South Beach Boulevard

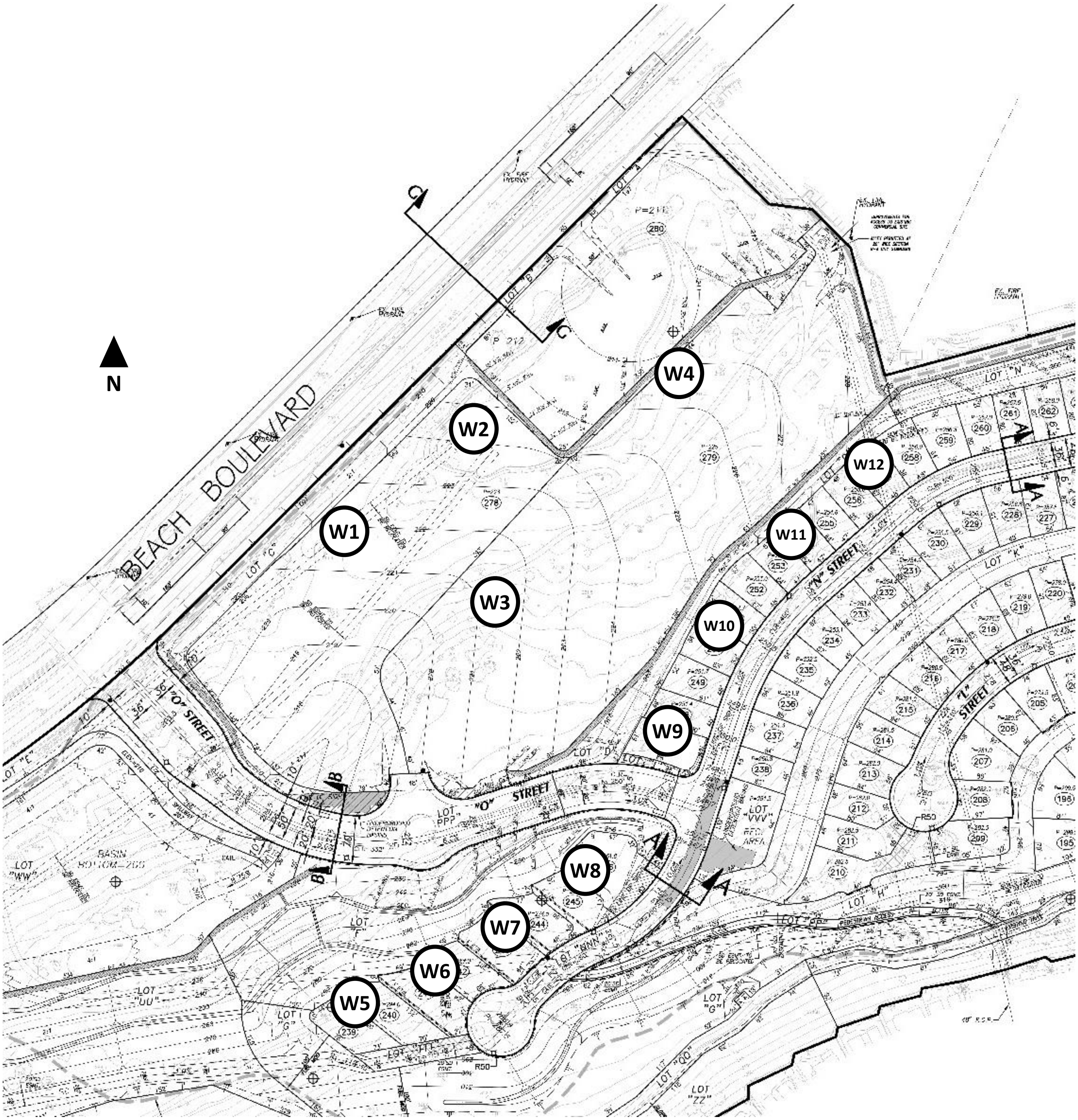


TABLE 17

Calculated Future (2035) With Project Traffic Noise Levels (dB)
Proposed Rancho La Habra Development Project

Receiver Location	Lot No.	PM Peak Hour Leq	CNEL
Along South Idaho Street			
E1	Lot 2	66	66
E2	Lot 3	68	67
E3	Lot 11	65	64
E4	Lot 12	66	66
E5	Lot 28	64	63
E6	Lot 29	58	58
Along Beach Boulevard			
W1	Lot 278 (pool)	71	72
W2	Lot 278	69	69
W3	Lot 279	56	56
W4	Lot 279	63	64
W5	Lot 239	61	62
W6	Lot 241	59	59
W7	Lot 243	59	60
W8	Lot 245	57	57
W9	Lot 247	56	56
W10	Lot 250	57	58
W11	Lot 253	58	59
W12	Lot 256	59	59

Note: Calculated noise levels are at first-floor elevations.

Source: A/E Tech LLC

At the exterior activity areas of the first row of future single-family homes along South Idaho Street, future traffic noise levels without mitigation would exceed the City's exterior noise standards and land use compatibility limit for residential uses.

6.3.2 Interior Noise

The interior noise level standard of the City of La Habra is 55 dB during daytime and 45 dB during nighttime hours. The worst-case future exterior noise exposure would occur at the exterior of multi-family homes closest to Beach Boulevard (Lot 278 of Site Plan). This means that an outdoor to indoor noise level reduction (NLR) of up to 17 dB (72-55=17) will be required to comply with the City's interior noise level standard during daytime. NLR of up to 27 dB may be required in the unlikely event that the same noise levels occur during nighttime hours.

To document compliance with the interior noise level standard of the City, a detailed analysis of the proposed construction was conducted to determine the NLR which will be provided by the buildings. The NLR provided by a building may be calculated by assuming a generalized sound level spectrum, correcting for A-weighting, determining the composite transmission loss and resulting sound level inside an affected room, correcting for room absorption and calculating the overall sound level inside the room. Worst-case exterior noise exposures were assumed to be 72 dB at the multi-family building facades along Beach Boulevard, and 67 dB at exterior areas of future single-family homes along South Idaho Street. It was also assumed for the calculations that windows and doors would remain closed, meaning that air conditioning or some form of mechanical ventilation would be required. Since experience has shown that the transmission loss performance reported for laboratory test conditions cannot be expected from normal "as-built" assemblies, a 3 dB adjustment is applied for the determination of compliance with applicable County noise level standards.

Construction details, based upon floor plans provided by the builder are summarized as follows, including the Sound Transmission Class (STC) of each sound transmitting component:

a. <u>Exterior Walls</u>: Stucco siding, 2"×4" wood studs, 1/2" gypsum board on the inside with cavity insulation (STC 46)

b. <u>Windows</u>: Low air-infiltration-rate aluminum frame sliders with dual glazing (STC 26)

c. <u>Doors</u>: Solid core wood or french doors with perimeter weather-stripping and threshold seals (STC 31)

d. <u>Interior Floors</u>: Carpet and pad or a combination of carpet and vinyl or another soft tile

e. <u>Interior Walls and Ceiling:</u> Gypsum board walls and ceiling

Table 18 presents a summary of calculated NLR values based upon the above-described construction details and transmission loss data obtained from laboratory test reports for individual building component assemblies.

From Table 18 it is apparent that the proposed construction of the buildings will achieve the required NLR levels for compliance with the City's interior noise level standard.

TABLE 18

Summary of Building Noise Level Reduction (NLR) Calculations
Proposed Rancho La Habra Residential Development

Room	Exterior CNEL	Building Attenuation (NLR)	Resulting Interior Sound Level
Multi-Family Unit Plan D			
First Floor Living Room/Dining/Kitchen	72 dB	28 dB	44 dB
Second Floor Master Bedroom/Retreat	72 dB	27 dB	45 dB
Second Floor Bedroom 3	72 dB	39 dB	33 dB
Third Floor Optional Bedroom	72 dB	30 dB	42 dB
Multi-Family Unit Plan E			
First Floor Living/Dining/Kitchen	72 dB	30 dB	42 dB
Second Floor Master Bedroom	72 dB	32 dB	40 dB
Second Floor Bedroom 2	72 dB	30 dB	42 dB
Third Floor Bedroom 4 Suite	72 dB	31 dB	41 dB
Single-Family Plan 1			
First Floor Great Room/Dining/Kitchen	67 dB	26 dB	41 dB
Second Floor Master Bedroom	67 dB	27 dB	40 dB
Second Floor Master Bath	67 dB	32 dB	35 dB

NLR = Outdoor-to-indoor Noise Level Reduction
Note: NLR values include a 3 dB adjustment for "as-built" assemblies.

Source: A/E Tech LLC

7. VIBRATION

This section presents the analysis of potential vibration impacts that construction equipment used during the grading phase of the proposed project may have at the nearest residential uses adjoining the project site. The vibration analysis consisted of measuring how groundborne vibration is transmitted across the local ground closest to the homes of concern, and predicting the levels of construction equipment vibration that will be caused by grading operations. The principal conclusion of the vibration analysis is that the local ground attenuation would provide sufficient dampening of vibration so that future groundborne vibration levels from construction equipment would be below the commonly used human perception and building damage thresholds within the backyards and at structures of homes adjoining the project site.

The vibration impact assessment follows the criteria/thresholds that are provided by the Federal Transit Administration (FTA) in the document Transit Noise and Vibration Impact Assessment (FTA, 2006). That document is referred to as the "FTA Guidance Manual" in the remainder of this report.

7.1 Vibration Propagation Tests

On Monday, July 13, 2015, A/E Tech LLC conducted vibration propagation tests of the local ground adjoining the neighboring homes along the northeast project property line and at the foot of the slope along the west side of the homes west of South Hagen Street. The vibration propagation tests consisted of using a 200-lb weight dropped from an approximate height of 3 feet above the ground to generate vibration pulses, and simultaneously measuring the resulting vibration response at four predetermined distances of 12.5, 25, 50, and 100 feet from the vibration impact location. Figure 8-A is an overview of the vibration test locations within the project site, and Figures 8-B and 8-C show the specific measurement locations labeled as positions 1 through 4 at each of the test locations. Vibration test Site 1 was selected to determine the local ground vibration attenuation for homes along the northeast boundary of the project site, and test Site 2 was chosen to be representative of the geologic conditions for existing homes in the Westridge Community located south of the project site.

Figure 8-A
Vibration Test Locations
Proposed Rancho La Habra Residential Development

Figure 8-B
Vibration Test Configuration
@ Site 1

Figure 8-C
Vibration Test Configuration
@ Site 2

The vibration measurements were conducted using four PCB Piezotronics (PCB) model 393B04 seismic accelerometers. The vibration pulse data from the four accelerometers were captured simultaneously using a National Instruments model NI 9234 four-channel signal processor. Appendix E shows the photographs of the vibration impact weight apparatus and each of the four measurement accelerometers at the two test sites in the field.

As the exciting force (i.e., 200-lb weight) was imparted on the ground, the ground motion it generated was captured by each of the accelerometers at the setback distance of the sensor from the weight drop location. A total of three events were measured at each of the four measurement locations at each test site, and the signals were captured for later analysis. Appendix F shows the results of the vibration acceleration measurements in terms of the gravity force, g (g = 9.80665 m/sec^2 or 386.08 in/sec^2). As can be seen in the signal charts shown in Appendix F, each event of the weight drop generated an acceleration signal at each of the four measurement locations. Acceleration amplitude of each event dissipates with distance from the location of the exciting force. Table 19 summarizes the numerical values of the measured peak acceleration for each of the vibration events at the four measurement locations at each test site.

TABLE 19

Measured Onsite Vibration Acceleration Values

Measurement No.	Measured Acceleration (in/sec^2)				Ground Attenuation Rate From 25 to 100 ft
	Position 1 @ 12.5 ft	Position 2 @ 25 ft	Position 3 @ 50 ft	Position 4 @ 100 ft	
Test Site 1					
1	41.82	25.12	20.58	6.09	0.242
2	60.5	25.71	19.87	5.91	0.230
3	61.85	21.55	19.00	3.76	0.174
Average Attenuation Rate from 25 ft to 100 ft					0.216
Test Site 2					
1	356.00	232.92	165.70	6.21	0.027
2	482.50	153.20	94.20	7.55	0.049
3	307.15	80.93	52.15	6.13	0.076
Average Attenuation Rate from 25 ft to 100 ft					0.051
Source: A/E Tech					

Table 20 also shows the ground attenuation rate between distances of 25 feet to 100 feet from the exciting force. From the attenuation data, it appears that the local ground at test Site 1 results in an attenuation of vibration acceleration at rates ranging between 0.174 to 0.242. The average calculated attenuation rate of the local soil at test Site 1 is 0.216, meaning that the vibration level at 100 feet from the source would drop to 0.216 of the vibration level at a distance of 25 feet from the source. At test Site 2, the local ground results in an attenuation of vibration acceleration at rates ranging between 0.027 to 0.076. The average calculated attenuation rate of the local soil at test Site 2 is 0.051 from 25 feet to 100 feet from the vibration impact location.

Construction activities typically result in varying degrees of ground vibration, depending on the equipment and methods employed. Operation of construction equipment causes ground vibrations that spread through the ground and diminish in strength with distance.

Ground vibrations from construction activities do not often reach the levels that can damage structures, but they could achieve the audible and feelable ranges in buildings very close to the site. Many construction equipment, such as air compressors, light trucks, hydraulic loaders, etc. are of the type that generates little or no ground vibration. Other heavy equipment including bulldozers and rollers to be utilized during the grading phase of the Rancho La Habra Development project could cause perceptible vibration levels in the local ground.

To determine the potential vibration effects of grading activities at the homes adjoining the project, vibration source levels for construction equipment were obtained from the FTA Guidance Manual (FTA, 2006). Table 20 is a summary of the reference source vibration data in terms of peak particle velocity (PPV) in units of in/sec.

Since vibration acceleration and vibration velocity are directly proportional to each other, the ground acceleration attenuation that is computed from the acceleration measurement data may be applied to the source data in Table 20 in order to estimate the vibration levels from various pieces of machinery at the homes abutting the project site.

TABLE 20

Reference Vibration Source Levels for Construction Equipment

Equipment		PPV at 25 ft (in/sec)
Clam shovel drop (slurry wall)		0.202
Hydromill (slurry wall)	in soil	0.008
	in rock	0.017
Vibratory Roller		0.210
Hoe Ram		0.089
Large bulldozer		0.089
Caisson drilling		0.089
Loaded trucks		0.076
Jackhammer		0.035
Small bulldozer		0.003

Source: FTA Guidance Manual, May 2006

Near test Site 1, based on an average attenuation rate of 0.216 between 25 feet and 100 feet from the impact location, a large bulldozer would generate a PPV of 0.019 in/sec at a distance of 100 feet within the project site (0.216x0.089 = 0.019). Similarly, a vibratory roller would generate a PPV of 0.045 in/sec at 100 feet from the equipment (0.216x0.210 = 0.045).

In areas that are on ground similar to test Site 2, based on an average attenuation rate of 0.051 between 25 to 100 feet, a large bulldozer would generate a PPV of 0.005 in/sec at a distance of 100 feet (0.051x0.089 = 0.005). Similarly, a vibratory roller would generate a PPV of 0.011 in/sec at 100 feet from the equipment (0.051x0.210 = 0.011).

7.2 Vibration Impact Determination

This vibration impact assessment is based on impact thresholds provided in the FTA Guidance Manual (FTA, 2006). The FTA criteria include limits on the building vibration that may be perceptible and hence annoying to building occupants and also limits on vibration levels that might cause building damage. The FTA criteria for groundborne vibration include limits for various building types, including residential.

The specific groundborne vibration impact limit applicable to residential uses is the threshold of feelable vibration, which is a PPV of approximately 0.03165 in/sec (FTA, 2006). Table 21, from the FTA Guidance Manual, shows vibration damage criteria for various building types.

TABLE 21

Construction Vibration Damage Criteria

Building Category	PPV (in/sec)
I. Reinforced-concrete, steel or timber (no plaster)	0.5
II. Engineered concrete and masonry (no plaster)	0.3
III. Non-engineered timber and masonry buildings	0.2
IV. Buildings extremely susceptible to vibration damage	0.12
Source: FTA Guidance Manual, May 2006	

Shortest distances from the residential structures of concern to the nearest grading activities associated with the project would be nearly 50 to 100 feet or more at the first row of single-family homes northeast of the project site (near test Site 1). Based on the local ground vibration attenuation rate, the predicted vibration peak particle velocity from a large bulldozer at such distances would be between 0.02 in/sec to 0.07 in/sec at the same elevations as the construction equipment. Such levels may exceed the threshold of human perception at times, however, they are far below the building damage criteria listed in Table 21.

The use of mechanical rollers or soil compactors near areas similar to test Site 1 would result in peak ground particle velocities between 0.045 and 0.17 in/sec at distances between 50 to 100 feet from the equipment. Therefore, ground vibration from such equipment would be felt at the adjacent homes but would not cause any structural damge to buildings because they are below the 0.2 in/sec damage criterion applicable to typical residential structures.

In the residential areas along the south side of the project site, ground type is generally similar to that near the vibration test Site 2. Nearest distances from receivers within the Westridge residential community to construction activities are expected to be greater than 100 feet. Furthermore, the backyards and building structures of these homes are elevated above the local ground within the project site. The vertical separation of the project soil from the surface soil of the residential lots would result in substantial additional dampening of vibration from the construction equipment. The combination of these factors would result in vibration levels from vibratory rollers, which are the equipment that generate the highest vibration levels, to be below 0.011 in/sec. Such levels are far below the threshold of perceptibility.

8. CUMULATIVE NOISE IMPACTS

8.1 Construction Noise

For determination of cumulative noise impacts from construction of the proposed project, existing background noise levels that were determined through onsite noise monitoring at representative noise-sensitive receivers have been combined with the estimated noise levels from each phase of project construction. Other related projects in the vicinity of the Ranch La Habra project that have the potential to be constructed concurrently with the project include the proposed West Coyote Hills residential development located in the City of Fullerton and south of the existing Westridge Community.

The West Coyote Hills project site is located on the south side of the hill south of the Rancho La Habra project site and is acoustically well shielded by local terrain and multiple rows of existing residential structures. Furthermore, the distance between the two projects causes a relatively large distance attenuation on noise levels. It is certain that construction noise levels from the West Coyote Hills project would primarily impact the outdoor areas of residential land uses along the south side of the Westridge Community facing that project. The combined shielding and distance attenuation would result in sound level reductions on the order of 20 to 30 dB from each project at receivers nearest to the other project. Therefore, in the event that West Coyote Hills is constructed simultaneously with Rancho La Habra, construction noise from each of these projects would not contribute to noise levels at the receivers impacted by the other.

8.2 Operational Noise

The long-term, permanent source of noise from the project is vehicular traffic generated by the project. The traffic noise analysis presented in this report (see Section 6.2.1) takes all future traffic, including project and non-project traffic, into account. Therefore, the analysis is inherently a cumulative noise evaluation of traffic in the project area. This analysis shows that the project would not result in significant effects on cumulative noise levels at noise-sensitive locations in the project environs.

9. MITIGATION

9.1 Construction Noise

Estimated noise exposure due to construction of the proposed Project would exceed the existing background sound levels during daytime hours. The City exempts construction activities from its

Municipal Code noise requirements between the hours of 7 a.m. and 8 p.m. on weekdays and Saturdays. While the project construction times would be limited to hours exempted from the City code, the project construction would still result in significant noise level increases at certain noise-sensitive locations during each phase of construction (see Section 6.1 for details of impacts).

Typically, to minimize annoyance of neighboring noise-sensitive uses, the contractors develop construction noise mitigation plans that include:

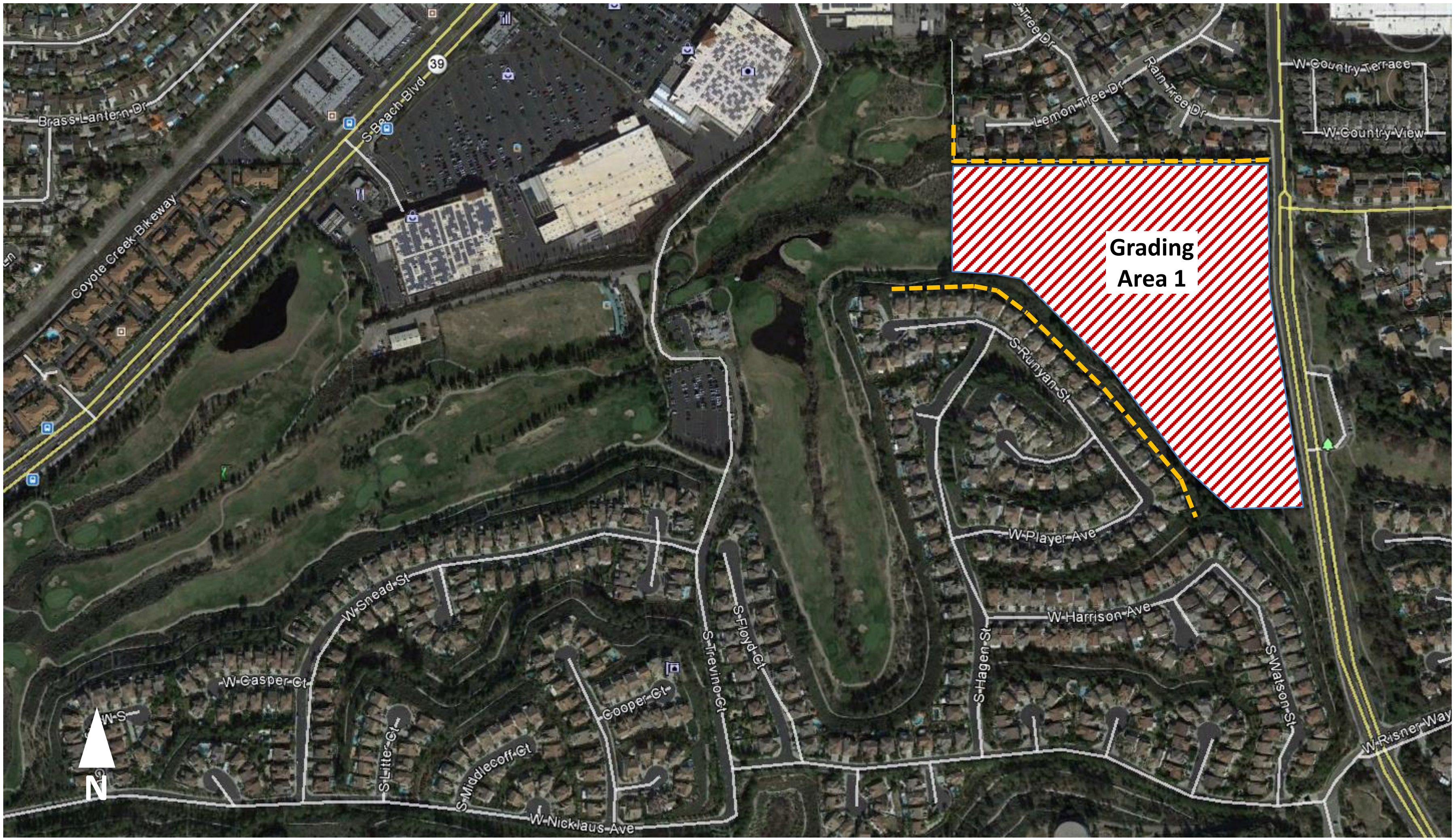
- Using equipment engines fitted with mufflers,
- Placing construction staging and equipment storage areas at locations as far away from noise-sensitive locations as possible.

While such measures would be helpful and should be implemented, they alone would not be sufficient to mitigate construction noise levels to below significant increases. To have the potential to mitigate construction noise to levels below the threshold of significant increase, the Project would need to consider erecting temporary noise barriers between the impacted noise receiver locations and locations of construction activities. During the grading phase in grading Areas 1 and 2, such noise barriers would have to reduce construction noise levels at the backyards of homes within the Westridge Community by up to 17 dB, and result in exterior noise reductions between 14 dB and 26 dB in backyards of homes located northeast of the project site. During grading in Area 3, the temporary noise barriers would need to reduce construction noise levels in backyards of first row of home in the Westridge Community by up to 15 dB.

Figures 9-A through 9-C show the locations where temporary construction noise barriers would need to be considered based on the findings of noise impacts during each phase of construction (see Tables 9 through 11). To be effective, noise barriers would have to be placed near the backyard fences of impacted homes, must be continuous without gaps, made of massive enough materials to minimize transmission of sound waves through the material itself, and of sufficient height to block the line of sight between the receptor and the source.

Temporary noise barriers of heights of 12 feet above the backyard pad elevation at impacted locations directly facing construction activities would reduce noise levels at exterior areas of the first row of homes within the Westridge Community by up to 12 dB. Similar size 12-foot-high noise barriers along the northeast boundaries of the project site would reduce noise levels in backyards of the existing neighboring homes in this area by up to 10 dB at locations immediately adjacent to the construction area.

Figure 9-A
Construction Noise Barrier Locations – Grading Area 1
Proposed Rancho La Habra Residential Development



--- Temporary Noise Barriers

Figure 9-B
Construction Noise Barrier Locations – Grading Area 2
Proposed Rancho La Habra Residential Development

Temporary Noise Barriers

Figure 9-C
Construction Noise Barrier Locations – Grading Area 3
Proposed Rancho La Habra Residential Development

Temporary Noise Barriers

In summary, to reduce impacts to less than significant for the first row of homes within the Westridge Community, a temporary noise wall would need to be tall enough to reduce construction noise by up to 17 dB. A 12-foot high wall would only reduce construction noise levels by 12 dB in the backyards of first row of these homes. To attenuate a maximum impact of 17 dB, a 28-foot-high wall would be necessary. In the northeast corner of the Project site, the maximum construction noise increase over ambient is 26 dB at site C-9 during grading in Area 1 and 31 dB at site C-10 during grading in Area 2 (Table 13). For a temporary noise wall to reduce construction noise levels to 5 dB above background or less, the wall would have to provide over 21 dB of noise reduction at C-9 during grading in Area 1 and over 26 dB of noise reduction at site C-10 during grading in Area 2. A temporary noise wall of over 50 feet in height would be required to reduce noise levels to less than significant in these areas. Building a freestanding wall, temporary or permanent, of 28 feet or taller is not physically feasible given footing size, shear strength, wind shear strength, earthquake stability, etc, and shorter walls would not be effective at mitigating impacts to less than significant. Furthermore, temporary walls of 12 feet high or taller along the rear property line of the adjoining Westridge Community residences would not be feasible for several additional reasons. The distance along that frontage is such that a temporary wall without gaps would be impractical to maintain due to factors including local topography, access difficulties, and potential engineering issues related to wind effects. Also, a 12-foot-high or taller wall would block all views from the rear yards of those residences, even when construction is not occurring, such as in the evenings and during weekends. Therefore, installation of a temporary noise wall of practical heights would result in visual and neighborhood intrusion impacts while not reducing the construction noise levels to below the significance threshold.

Because temporary noise walls of heights of 12 feet and less would not reduce construction noise impacts to less than significant and walls taller than 12 feet would not be feasible, construction noise impacts remain significant and unavoidable.

9.2 Operational Noise

9.2.1 Noise Mitigation of Existing Land Uses

Based on estimated future peak-hour traffic noise level changes predicted for the project (as presented in Section 6.2.1 and Tables 16 and 17), project-induced increases in traffic would not cause significant noise impacts during future traffic peak hours nor over a 24-hour period at existing noise-sensitive locations along area roadways. Therefore, no mitigation of traffic noise would be required for existing noise-sensitive land use.

9.2.2 Noise Mitigation of Future (Project) Homes

Based on noise level predictions within the project site, future unmitigated traffic noise exposure at the exterior areas of first rows of multi-family and single-family homes within the project site along Beach Boulevard would exceed the applicable City of La Habra noise standards. The first row of future single-family homes along the west side of South Idaho Street would also be exposed to traffic noise levels in excess of the City's noise standards.

Potential traffic noise mitigation measures which may be considered for the project include the following:

- Construction of noise barriers along the property lines of lots facing Beach Boulevard and South Idaho Street,
- Allowing for open-space buffers with sufficient distances between the nearest homes and each roadway so that exterior traffic noise levels at the nearest homes would be below the City noise criteria,
- Placing all exterior activity areas for lots closest to each roadway behind the residential structures so that they are shielded from traffic noise,
- Modifying speed limits on roadways, or
- Restricting truck traffic on the roadways.

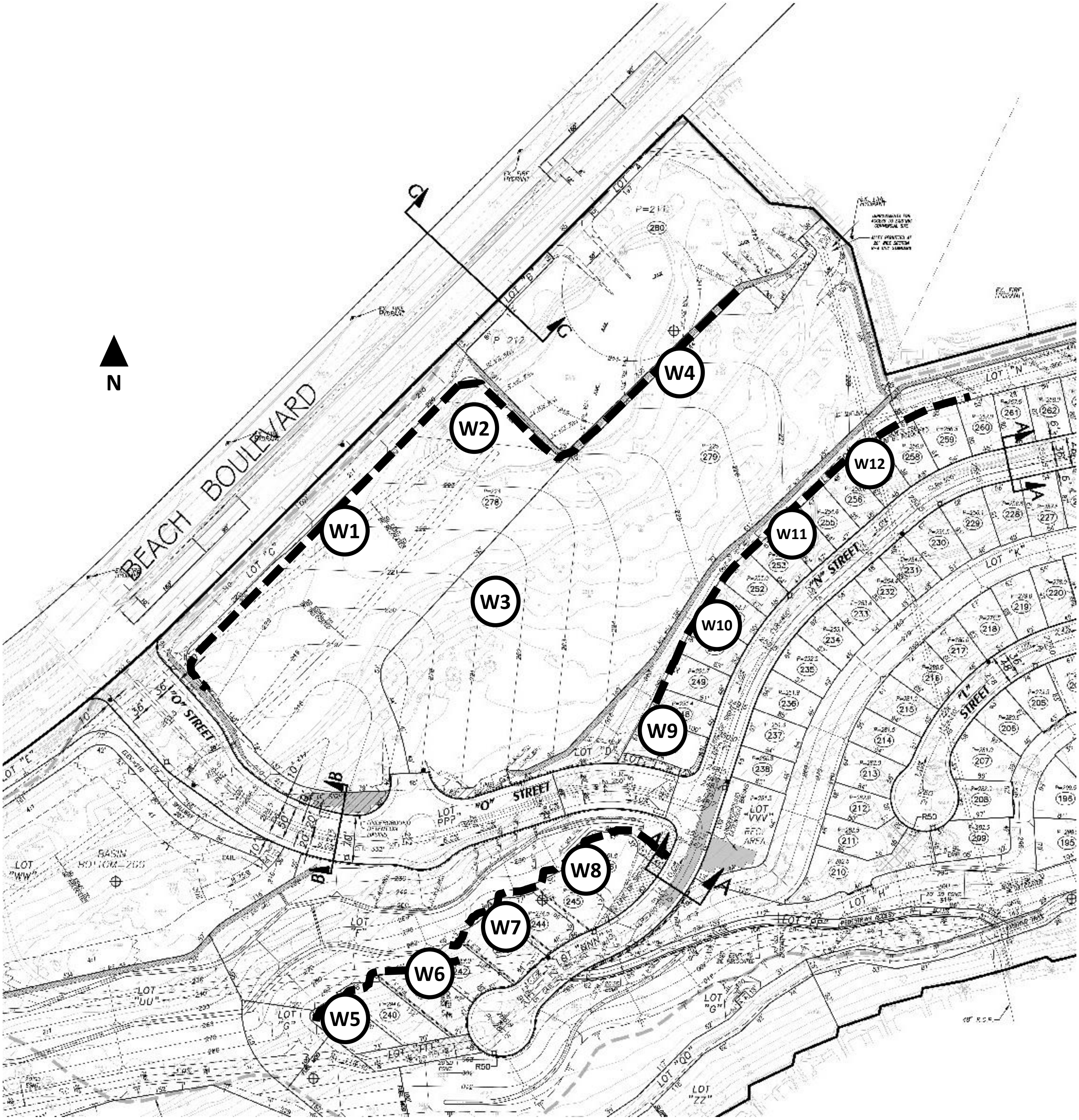
Of the above mitigation measures, the noise barrier option is the only practical, reasonable, and effective choice that is consistent with the project purpose. The TNM computer program was used to determine the noise level reduction provided by noise barriers placed between the future homes and the roadways. TNM calculates barrier insertion loss by accounting for variables such as distance from source to barrier, distance from barrier to receiver, source and receiver heights and barrier height. Per standard assumptions, effective heights of automobiles, medium trucks and heavy trucks are 0, 2, and 8 feet above the road, respectively. Receiver height is assumed to be 5 feet above the local ground elevation.

Figure 10-A shows the locations of noise barriers between the future receivers and South Idaho Street, and Figure 10-B shows the locations of noise barriers between the future multi-family and single-family homes and Beach Boulevard.

Figure 10-A
Traffic Noise Barrier Locations
Along South Idaho Street

Noise Barrier

Figure 10-B
Traffic Noise Barrier Locations
Facing Beach Boulevard



Noise Barrier

Table 22 shows the results of the noise barrier modeling analysis for various barrier heights located at the lot property line between the future home and each roadway. From the noise barrier calculation results presented in Table 23, it is evident that noise barriers at the lot lines would generally be effective in reducing exterior traffic noise to levels below the City's daytime noise standard.

At the second- and third-floor building elevations within the impacted lots, it is recommended that exterior activity areas such as balconies be placed at the opposite side of buildings from the roadways.

In addition, to mitigate exterior noise from commercial activities within the Westridge Plaza shopping center, it is recommended that a 6-foot-high noise barrier that would block the line-of-sight to such activities at the first-floor elevations be constructed along the backyard property lines of the first row of homes along the south side of the shopping center.

Furthermore, to ensure that the interior sound levels of the future homes within the proposed project comply with the City's noise criterion, the following conditions should be satisfied:

1. Windows and sliding glass doors of homes closest to the traffic and commercial noise sources along the west, east, and north sides of the project should be mounted in low air infiltration rate frames (0.5 cfm/ft. or less per ANSI specifications).
2. Exterior doors of homes closest to the traffic and commercial noise sources along the west, east, and north sides of the project should be solid core with perimeter weatherstripping and threshold seals.
3. Air conditioning or mechanical ventilation should be provided for the first row of homes closest to the traffic and commercial noise sources along the west, east, and north sides of the project to allow occupants to close doors and windows for the required acoustical isolation.
4. Roof or attic vents directly facing the traffic and commercial noise sources should be baffled so that sound must take an indirect route when entering the attic space.

It is the responsibility of the builder to ensure that all materials and construction practices employed for this project are consistent with the design assumption used for this analysis, and with these recommendations. A/E Tech would not be responsible for degradation of acoustical performance due to substitutions, deletions, modifications or defects in manufacture or workmanship.

TABLE 22

Project Traffic Noise Barrier Calculation Results
Proposed Rancho La Habra Development Project

Receiver Location	Lot No.	Calculated CNEL (dB)					
		No Barrier	6-ft Barrier	7-ft Barrier	8-ft Barrier	9-ft Barrier	10-ft Barrier
Along South Idaho Street							
E1	Lot 2	66	57	56	55	55	54
E2	Lot 3	67	59	58	57	56	55
E3	Lot 11	64	60	59	59	58	58
E4	Lot 12	66	60	58	57	56	55
E5	Lot 28	63	60	59	58	58	57
E6	Lot 29	58	56	56	54	53	53
Along Beach Boulevard							
W1	Lot 278	72	61	60	59	59	58
W2	Lot 278	69	61	60	59	59	58
W3*	Lot 279	56	56	56	56	56	56
W4	Lot 279	64	57	55	54	54	53
W5	Lot 239	62	52	51	50	50	49
W6	Lot 241	59	51	50	50	49	48
W7	Lot 243	60	54	54	53	50	50
W8	Lot 245	57	51	50	49	48	47
W9	Lot 247	56	51	50	49	48	47
W10	Lot 250	58	52	51	50	49	48
W11	Lot 253	59	53	52	51	50	49
W12	Lot 256	59	53	52	51	50	49

* No noise barrier at this location.
Note: Calculated noise levels are at first-floor elevations.
Source: A/E Tech LLC

9.3 Construction Vibration

Based on the vibration analysis results, use of vibratory rollers should be avoided near the existing residential area located along the northeast property line of the project site.

Construction activities in all other areas within the project site are not expected to result in vibration levels exceeding the threshold of feelable vibration. Therefore, vibration effects of project construction activities in such areas would be less than significant and no further mitigation would be required.

10. REFERENCES

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Temple University Department of Civil/Environmental Engineering <http://www.temple.edu/departments/CETP/environ10.html>

Appendix A
Acoustical Terminology

List of Technical Terms

Term	Definitions
Decibel, dB	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base of 10 of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micropascals (20 micronewtons per square meter).
Frequency, Hz	The number of complete pressure fluctuations per second above and below the atmospheric pressure.
A-Weighted Sound Level, dBA	The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise. All sound levels in this report are A-weighted, unless reported otherwise.
L_{01}, L_{10}, L_{50}, L_{90}	The A-weighted noise levels that are exceeded 1, 10, 50 and 90 percent of the time during the measurement period.
Equivalent Noise Level, L_{eq}	The average A-weighted noise level during the measurement period.
Community Noise Equivalent Level, CNEL	The average A-weighted noise level during a 24-hour day, obtained after addition of 5 decibels in the evening from 7:00 p.m. to 10:00 p.m. and after the addition of 10 decibels to sound levels measured in the night between 10:00 p.m. and 7:00 a.m.
L_{max}, L_{min}	The maximum and minimum A-weighted noise level during the measurement period.
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
STC Rating	Sound Transmission Class (or STC) is an integer rating of how well a building partition attenuates airborne sound. STC rating is widely used to rate interior partitions, ceilings/floors, doors, windows, and exterior wall configurations.

Appendix B

City of La Habra Land Use Compatibility with Community Noise Environments

Table 7-1 Land Use Compatibility with Community Noise Environments

Land Use Categories and Uses		Compatible Land Use Zones						
CATEGORIES	USES	CNEL <55	55-60	60-65	65-70	70-75	75-80	CNEL >80
Residential	Single Family, Duplex, Multiple Family	A	A	B	B	C	D	D
	Mobile Home	A	A	B	C	C	D	D
Commercial Regional, District	Hotel, Motel, Transient Lodging	A	A	B	B	C	C	D
Commercial Regional, Village District, Special	Commercial Retail, Bank, Restaurant, Movie Theater	A	A	A	A	B	B	C
Commercial, Industrial, Institutional	Office Building, Research and Development, Professional Offices, City Office Building	A	A	A	B	B	C	D
Commercial Recreation Institutional Civic Center	Amphitheater, Concert Hall, Auditorium, Meeting Hall	B	B	C	C	D	D	D
Commercial Recreation	Children's Amusement Park, Miniature Golf Course, Go-cart Track, Equestrian Center, Sports Club	A	A	A	B	B	D	D
Commercial General, Special Industrial, Institutional	Automobile Service Station, Auto Dealership, Manufacturing, Warehousing, Wholesale, Utilities	A	A	A	A	B	B	B
Institutional General	Hospital, Church, Library, Schools' Classroom, Day Care	A	A	B	C	C	D	D
Open Space	Parks	A	A	A	B	C	D	D
	Golf Course, Cemeteries, Nature Centers, Wildlife Reserves, Wildlife Habitat	A	A	A	A	B	C	C
Agriculture	Agriculture	A	A	A	A	A	A	A

SOURCE: California Governor's Office of Planning and Research, General Plan Guidelines 2003, Appendix C (Guidelines for the Preparation and Content of the Noise Element of the General Plan) (October 2003).

INTERPRETATION:

Zone A Clearly Compatible: Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction without any special noise insulation requirements.

Zone B Compatible with Mitigation: New construction or development should be undertaken only after detailed analysis of the noise reduction requirements are made and needed noise insulation features in the design are determined. Conventional construction, with closed windows and fresh air supply systems or air conditioning, will normally suffice. Note that residential uses are prohibited with Airport CNEL greater than 65.

Zone C Normally Incompatible: New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of noise reduction requirements must be made and needed noise insulation features included in the design.

Zone D Clearly Incompatible: New construction or development should generally not be undertaken.

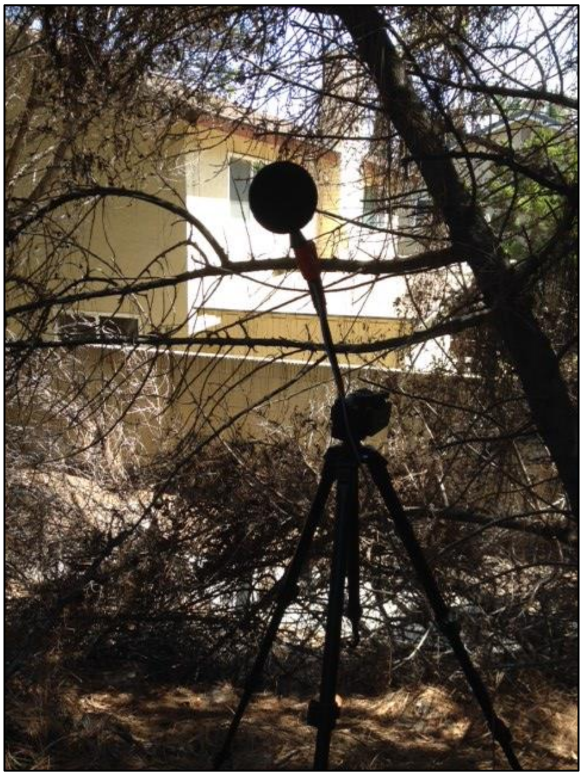
Appendix C

Ambient Noise Measurements Photographs

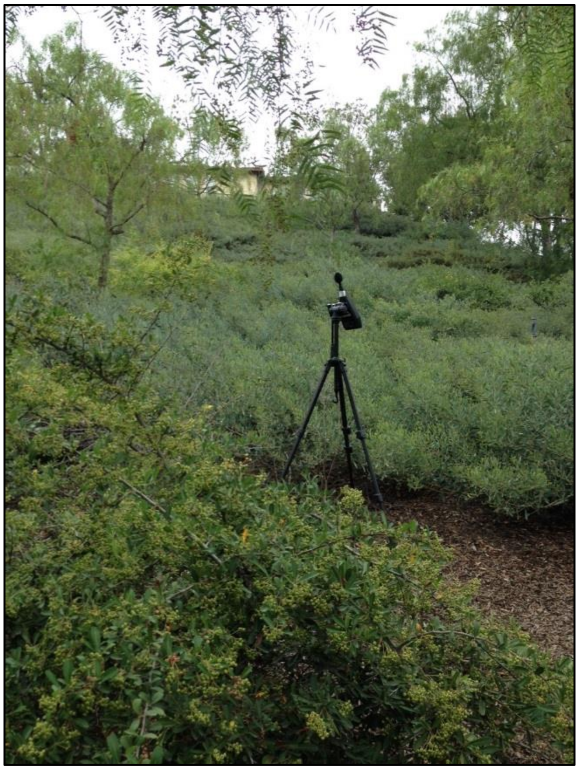
C-1. Ambient Noise Measurement Photographs at Site LT-1

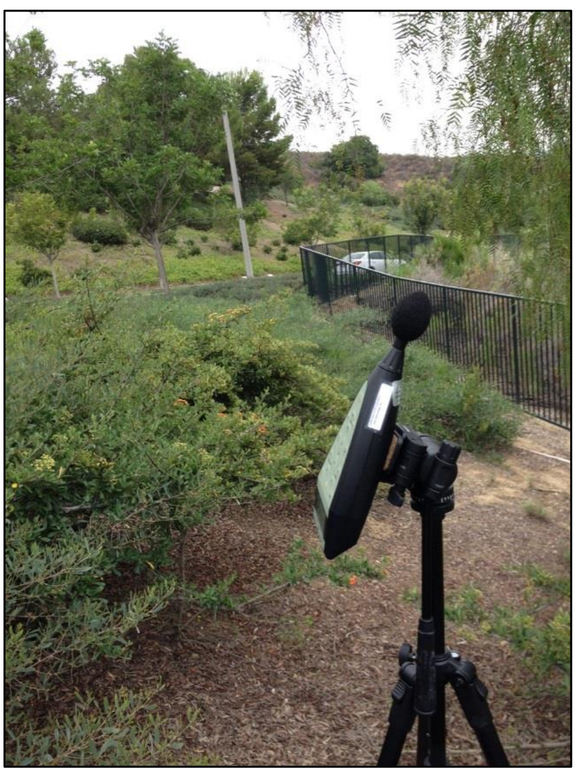
C-2. Ambient Noise Measurement Photographs at Site LT-2

C-3. Ambient Noise Measurement Photographs at Site LT-3

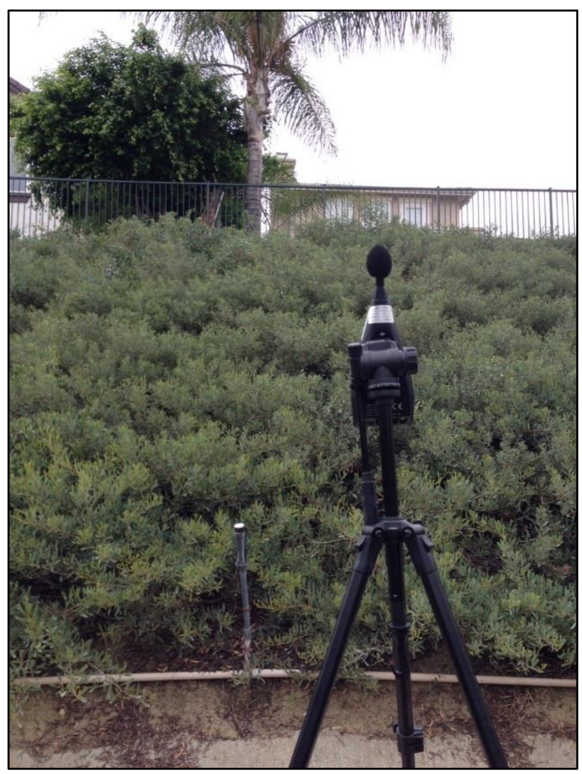


C-4. Ambient Noise Measurement Photographs at Site ST-1

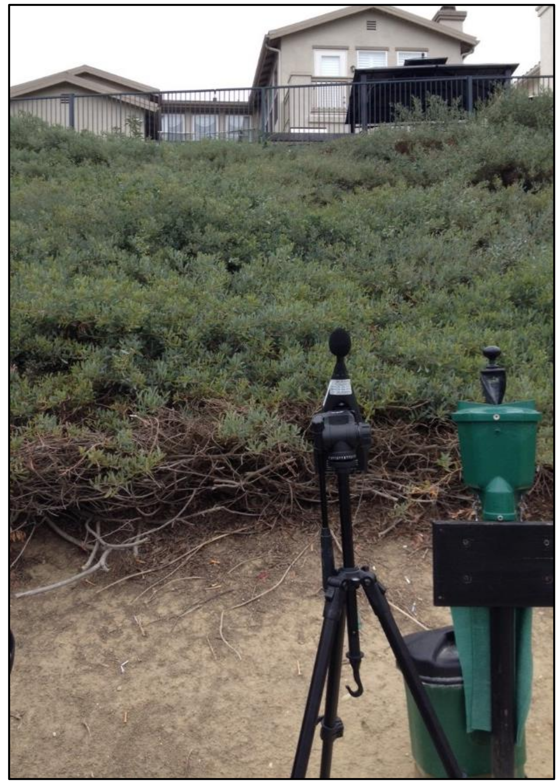




C-5. Ambient Noise Measurement Photographs at Site ST-2



C-6. Ambient Noise Measurement Photographs at Site ST-3

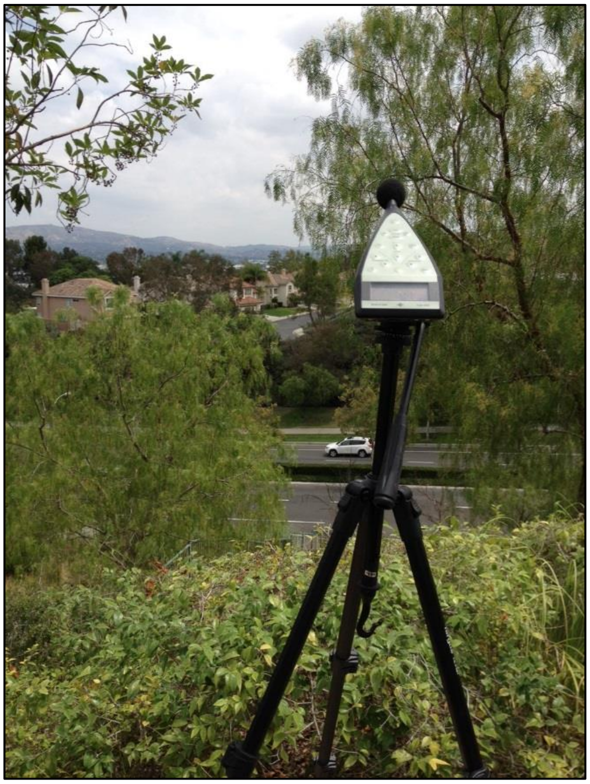


C-7. Ambient Noise Measurement Photographs at Site ST-4

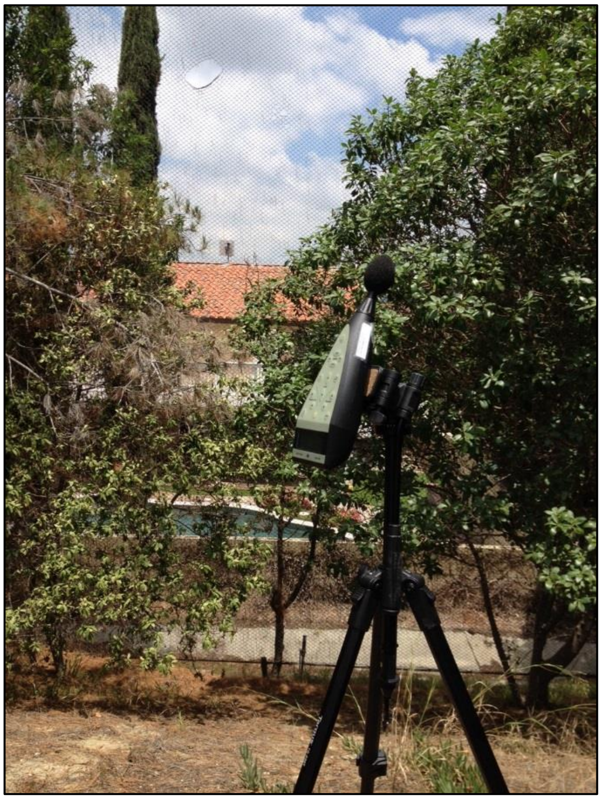
C-8. Ambient Noise Measurement Photographs at Site ST-5

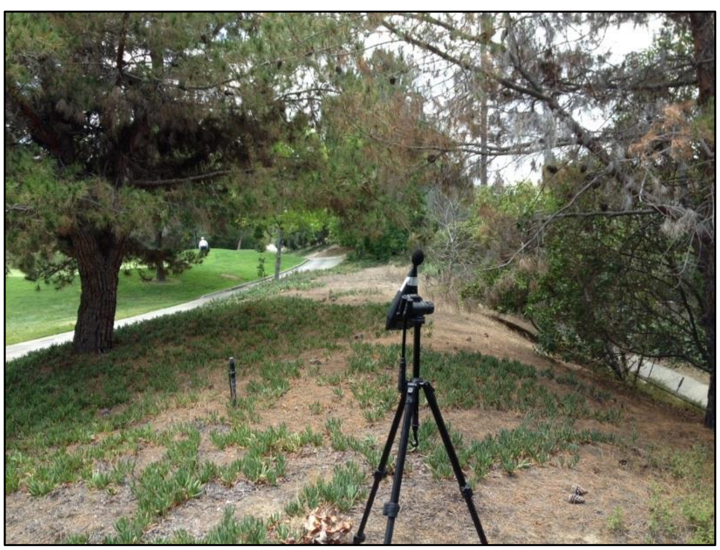
C-9. Ambient Noise Measurement Photographs at Site ST-6

C-10. Ambient Noise Measurement Photographs at Site ST-7



C-11. Ambient Noise Measurement Photographs at Site ST-8





C-12. Ambient Noise Measurement Photographs at Site ST-9

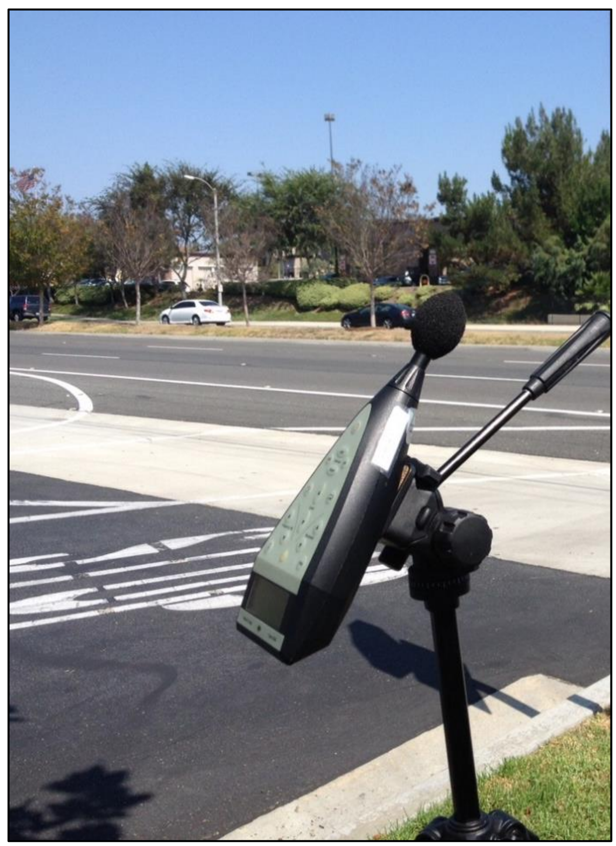
C-13. Ambient Noise Measurement Photographs at Site ST-10

C-14. Ambient Noise Measurement Photographs at Site ST-11

C-15. Ambient Noise Measurement Photographs at Site ST-12

C-16. Ambient Noise Measurement Photographs at Site ST-13

C-17. Ambient Noise Measurement Photographs at Site ST-14



C-18. Ambient Noise Measurement Photographs at Site ST-15

C-19. Ambient Noise Measurement Photographs at Site ST-16

Appendix D

Construction Noise Calculation Data Sheets

D-1
Estimated Construction Noise Levels
Demolition

C-1	Distance	1950	Usage	Source Lmax	@ Receiver		Overall	
	Shielding	10	Factor	@ 50 ft	Lmax	Hourly Leq	Leq	Lmax
	Loader	2	40%	79.1	40	36	43	46
	Dozer	1	40%	81.7	40	36		
	Excavator	1	50%	85.0	43	40		

C-2	Distance	1380	Usage	Source Lmax	@ Receiver		Overall	
	Shielding	0	Factor	@ 50 ft	Lmax	Hourly Leq	Leq	Lmax
	Loader	2	40%	79.1	53	49	56	59
	Dozer	1	40%	81.7	53	49		
	Excavator	1	50%	85.0	56	53		

C-3	Distance	790	Usage	Source Lmax	@ Receiver		Overall	
	Shielding	0	Factor	@ 50 ft	Lmax	Hourly Leq	Leq	Lmax
	Loader	2	40%	79.1	58	54	61	64
	Dozer	1	40%	81.7	58	54		
	Excavator	1	50%	85.0	61	58		

C-4	Distance	1300	Usage	Source Lmax	@ Receiver		Overall	
	Shielding	10	Factor	@ 50 ft	Lmax	Hourly Leq	Leq	Lmax
	Loader	2	40%	79.1	44	40	46	50
	Dozer	1	40%	81.7	43	39		
	Excavator	1	50%	85.0	47	44		

C-5	Distance	1310	Usage	Source Lmax	@ Receiver		Overall	
	Shielding	0	Factor	@ 50 ft	Lmax	Hourly Leq	Leq	Lmax
	Loader	2	40%	79.1	54	50	56	60
	Dozer	1	40%	81.7	53	49		
	Excavator	1	50%	85.0	57	54		

C-5A	Distance	930	Usage	Source Lmax	@ Receiver		Overall	
	Shielding	0	Factor	@ 50 ft	Lmax	Hourly Leq	Leq	Lmax
	Loader	2	40%	79.1	57	53	59	63
	Dozer	1	40%	81.7	56	52		
	Excavator	1	50%	85.0	60	57		

C-6	Distance	1850	Usage	Source Lmax	@ Receiver		Overall	
	Shielding	20	Factor	@ 50 ft	Lmax	Hourly Leq	Leq	Lmax
	Loader	2	40%	79.1	31	27	33	37
	Dozer	1	40%	81.7	30	26		
	Excavator	1	50%	85.0	34	31		

D-2
Estimated Construction Noise Levels
Demolition

C-7	Distance	2780	Usage	Source Lmax	@ Receiver		Overall	
	Shielding	20	Factor	@ 50 ft	Lmax	Hourly Leq	Leq	Lmax
	Loader	2	40%	79.1	27	23	30	33
	Dozer	1	40%	81.7	27	23		
	Excavator	1	50%	85.0	30	27		

C-8	Distance	2480	Usage	Source Lmax	@ Receiver		Overall	
	Shielding	0	Factor	@ 50 ft	Lmax	Hourly Leq	Leq	Lmax
	Loader	2	40%	79.1	48	44	51	54
	Dozer	1	40%	81.7	48	44		
	Excavator	1	50%	85.0	51	48		

C-9	Distance	1690	Usage	Source Lmax	@ Receiver		Overall	
	Shielding	0	Factor	@ 50 ft	Lmax	Hourly Leq	Leq	Lmax
	Loader	2	40%	79.1	52	48	54	57
	Dozer	1	40%	81.7	51	47		
	Excavator	1	50%	85.0	54	51		

C-10	Distance	1600	Usage	Source Lmax	@ Receiver		Overall	
	Shielding	0	Factor	@ 50 ft	Lmax	Hourly Leq	Leq	Lmax
	Loader	2	40%	79.1	52	48	54	58
	Dozer	1	40%	81.7	52	48		
	Excavator	1	50%	85.0	55	52		

C-14	Distance	810	Usage	Source Lmax	@ Receiver		Overall	
	Shielding	5	Factor	@ 50 ft	Lmax	Hourly Leq	Leq	Lmax
	Loader	2	40%	79.1	53	49	55	59
	Dozer	1	40%	81.7	53	49		
	Excavator	1	50%	85.0	56	53		

C-15	Distance	3050	Usage	Source Lmax	@ Receiver		Overall	
	Shielding	10	Factor	@ 50 ft	Lmax	Hourly Leq	Leq	Lmax
	Loader	2	40%	79.1	36	32	39	42
	Dozer	1	40%	81.7	36	32		
	Excavator	1	50%	85.0	39	36		

D-3
Crushing Operations

C-1	Distance	3300	Usage Factor	Source Lmax @	Hourly Leq	Leq	Lmax
	Shielding	20					
	Jaw Crusher	1	70%	82.0	44.1	32	32
	Cone Crusher	1	70%	82.0	44.1		
	Screens	1	100%	86.0	49.6		
	Conveyors	1	100%	73.0	36.6		

C-2	Distance	2600	Usage Factor	Source Lmax @	Hourly Leq	Leq	Lmax
	Shielding	5					
	Jaw Crusher	1	70%	82.0	46.1	49	49
	Cone Crusher	1	70%	82.0	46.1		
	Screens	1	100%	86.0	51.7		
	Conveyors	1	100%	73.0	38.7		

C-3	Distance	1700	Usage Factor	Source Lmax @	Hourly Leq	Leq	Lmax
	Shielding	0					
	Jaw Crusher	1	70%	82.0	49.8	57	58
	Cone Crusher	1	70%	82.0	49.8		
	Screens	1	100%	86.0	55.4		
	Conveyors	1	100%	73.0	42.4		

C-4	Distance	1450	Usage Factor	Source Lmax @	Hourly Leq	Leq	Lmax
	Shielding	0					
	Jaw Crusher	1	70%	82.0	51.2	59	59
	Cone Crusher	1	70%	82.0	51.2		
	Screens	1	100%	86.0	56.8		
	Conveyors	1	100%	73.0	43.8		

C-5	Distance	1220	Usage Factor	Source Lmax @	Hourly Leq	Leq	Lmax
	Shielding	0					
	Jaw Crusher	1	70%	82.0	52.7	60	61
	Cone Crusher	1	70%	82.0	52.7		
	Screens	1	100%	86.0	58.3		
	Conveyors	1	100%	73.0	45.3		

D-4

Crushing Operations

C-5A	Distance	545	Usage	Source			
	Shielding	0	Factor	Lmax @	Hourly Leq	Leq	Lmax
	Jaw Crusher	1	70%	82.0	59.7	67	68
	Cone Crusher	1	70%	82.0	59.7		
	Screens	1	100%	86.0	65.3		
	Conveyors	1	100%	73.0	52.3		

C-6	Distance	1500	Usage	Source			
	Shielding	15	Factor	Lmax @	Hourly Leq	Leq	Lmax
	Jaw Crusher	1	70%	82.0	50.9	44	44
	Cone Crusher	1	70%	82.0	50.9		
	Screens	1	100%	86.0	56.5		
	Conveyors	1	100%	73.0	43.5		

C-7	Distance	2500	Usage	Source			
	Shielding	20	Factor	Lmax @	Hourly Leq	Leq	Lmax
	Jaw Crusher	1	70%	82.0	46.5	34	35
	Cone Crusher	1	70%	82.0	46.5		
	Screens	1	100%	86.0	52.0		
	Conveyors	1	100%	73.0	39.0		

C-8	Distance	1850	Usage	Source			
	Shielding	0	Factor	Lmax @	Hourly Leq	Leq	Lmax
	Jaw Crusher	1	70%	82.0	49.1	57	57
	Cone Crusher	1	70%	82.0	49.1		
	Screens	1	100%	86.0	54.6		
	Conveyors	1	100%	73.0	41.6		

C-9	Distance	1060	Usage	Source			
	Shielding	0	Factor	Lmax @	Hourly Leq	Leq	Lmax
	Jaw Crusher	1	70%	82.0	53.9	62	62
	Cone Crusher	1	70%	82.0	53.9		
	Screens	1	100%	86.0	59.5		
	Conveyors	1	100%	73.0	46.5		

D-5
Crushing Operations

C-10	Distance	920	Usage Factor	Source Lmax @	Hourly Leq	Leq	Lmax
	Shielding	0					
	Jaw Crusher	1	70%	82.0	55.2	63	63
	Cone Crusher	1	70%	82.0	55.2		
	Screens	1	100%	86.0	60.7		
	Conveyors	1	100%	73.0	47.7		

C-14	Distance	2300	Usage Factor	Source Lmax @	Hourly Leq	Leq	Lmax
	Shielding	5					
	Jaw Crusher	1	70%	82.0	47.2	50	50
	Cone Crusher	1	70%	82.0	47.2		
	Screens	1	100%	86.0	52.7		
	Conveyors	1	100%	73.0	39.7		

C-15	Distance	2600	Usage Factor	Source Lmax @	Hourly Leq	Leq	Lmax
	Shielding	5					
	Jaw Crusher	1	70%	82.0	46.1	49	49
	Cone Crusher	1	70%	82.0	46.1		
	Screens	1	100%	86.0	51.7		
	Conveyors	1	100%	73.0	38.7		

D-6
Estimated Construction Noise Levels
Infrastructure and Building Construction

Receiver C-1	Distance	Shielding	Source Lmax @ 50 ft	Equipment Lmax	Usage Factor	Equipment Leq
Concrete Pump	1130	5	81.0	48.9	20%	41.9
Crane	1130	5	81.0	48.9	16%	41.0
Generator	1130	5	81.0	48.9	50%	45.9
Concrete Pump	2055	10	81.0	38.7	20%	31.7
Generator	2055	10	81.0	38.7	50%	35.7
Concrete Pump	3740	20	81.0	23.5	20%	16.5
Generator	3740	20	81.0	23.5	50%	20.5
Concrete Pump	4470	20	81.0	22.0	20%	15.0
Generator	4470	20	81.0	22.0	50%	19.0
Pumps	1130	10	77.0	39.9	50%	36.9
Pumps	2055	20	77.0	24.7	50%	21.7
Pumps	4470	20	77.0	18.0	50%	15.0
			Overall:	**54**		**49**

Receiver C-2	Distance	Shielding	Source Lmax @ 50 ft	Equipment Lmax	Usage Factor	Equipment Leq
Concrete Pump	815	0	81.0	56.8	20%	49.8
Crane	815	0	81.0	56.8	16%	48.8
Generator	815	0	81.0	56.8	50%	53.7
Concrete Pump	1185	0	81.0	53.5	20%	46.5
Generator	1185	0	81.0	53.5	50%	50.5
Concrete Pump	2005	5	81.0	43.9	20%	36.9
Generator	2005	5	81.0	43.9	50%	40.9
Concrete Pump	3900	20	81.0	23.2	20%	16.2
Generator	3900	20	81.0	23.2	50%	20.1
Pumps	1185	0	77.0	49.5	50%	46.5
Pumps	2005	5	77.0	39.9	50%	36.9
Pumps	3900	20	77.0	19.2	50%	16.1
			Overall:	**63**		**58**

Receiver C-3	Distance	Shielding	Source Lmax @ 50 ft	Equipment Lmax	Usage Factor	Equipment Leq
Concrete Pump	1045	0	81.0	54.6	20%	47.6
Crane	1045	0	81.0	54.6	16%	46.6
Generator	1045	0	81.0	54.6	50%	51.6
Concrete Pump	490	0	81.0	61.2	20%	54.2
Generator	490	0	81.0	61.2	50%	58.2
Concrete Pump	1975	0	81.0	49.1	20%	42.1
Generator	1975	0	81.0	49.1	50%	46.1
Concrete Pump	2850	20	81.0	25.9	20%	18.9
Generator	280	20	81.0	46.0	50%	43.0
Pumps	490	0	77.0	57.2	50%	54.2
Pumps	1975	5	77.0	40.1	50%	37.1
Pumps	2850	20	77.0	21.9	50%	18.9
			Overall:	**66**		**62**

D-7
Estimated Construction Noise Levels
Infrastructure and Building Construction

Receiver C-4	Distance	Shielding	Source Lmax @ 50 ft	Equipment Lmax	Usage Factor	Equipment Leq
Concrete Pump	2200	20	81.0	28.1	20%	21.1
Crane	2200	20	81.0	28.1	16%	20.2
Generator	2200	20	81.0	28.1	50%	25.1
Concrete Pump	1290	10	81.0	42.8	20%	35.8
Generator	1290	10	81.0	42.8	50%	39.8
Concrete Pump	1490	0	81.0	51.5	20%	44.5
Generator	1490	0	81.0	51.5	50%	48.5
Concrete Pump	1900	20	81.0	29.4	20%	22.4
Generator	1900	20	81.0	29.4	50%	26.4
Pumps	1290	10	77.0	38.8	50%	35.8
Pumps	1490	0	77.0	47.5	50%	44.5
Pumps	1900	20	77.0	25.4	50%	22.4
			Overall:	**56**		**52**

Receiver C-5	Distance	Shielding	Source Lmax @ 50 ft	Equipment Lmax	Usage Factor	Equipment Leq
Concrete Pump	2600	0	81.0	46.7	20%	39.7
Crane	2600	0	81.0	46.7	16%	38.7
Generator	2600	0	81.0	46.7	50%	43.7
Concrete Pump	1630	0	81.0	50.7	20%	43.7
Generator	1630	0	81.0	50.7	50%	47.7
Concrete Pump	1050	5	81.0	49.6	20%	42.6
Generator	1050	5	81.0	49.6	50%	46.5
Concrete Pump	1230	20	81.0	33.2	20%	26.2
Generator	1230	20	81.0	33.2	50%	30.2
Pumps	1630	0	77.0	46.7	50%	43.7
Pumps	1050	5	77.0	45.6	50%	42.5
Pumps	1230	20	77.0	29.2	50%	26.2
			Overall:	**58**		**54**

Receiver 6	Distance	Shielding	Source Lmax @ 50 ft	Equipment Lmax	Usage Factor	Equipment Leq
Concrete Pump	3390	20	81.0	24.4	20%	17.4
Crane	3390	20	81.0	24.4	16%	16.4
Generator	3390	20	81.0	24.4	50%	21.4
Concrete Pump	2350	20	81.0	27.6	20%	20.6
Generator	2350	20	81.0	27.6	50%	24.5
Concrete Pump	1180	5	81.0	48.5	20%	41.6
Generator	1180	5	81.0	48.5	50%	45.5
Concrete Pump	490	0	81.0	61.2	20%	54.2
Generator	490	0	81.0	61.2	50%	58.2
Pumps	2350	20	77.0	23.6	50%	20.5
Pumps	1180	5	77.0	44.5	50%	41.5
Pumps	490	0	77.0	57.2	50%	54.2
			Overall:	**65**		**61**

D-8
Estimated Construction Noise Levels
Infrastructure and Building Construction

Receiver 7	Distance	Shielding	Source Lmax @ 50 ft	Equipment Lmax	Usage Factor	Equipment Leq
Concrete Pump	4020	20	81.0	22.9	20%	15.9
Crane	4020	20	81.0	22.9	16%	14.9
Generator	4020	20	81.0	22.9	50%	19.9
Concrete Pump	3100	20	81.0	25.2	20%	18.2
Generator	3100	20	81.0	25.2	50%	22.1
Concrete Pump	2150	10	81.0	38.3	20%	31.3
Generator	2150	10	81.0	38.3	50%	35.3
Concrete Pump	1020	0	81.0	54.8	20%	47.8
Generator	1020	0	81.0	54.8	50%	51.8
Pumps	3100	20	77.0	21.2	50%	18.1
Pumps	2150	10	77.0	34.3	50%	31.3
Pumps	1020	0	77.0	50.8	50%	47.8
			Overall:	**59**		**54**

Receiver 8	Distance	Shielding	Source Lmax @ 50 ft	Equipment Lmax	Usage Factor	Equipment Leq
Concrete Pump	3880	0	81.0	43.2	20%	36.2
Crane	3880	0	81.0	43.2	16%	35.2
Generator	3880	0	81.0	43.2	50%	40.2
Concrete Pump	2920	0	81.0	45.7	20%	38.7
Generator	2920	0	81.0	45.7	50%	42.7
Concrete Pump	1500	0	81.0	51.5	20%	44.5
Generator	1500	0	81.0	51.5	50%	48.4
Concrete Pump	530	0	81.0	60.5	20%	53.5
Generator	530	0	81.0	60.5	50%	57.5
Pumps	2920	0	77.0	41.7	50%	38.7
Pumps	1500	0	77.0	47.5	50%	44.4
Pumps	530	0	77.0	56.5	50%	53.5
			Overall:	**65**		**61**

Receiver 9	Distance	Shielding	Source Lmax @ 50 ft	Equipment Lmax	Usage Factor	Equipment Leq
Concrete Pump	3180	0	81.0	44.9	20%	37.9
Crane	3180	0	81.0	44.9	16%	37.0
Generator	3180	0	81.0	44.9	50%	41.9
Concrete Pump	2270	0	81.0	47.9	20%	40.9
Generator	2270	0	81.0	47.9	50%	44.8
Concrete Pump	770	0	81.0	57.2	20%	50.3
Generator	770	0	81.0	57.2	50%	54.2
Concrete Pump	700	0	81.0	58.1	20%	51.1
Generator	700	0	81.0	58.1	50%	55.1
Pumps	2270	0	77.0	43.9	50%	40.8
Pumps	770	0	77.0	53.2	50%	50.2
Pumps	700	0	77.0	54.1	50%	51.1
			Overall:	**65**		**61**

D-9
Estimated Construction Noise Levels
Infrastructure and Building Construction

Receiver 10	Distance	Shielding	Source Lmax @ 50 ft	Equipment Lmax	Usage Factor	Equipment Leq
Concrete Pump	3150	0	81.0	45.0	20%	38.0
Crane	3150	0	81.0	45.0	16%	37.1
Generator	3150	0	81.0	45.0	50%	42.0
Concrete Pump	2200	0	81.0	48.1	20%	41.1
Generator	2200	0	81.0	48.1	50%	45.1
Concrete Pump	715	0	81.0	57.9	20%	50.9
Generator	715	0	81.0	57.9	50%	54.9
Concrete Pump	1070	10	81.0	44.4	20%	37.4
Generator	1070	10	81.0	44.4	50%	41.4
Pumps	2200	0	77.0	44.1	50%	41.1
Pumps	715	0	77.0	53.9	50%	50.9
Pumps	1070	10	77.0	40.4	50%	37.4
			Overall:	**63**		**58**

Receiver 14	Distance	Shielding	Source Lmax @ 50 ft	Equipment Lmax	Usage Factor	Equipment Leq
Concrete Pump	680	0	81.0	58.3	20%	51.3
Crane	680	0	81.0	58.3	16%	50.4
Generator	680	0	81.0	58.3	50%	55.3
Concrete Pump	1170	0	81.0	53.6	20%	46.6
Generator	1170	0	81.0	53.6	50%	50.6
Concrete Pump	2450	10	81.0	37.2	20%	30.2
Generator	2450	10	81.0	37.2	50%	34.2
Concrete Pump	3625	10	81.0	33.8	20%	26.8
Generator	3625	10	81.0	33.8	50%	30.8
Pumps	1170	0	77.0	49.6	50%	46.6
Pumps	2450	10	77.0	33.2	50%	30.2
Pumps	3625	10	77.0	29.8	50%	26.8
			Overall:	**64**		**59**

D-10
Estimated Construction Noise Levels
Infrastructure and Building Construction

Receiver 15	Distance	Shielding	Source Lmax @ 50 ft	Equipment Lmax	Usage Factor	Equipment Leq
Concrete Pump	4540	20	81.0	21.8	20%	14.8
Crane	4540	20	81.0	21.8	16%	13.9
Generator	4540	20	81.0	21.8	50%	18.8
Concrete Pump	3510	20	81.0	24.1	20%	17.1
Generator	3510	20	81.0	24.1	50%	21.1
Concrete Pump	2280	0	81.0	47.8	20%	40.8
Generator	2280	0	81.0	47.8	50%	44.8
Concrete Pump	1025	0	81.0	54.8	20%	47.8
Generator	1025	0	81.0	54.8	50%	51.8
Pumps	3510	20	77.0	20.1	50%	17.1
Pumps	2280	0	77.0	43.8	50%	40.8
Pumps	1025	0	77.0	50.8	50%	47.8
			Overall:	**59**		**55**

Receiver 16	Distance	Shielding	Source Lmax @ 50 ft	Equipment Lmax	Usage Factor	Equipment Leq
Concrete Pump	4510	20	81.0	21.9	20%	14.9
Crane	4510	20	81.0	21.9	16%	13.9
Generator	4510	20	81.0	21.9	50%	18.9
Concrete Pump	3590	20	81.0	23.9	20%	16.9
Generator	3590	20	81.0	23.9	50%	20.9
Concrete Pump	2620	5	81.0	41.6	20%	34.6
Generator	2620	5	81.0	41.6	50%	38.6
Concrete Pump	1430	0	81.0	51.9	20%	44.9
Generator	1430	0	81.0	51.9	50%	48.9
Pumps	3590	20	77.0	19.9	50%	16.9
Pumps	2620	5	77.0	37.6	50%	34.6
Pumps	1430	0	77.0	47.9	50%	44.9
			Overall:	**56**		**52**

Appendix E

Vibration Test Photographs

E-1. Vibration Measurement Photographs at Site 1

Position #1

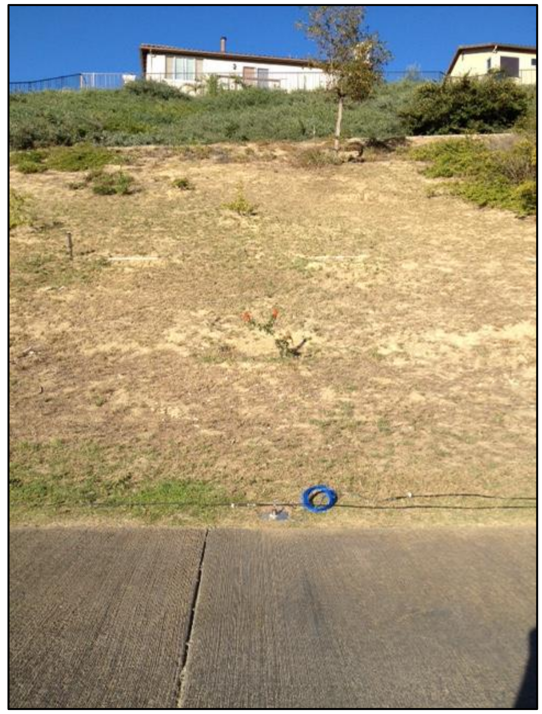
Position #2

Position #3

Position #4

E-2. Vibration Measurement Photographs at Site 2

Position #1



Position #2

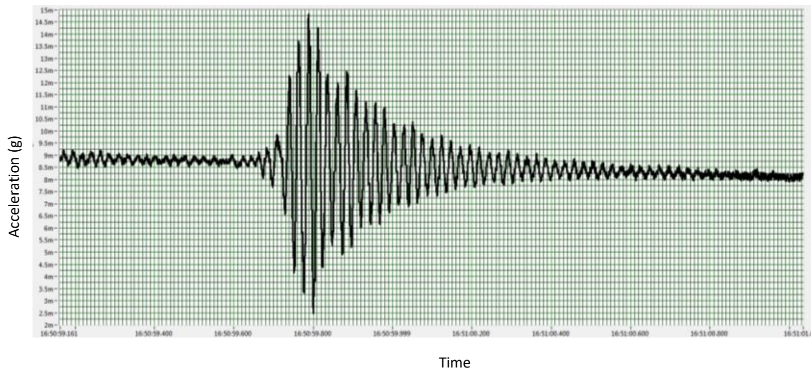
Position #3

Position #4

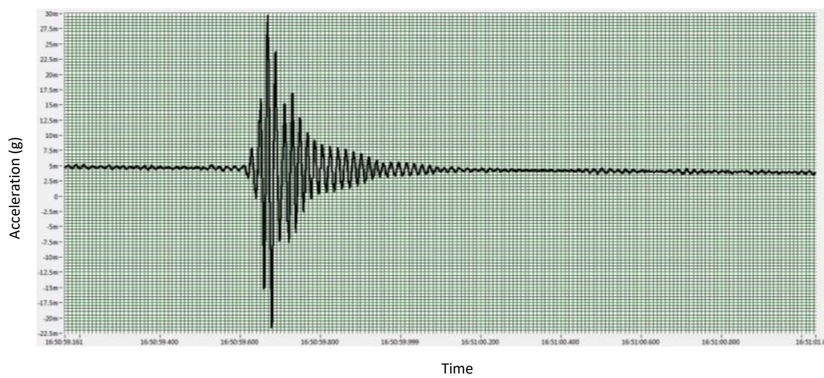
Appendix F

Vibration Measurement Charts

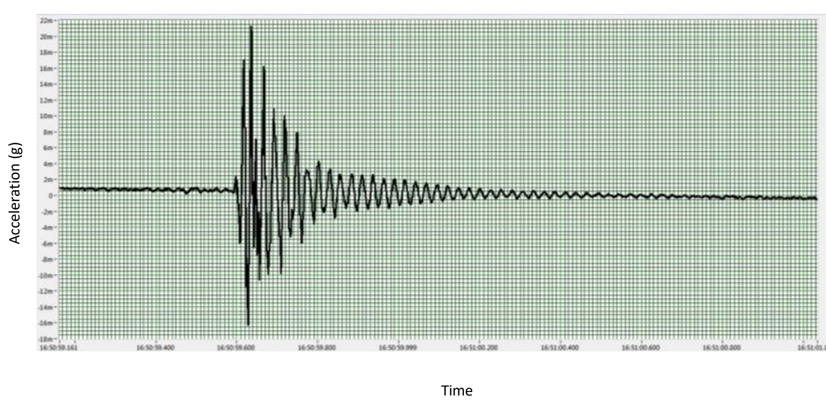
F-1
Site 1: Vibration Measurement #1
@12.5 Feet From Impact Location



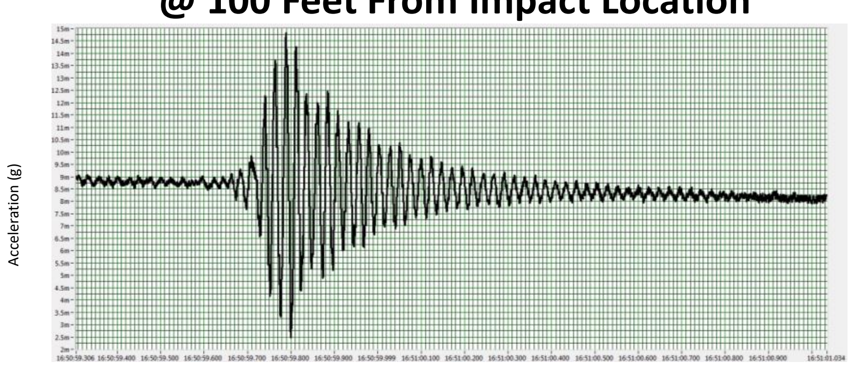
@ 25 Feet From Impact Location



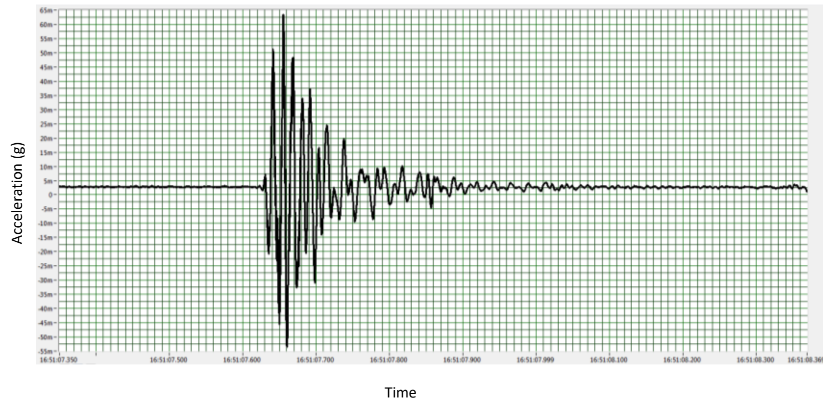
@ 50 Feet From Impact Location



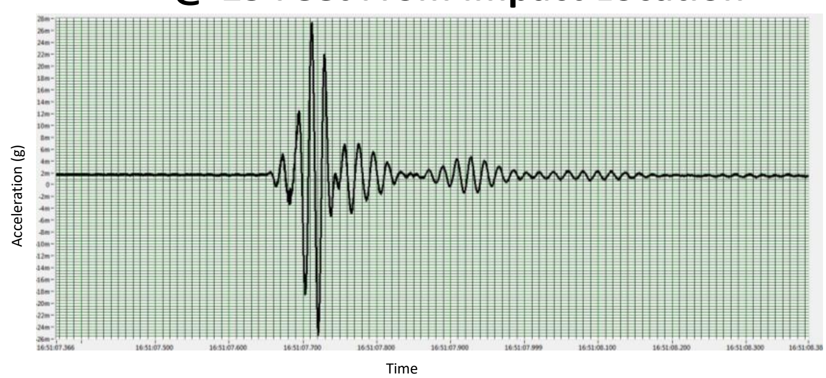
@ 100 Feet From Impact Location



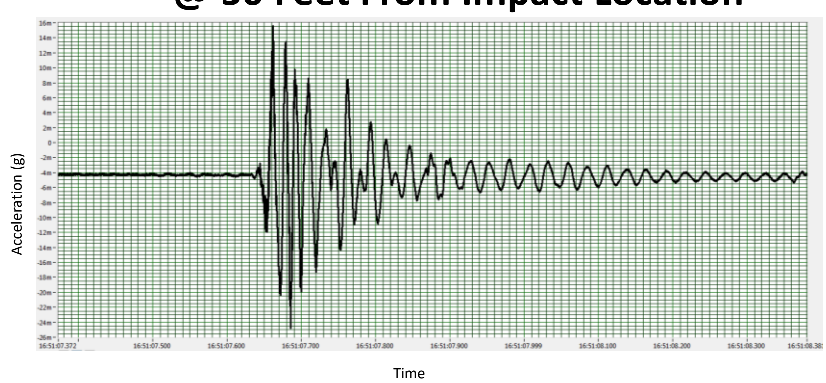
F-2
Site 1: Vibration Measurement #2
@12.5 Feet From Impact Location



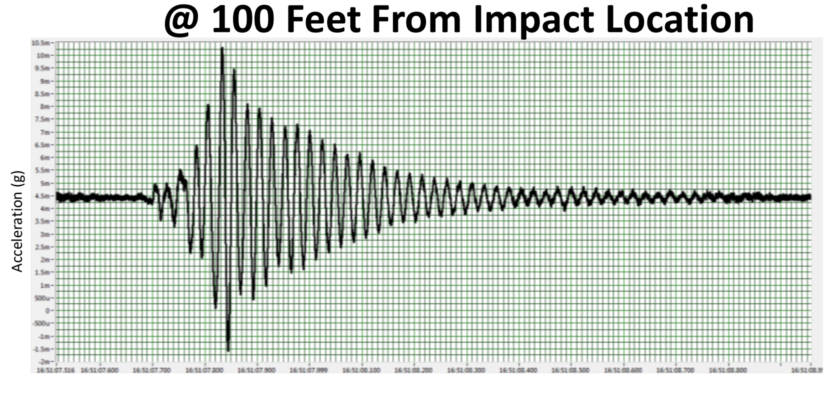
@ 25 Feet From Impact Location



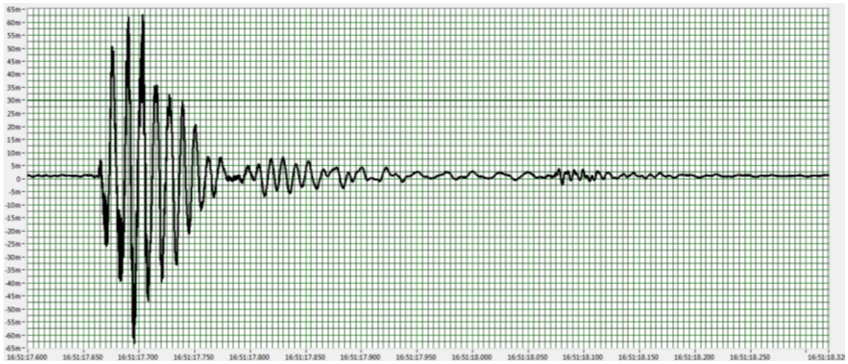
@ 50 Feet From Impact Location



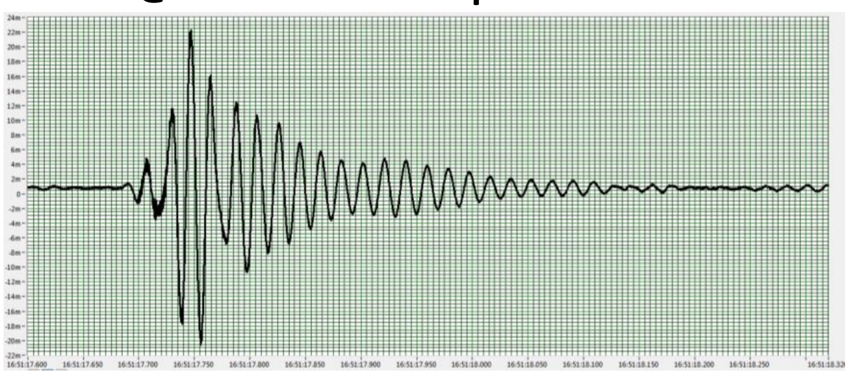
@ 100 Feet From Impact Location



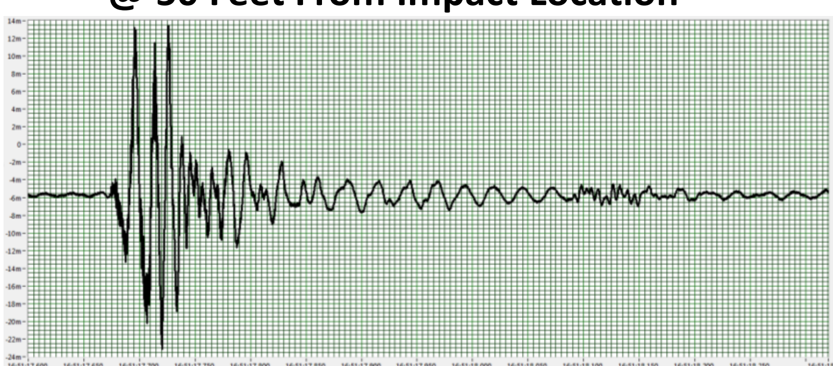
F-3
Site 1: Vibration Measurement #3
@12.5 Feet From Impact Location



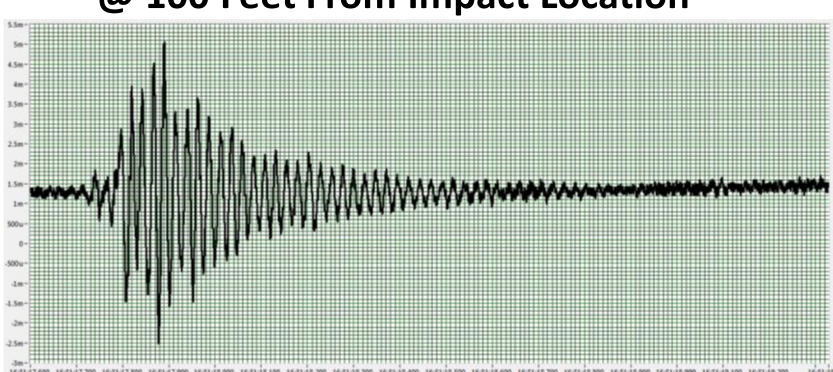
@ 25 Feet From Impact Location



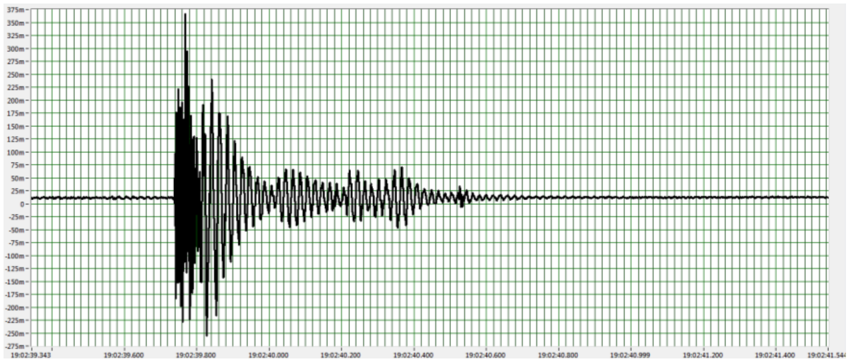
@ 50 Feet From Impact Location



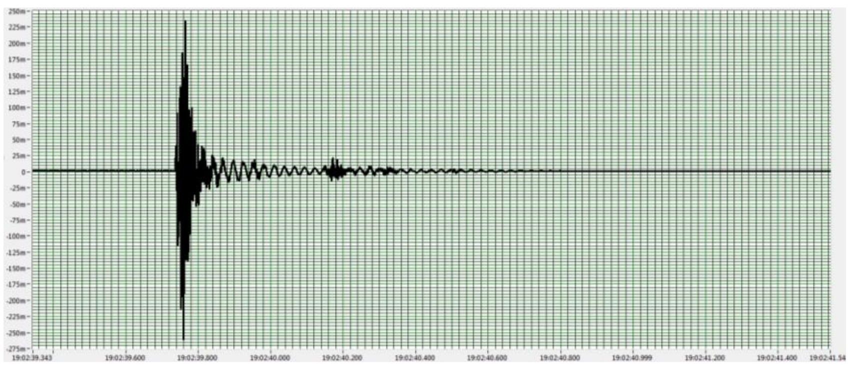
@ 100 Feet From Impact Location



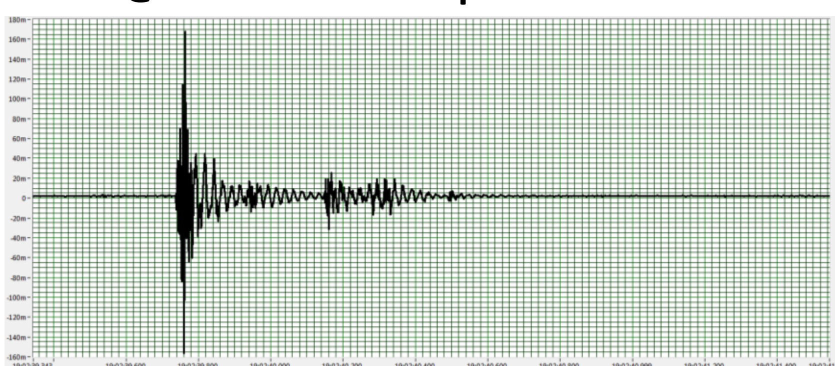
F-4
Site 2: Vibration Measurement #1
@12.5 Feet From Impact Location



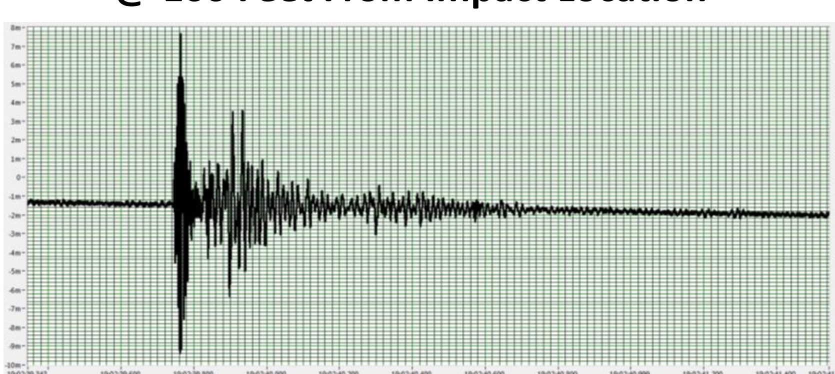
@ 25 Feet From Impact Location



@ 50 Feet From Impact Location



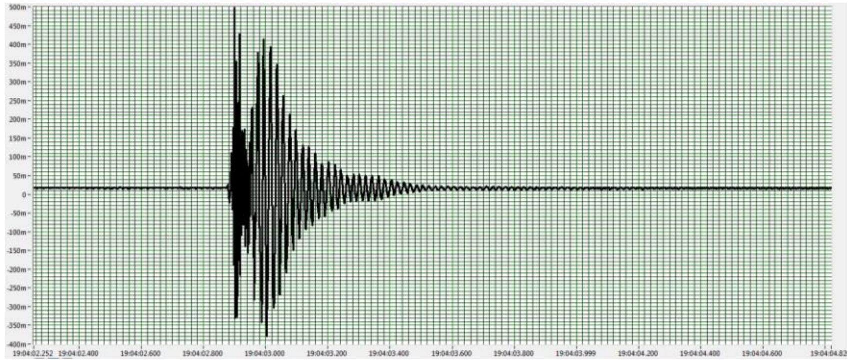
@ 100 Feet From Impact Location



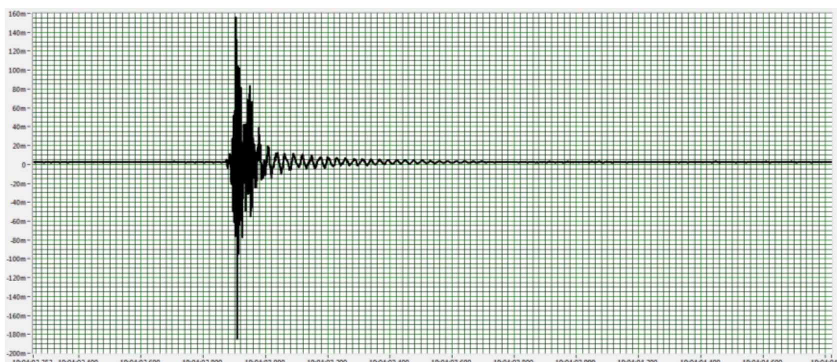
F-5

Site 2: Vibration Measurement #2

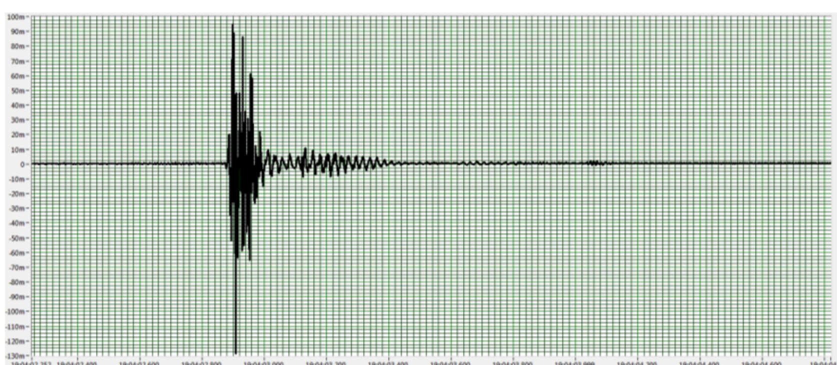
@12.5 Feet From Impact Location



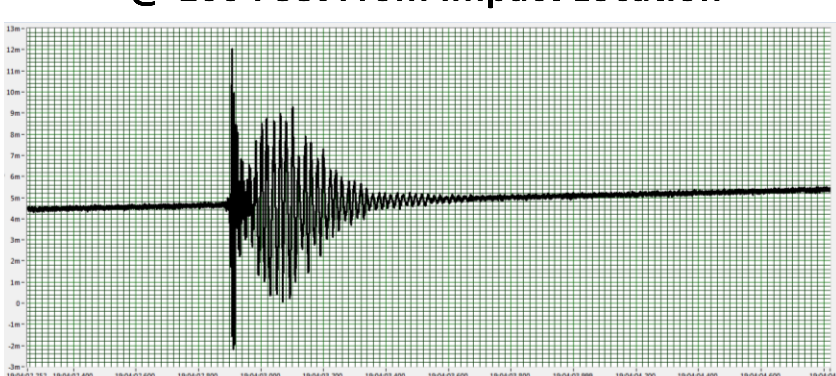
@ 25 Feet From Impact Location



@ 50 Feet From Impact Location



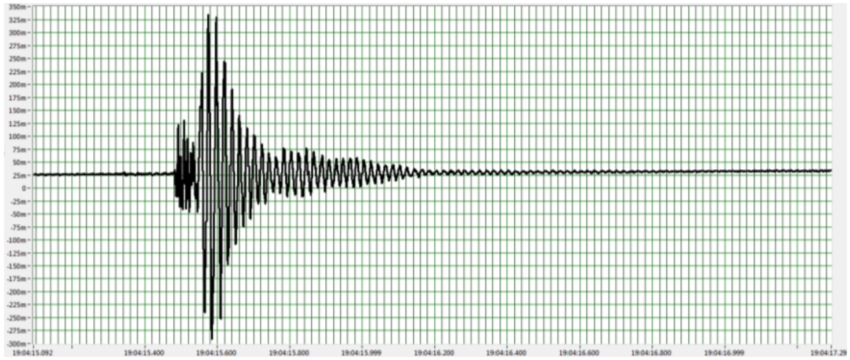
@ 100 Feet From Impact Location



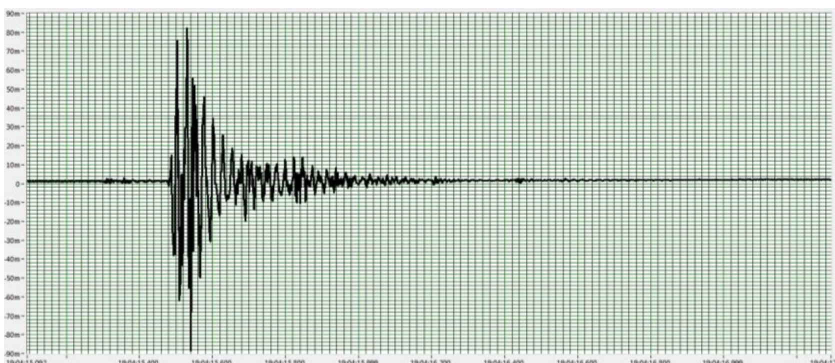
F-6

Site 2: Vibration Measurement #3

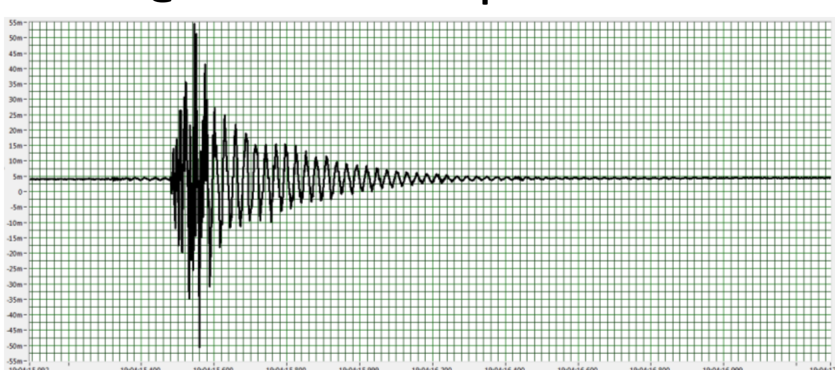
@12.5 Feet From Impact Location



@ 25 Feet From Impact Location



@ 50 Feet From Impact Location



@ 100 Feet From Impact Location