Well 28

NOISE IMPACT ANALYSIS

CITY ORANGE

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LIST OF ABBREVIATED TERMS

•	Reference
ANSI	American National Standards Institute
CEQA	California Environmental Quality Act
CNEL	Community Noise Equivalent Level
dBA	A-weighted decibels
EPA	Environmental Protection Agency
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
INCE	Institute of Noise Control Engineering
L_{eq}	Equivalent continuous (average) sound level
L_{max}	Maximum level measured over the time interval
L_{min}	Minimum level measured over the time interval
mph	Miles per hour
OSHA	Occupational Safety and Health Administration
PPV	Peak Particle Velocity
Project	Well 28
RMS	Root-mean-square
VdB	Vibration Decibels

EXECUTIVE SUMMARY

Urban Crossroads, Inc. has prepared this noise study to determine the noise exposure and the necessary noise attenuation measures for the proposed Well 28 development ("Project"). The Project site is located at 235 West Maple Avenue in the City Orange in an area of the Historic District characterized by historic industrial and residential structures. The proposed Project is expected to produce 3,000 gallons of water per minute and have a depth of 1,200 feet and it will be powered by a 350-horsepower pump. This study has been prepared to assess the potential Project-related construction noise and vibration impacts consistent with applicable City Orange noise standards and significance criteria.

OPERATIONAL NOISE ANALYSIS

Using reference noise levels to represent the potential noise sources within Well 28 site, the analysis shows that the Project-related operational noise levels the operational noise levels are expected to range from 39.8 to 47.3 dBA L_{eq} at the nearby receiver locations. The analysis shows that the operational noise levels associated with Well 28 Project will satisfy the City Orange 55 dBA L_{eq} daytime and 50 dBA L_{eq} nighttime exterior noise level standards with the planned 14-foot high well enclosure and the 16-foot high screen wall. Therefore, the operational noise impacts are considered *less than significant* at the nearby noise-sensitive receiver locations.

CONSTRUCTION NOISE ANALYSIS

Construction activities are expected to create high-level noise conditions at receivers surrounding the Project site. Using sample reference noise levels to represent the planned construction activities of Well 28 site, this analysis estimates that the Project-related construction noise levels are expected to range from 53.6 to 67.5 dBA CNEL at the nearby receiver location with the planned 24-foot high construction noise barrier. The construction noise analysis shows that the nearby receiver locations will satisfy the 75 dBA CNEL significance threshold during Project construction activities with the planned 24-foot high construction noise barrier. Therefore, the noise impacts due to Project construction noise is considered *less than significant* at all receiver locations.

CONSTRUCTION VIBRATION ANALYSIS

Construction activities has the potential to result in varying degrees of ground vibration, depending on the specific construction activities and equipment used. To assess the Project construction vibration levels, this analysis describes both the transient vibration levels associated with typical construction equipment activities and the continuous vibration levels associated with the well drilling activities.

TYPICAL CONSTRUCTION ACTIVITY VIBRATION LEVELS

Based on the vibration criteria provided in the Caltrans *Transportation and Construction Vibration Guidance Manual*, (1 p. 38), the typical Project construction vibration levels will satisfy the

transient human annoyance and building damage thresholds. Therefore, the vibration impacts due to Project typical construction activities are considered *less than significant*. In addition, the typical construction vibration levels at the closest sensitive receiver are unlikely to be sustained during the entire construction period but will occur rather only during the times that heavy construction equipment is operating adjacent to the Project site boundaries

WELL DRILLING VIBRATION LEVELS

Based on the vibration criteria provided in the Caltrans *Transportation and Construction Vibration Guidance Manual*, (1 p. 38), the well drilling vibration levels will satisfy the continuous human annoyance and building damage thresholds. Therefore, the vibration impacts due to Project well drilling are considered *less than significant*.

CONSTRUCTION NOISE AND VIBRATION ABATEMENT MEASURES

The following noise and vibration abatement measures are required to reduce Project construction noise levels at the adjacent sensitive receiver locations:

1. Install the planned 24-foot high temporary construction noise barrier. The noise control barrier must have a solid face from top to bottom. The noise control barriers must meet the minimum height and be constructed as follows:
    a. The temporary noise barriers shall provide a minimum transmission loss of 20 dBA (Federal Highway Administration, Noise Barrier Design Handbook). The noise barrier shall be constructed using an acoustical blanket (e.g. vinyl acoustic curtains or quilted blankets).
    b. The noise barrier must be maintained, and any damage promptly repaired. Gaps, holes, or weaknesses in the barrier or openings between the barrier and the ground shall be promptly repaired.
    c. The noise control barrier and associated elements shall be completely removed, and the site appropriately restored upon the conclusion of the construction activity.
2. The construction contractor shall locate/stage all equipment inside the planned 24-foot high temporary construction noise barrier during all Project construction activities.
3. The planned 20-foot wide double swing gate shall remain closed at all times, except during active use to provide access to the construction site.
4. During all Project site construction, the construction contractor shall equip all construction equipment, mobile or stationary, with properly operating and maintained mufflers, consistent with manufacturers' standards. The construction contractor shall place all stationary construction equipment so that emitted noise is directed away from the noise-sensitive receivers nearest the Project site.
5. Electrically powered air compressors and similar power tools shall be used, when feasible, in place of diesel equipment.

6. No music or electronically reinforced speech from construction workers shall be allowed within the Project site.
7. Haul truck deliveries shall be limited to the hours between 7:00 a.m. and 8:00 p.m. on any day except for Sunday or a Federal holiday, or between the hours of 9:00 a.m. and 8:00 p.m. on Sunday or a Federal holiday (City Orange Municipal Code Section 8.24.50(E).

SUMMARY OF SIGNIFICANCE FINDINGS

The results of this Well 28 Noise Impact Analysis are summarized below based on the significance criteria in Section 4 of this report. Table ES-1 shows the findings of significance for each potential noise and/or vibration impact with applicable Project standard practices described in this study.

TABLE ES-1: SUMMARY OF SIGNIFICANCE FINDINGS

Analysis	Report Section	Significance Findings	
		Unmitigated	Mitigated
Operational Noise	6	*Less Than Significant*	-
Construction Noise	7	*Less Than Significant*	-
Construction Vibration		*Less Than Significant*	-

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1 INTRODUCTION

This noise analysis has been completed to determine the noise impacts associated with the development of the proposed Well 28 ("Project"). This noise study describes the proposed Project, provides information regarding noise fundamentals, outlines the local regulatory setting, provides the study methods and procedures for noise and vibration analysis. In addition, this study includes an analysis of the potential Project-related construction noise and vibration impacts.

1.1 SITE LOCATION

The proposed Well 28 site is located at 235 West Maple Avenue in the City Orange, as shown on Exhibit 1-A. The Project site is located at the northeast corner at the intersection of Maple Avenue and Lemon Street. The project site is in an area of the Historic District characterized by historic industrial and residential structures. Structures contributing to the Old Towne Orange Historic District are present immediately to the north at 233 N. Lemon Street, to the east at 204 N. Olive Street (Chapman University Elliott Alumni House) and 214 N. Olive Street, and to the south at 193 N. Lemon Street, on the opposite side of Maple Avenue.

Contemporary development includes Chapman University's Dodge College of Film & Media Arts and the recently completed City of Orange/Metrolink Parking Structure, both located on the opposite side of Lemon Street. The City of Orange General Plan designates the Project site for Public-Institutional (P-I) uses. (2) The site is currently a vacant lot completely paved over and secured with an existing 6-foot high chain link fence.

1.2 PROJECT DESCRIPTION

The proposed Project is anticipated to include the construction and operation of the Proposed Well 28. The proposed the well operations site plan is shown on Exhibit 1-B and the well construction layout is shown on Exhibit 1-C. The proposed well is expected to produce 3,000 gallons of water per minute and have a depth of 1,200 feet. It will be powered by a 350-horsepower pump. A temporary 24-foot-high (approximately 500 linear feet) sound wall will be provided to enclose the well area during well drilling operations. Construction of the well would involve removal of the existing asphalt and the drilling of the well head, expected to occur 24 hours a day, 7 days a week for a period of three weeks. The installation of additional well infrastructure would follow, with resurfacing of the site, perimeter landscaping, wall and/or fence installation, and driveway, curb, and water line installation completing the construction process. Construction activities apart from well drilling would occur from 7 am to 5 pm and would be concluded in approximately 1.5 years. Site improvements include a 14-foot high well enclosure with an additional 16-foot-high screen wall, man-gate, 18-foot-wide automatic rolling gate, 20-foot-wide driveway, 6-foot-high metal fence, AC pavement and concrete pads within the well site. A portion of the site will be developed with a mini public park, which will be constructed along with Well 28. The mini park would include benches, fencing, landscaping, removable bollards, trash receptacles, and decomposed granite and concrete pathways. A parking lot would not be included in the design.

EXHIBIT 1-A: LOCATION MAP

EXHIBIT 1-B: WELL OPERATIONS SITE PLAN

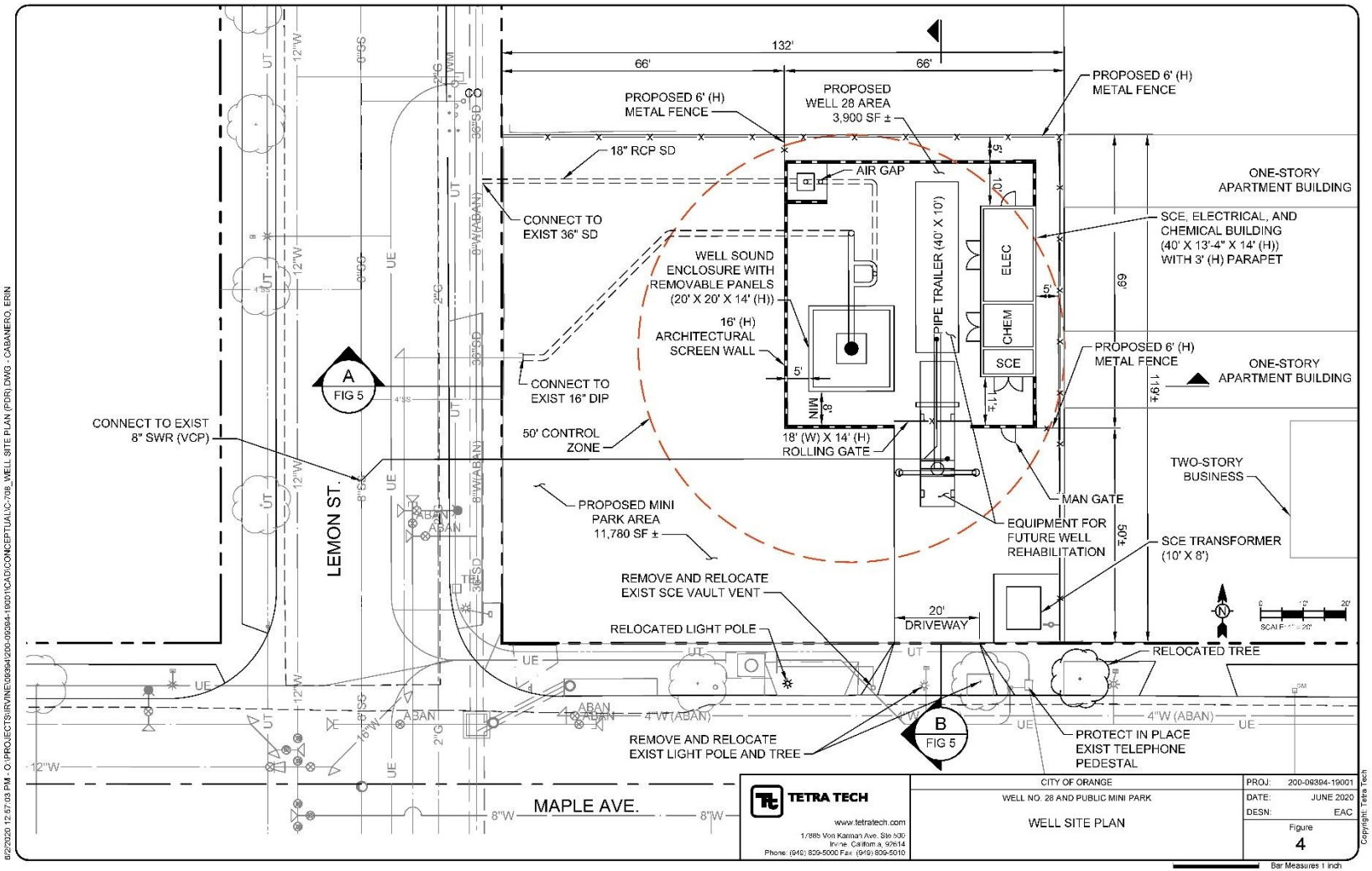
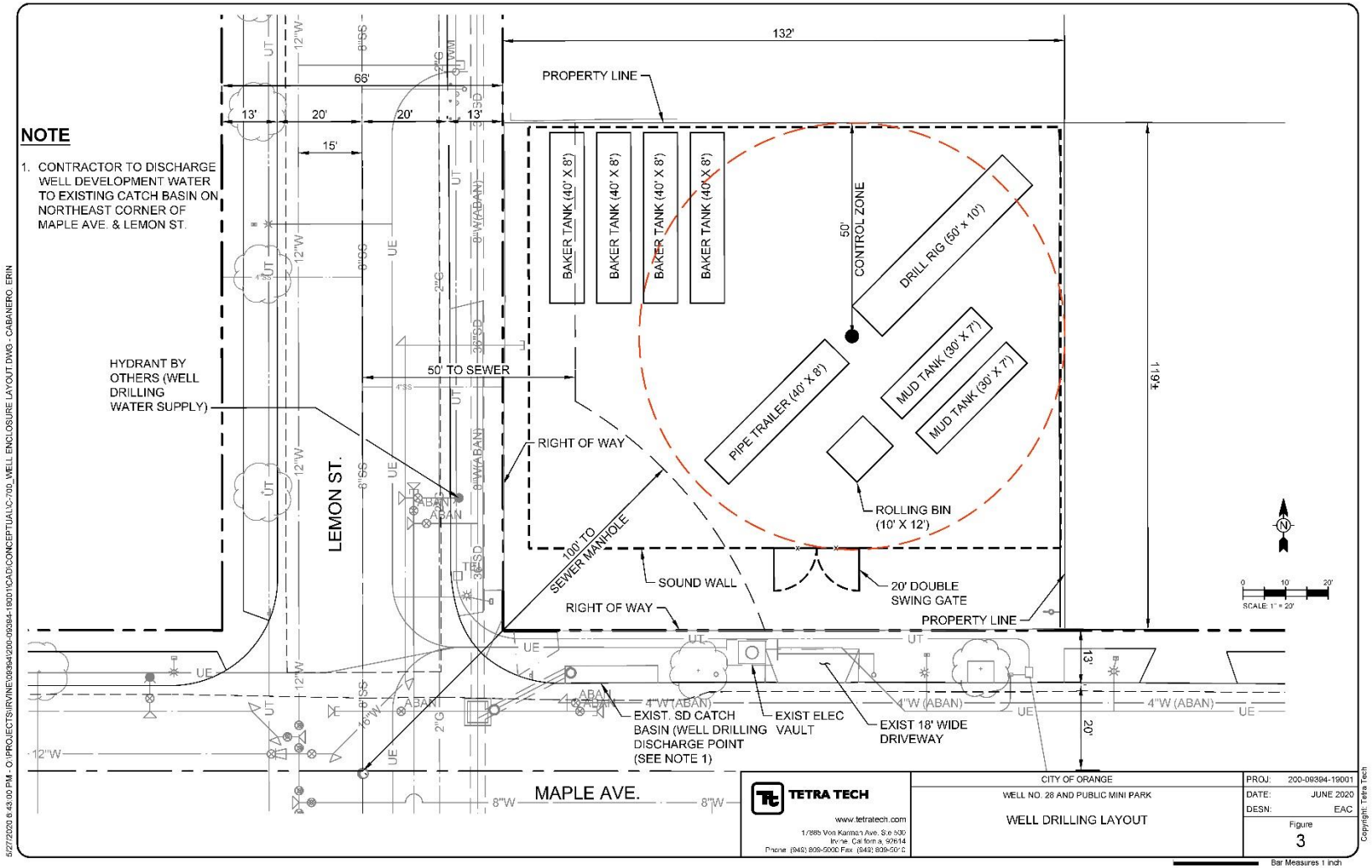


EXHIBIT 1-C: WELL CONSTRUCTION LAYOUT



2 FUNDAMENTALS

Noise is simply defined as "unwanted sound." Sound becomes unwanted when it interferes with normal activities, when it causes actual physical harm or when it has adverse effects on health. Noise is measured on a logarithmic scale of sound pressure level known as a decibel (dB). A-weighted decibels (dBA) approximate the subjective response of the human ear to broad frequency noise source by discriminating against very low and very high frequencies of the audible spectrum. They are adjusted to reflect only those frequencies which are audible to the human ear. Exhibit 2-A presents a summary of the typical noise levels and their subjective loudness and effects that are described in more detail below.

EXHIBIT 2-A: TYPICAL NOISE LEVELS

COMMON OUTDOOR ACTIVITIES	COMMON INDOOR ACTIVITIES	A - WEIGHTED SOUND LEVEL dBA	SUBJECTIVE LOUDNESS	EFFECTS OF NOISE
THRESHOLD OF PAIN		140	INTOLERABLE OR DEAFENING	HEARING LOSS
NEAR JET ENGINE		130		
		120		
JET FLY-OVER AT 300m (1000 ft)	ROCK BAND	110		
LOUD AUTO HORN		100	VERY NOISY	
GAS LAWN MOWER AT 1m (3 ft)		90		
DIESEL TRUCK AT 15m (50 ft), at 80 km/hr (50 mph)	FOOD BLENDER AT 1m (3 ft)	80		SPEECH INTERFERENCE
NOISY URBAN AREA, DAYTIME	VACUUM CLEANER AT 3m (10 ft)	70	LOUD	
HEAVY TRAFFIC AT 90m (300 ft)	NORMAL SPEECH AT 1m (3 ft)	60		
QUIET URBAN DAYTIME	LARGE BUSINESS OFFICE	50	MODERATE	SLEEP DISTURBANCE
QUIET URBAN NIGHTTIME	THEATER, LARGE CONFERENCE ROOM (BACKGROUND)	40		
QUIET SUBURBAN NIGHTTIME	LIBRARY	30	FAINT	NO EFFECT
QUIET RURAL NIGHTTIME	BEDROOM AT NIGHT, CONCERT HALL (BACKGROUND)	20		
	BROADCAST/RECORDING STUDIO	10	VERY FAINT	
LOWEST THRESHOLD OF HUMAN HEARING	LOWEST THRESHOLD OF HUMAN HEARING	0		

Source: Environmental Protection Agency Office of Noise Abatement and Control, Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety (EPA/ONAC 550/9-74-004) March 1974.

2.1 RANGE OF NOISE

Since the range of intensities that the human ear can detect is so large, the scale frequently used to measure intensity is a scale based on multiples of 10, the logarithmic scale. The scale for measuring intensity is the decibel scale. Each interval of 10 decibels indicates a sound energy ten times greater than before, which is perceived by the human ear as being roughly twice as loud. (3) The most common sounds vary between 40 dBA (very quiet) to 100 dBA (very loud). Normal conversation at three feet is roughly at 60 dBA, while loud jet engine noises equate to 110 dBA

at approximately 100 feet, which can cause serious discomfort. (4) Another important aspect of noise is the duration of the sound and the way it is described and distributed in time.

2.2 NOISE DESCRIPTORS

Environmental noise descriptors are generally based on averages, rather than instantaneous, noise levels. The most commonly used figure is the equivalent level (L_{eq}). Equivalent sound levels are not measured directly but are calculated from sound pressure levels typically measured in A-weighted decibels (dBA). The equivalent sound level (L_{eq}) represents a steady state sound level containing the same total energy as a time varying signal over a given sample period (typically one hour) and is commonly used to describe the "average" noise levels within the environment.

Peak hour or average noise levels, while useful, do not completely describe a given noise environment. Noise levels lower than peak hour may be disturbing if they occur during times when quiet is most desirable, namely evening and nighttime (sleeping) hours. To account for this, the Day-Night Average Noise Level (LDN) and the Community Noise Equivalent Level (CNEL), representing a composite 24-hour noise level is utilized. The LDN and CNEL are weighted averages of the intensity of a sound, with corrections for time of day, and averaged over 24 hours. The LDN time of day corrections include the addition of 10 decibels to dBA Leq sound levels at night between 10:00 p.m. and 7:00 a.m. The CNEL time of day corrections require the addition of 5 decibels to dBA Leq sound levels in the evening from 7:00 p.m. to 10:00 p.m., in addition to the corrections for the LDN. These additions are made to account for the noise sensitive time periods during the evening and night hours when sound appears louder. LDN and CNEL do not represent the actual sound level heard at any time, but rather represent the total sound exposure. The City Orange relies on the 24-hour CNEL level to assess land use compatibility with transportation related noise sources.

2.3 SOUND PROPAGATION

When sound propagates over a distance, it changes in level and frequency content. The way noise reduces with distance depends on the following factors.

2.3.1 GEOMETRIC SPREADING

Sound from a localized source (i.e., a stationary point source) propagates uniformly outward in a spherical pattern. The sound level attenuates (or decreases) at a rate of 6 dB for each doubling of distance from a point source. Highways consist of several localized noise sources on a defined path and hence can be treated as a line source, which approximates the effect of several point sources. Noise from a line source propagates outward in a cylindrical pattern, often referred to as cylindrical spreading. Sound levels attenuate at a rate of 3 dB for each doubling of distance from a line source. (3)

2.3.2 GROUND ABSORPTION

The propagation path of noise from a highway to a receiver is usually very close to the ground. Noise attenuation from ground absorption and reflective wave canceling adds to the attenuation

associated with geometric spreading. Traditionally, the excess attenuation has also been expressed in terms of attenuation per doubling of distance. This approximation is usually sufficiently accurate for distances of less than 200 ft. For acoustically hard sites (i.e., sites with a reflective surface between the source and the receiver, such as a parking lot or body of water), no excess ground attenuation is assumed. For acoustically absorptive or soft sites (i.e., those sites with an absorptive ground surface between the source and the receiver such as soft dirt, grass, or scattered bushes and trees), an excess ground attenuation value of 1.5 dB per doubling of distance is normally assumed. When added to the cylindrical spreading, the excess ground attenuation results in an overall drop-off rate of 4.5 dB per doubling of distance from a line source. (5)

2.3.3 ATMOSPHERIC EFFECTS

Receivers located downwind from a source can be exposed to increased noise levels relative to calm conditions, whereas locations upwind can have lowered noise levels. Sound levels can be increased at large distances (e.g., more than 500 feet) due to atmospheric temperature inversion (i.e., increasing temperature with elevation). Other factors such as air temperature, humidity, and turbulence can also have significant effects. (3)

2.3.4 SHIELDING

A large object or barrier in the path between a noise source and a receiver can substantially attenuate noise levels at the receiver. The amount of attenuation provided by shielding depends on the size of the object and the frequency content of the noise source. Shielding by trees and other such vegetation typically only has an “out of sight, out of mind” effect. That is, the perception of noise impact tends to decrease when vegetation blocks the line-of-sight to nearby residents. However, for vegetation to provide a substantial, or even noticeable, noise reduction, the vegetation area must be at least 15 feet in height, 100 feet wide and dense enough to completely obstruct the line-of sight between the source and the receiver. This size of vegetation may provide up to 5 dBA of noise reduction. The FHWA does not consider the planting of vegetation to be a noise abatement measure. (5)

2.4 NOISE CONTROL

Noise control is the process of obtaining an acceptable noise environment for an observation point or receiver by controlling the noise source, transmission path, receiver, or all three. This concept is known as the source-path-receiver concept. In general, noise control measures can be applied to these three elements.

2.5 NOISE BARRIER ATTENUATION

Effective noise barriers can reduce noise levels by up to 10 to 15 dBA, cutting the loudness of traffic noise in half. A noise barrier is most effective when placed close to the noise source or receiver. Noise barriers, however, do have limitations. For a noise barrier to work, it must be high enough and long enough to block the path of the noise source. (5)

2.6 LAND USE COMPATIBILITY WITH NOISE

Some land uses are more tolerant of noise than others. For example, schools, hospitals, churches, and residences are more sensitive to noise intrusion than are commercial or industrial developments and related activities. As ambient noise levels affect the perceived amenity or livability of a development, so too can the mismanagement of noise impacts impair the economic health and growth potential of a community by reducing the area's desirability as a place to live, shop and work. For this reason, land use compatibility with the noise environment is an important consideration in the planning and design process. The FHWA encourages State and Local government to regulate land development in such a way that noise-sensitive land uses are either prohibited from being located adjacent to a highway, or that the developments are planned, designed, and constructed in such a way that noise impacts are minimized. (6)

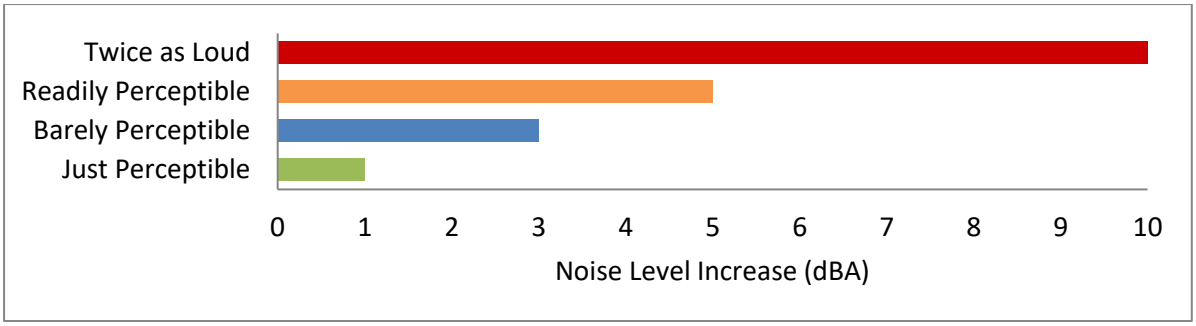
2.7 COMMUNITY RESPONSE TO NOISE

Community responses to noise may range from registering a complaint by telephone or letter, to initiating court action, depending upon everyone's susceptibility to noise and personal attitudes about noise. Several factors are related to the level of community annoyance including:

- Fear associated with noise producing activities;
- Socio-economic status and educational level;
- Perception that those affected are being unfairly treated;
- Attitudes regarding the usefulness of the noise-producing activity;
- Belief that the noise source can be controlled.

Approximately ten percent of the population has a very low tolerance for noise and will object to any noise not of their making. Consequently, even in the quietest environment, some complaints will occur. Twenty-five percent of the population will not complain even in very severe noise environments. Thus, a variety of reactions can be expected from people exposed to any given noise environment. (7) Surveys have shown that about ten percent of the people exposed to traffic noise of 60 dBA will report being highly annoyed with the noise, and each increase of one dBA is associated with approximately two percent more people being highly annoyed. When traffic noise exceeds 60 dBA or aircraft noise exceeds 55 dBA, people may begin to complain. (7) Despite this variability in behavior on an individual level, the population can be expected to exhibit the following responses to changes in noise levels as shown on Exhibit 2-B. A change of 3 dBA are considered *barely perceptible*, and changes of 5 dBA are considered *readily perceptible*. (5)

EXHIBIT 2-B: NOISE LEVEL INCREASE PERCEPTION



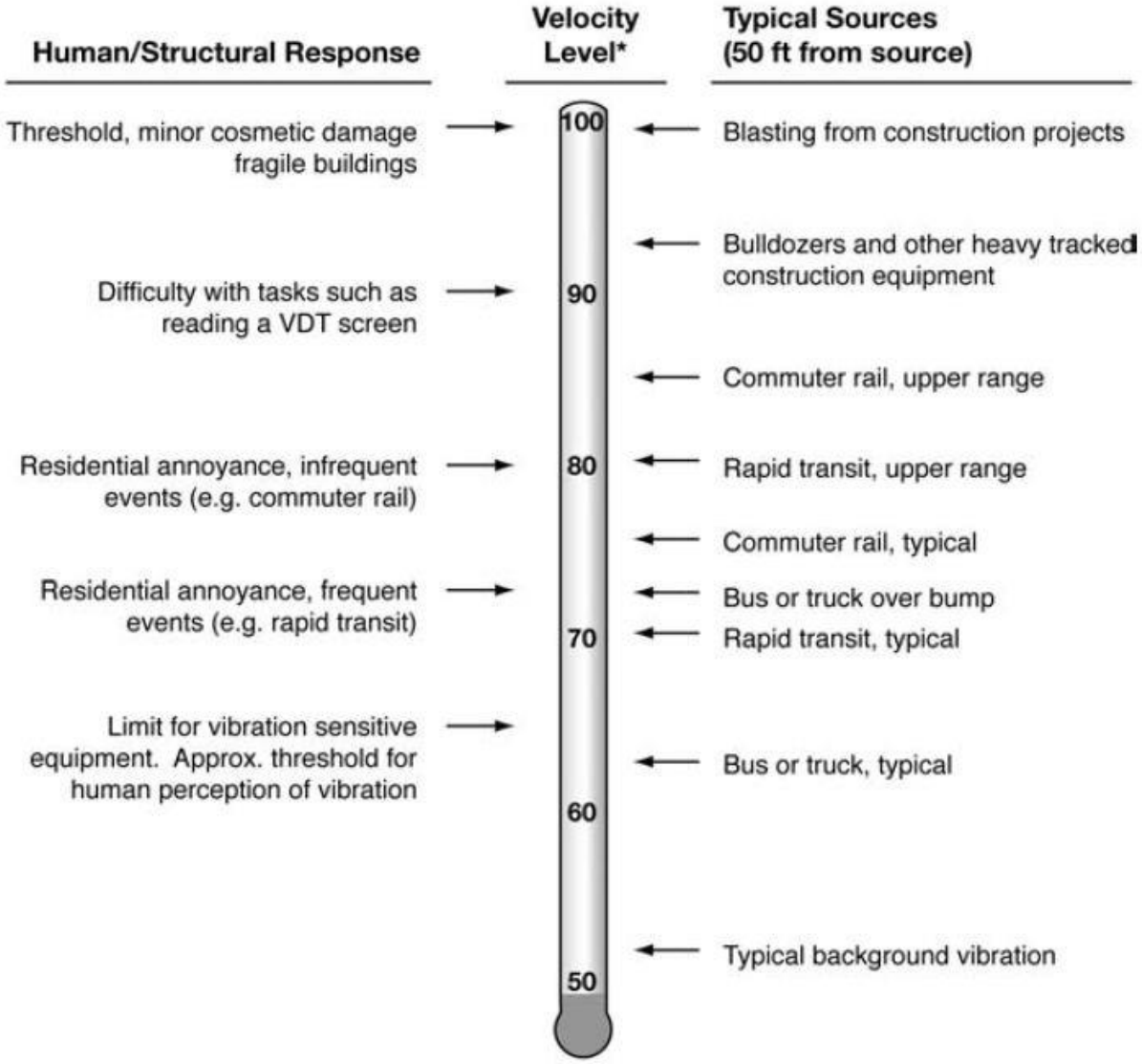
2.8 VIBRATION

Per the Federal Transit Administration (FTA) *Transit Noise Impact and Vibration Assessment Manual* (9), vibration is the periodic oscillation of a medium or object. The rumbling sound caused by the vibration of room surfaces is called structure-borne noise. Sources of ground-borne vibrations include natural phenomena (e.g., earthquakes, volcanic eruptions, sea waves, landslides) or human-made causes (e.g., explosions, machinery, traffic, trains, construction equipment). Vibration sources may be continuous, such as factory machinery, or transient, such as explosions. As is the case with airborne sound, ground-borne vibrations may be described by amplitude and frequency.

There are several different methods that are used to quantify vibration. The peak particle velocity (PPV) is defined as the maximum instantaneous peak of the vibration signal. The PPV is most frequently used to describe vibration impacts to buildings but is not always suitable for evaluating human response (annoyance) because it takes some time for the human body to respond to vibration signals. Instead, the human body responds to average vibration amplitude often described as the root mean square (RMS). The RMS amplitude is defined as the average of the squared amplitude of the signal and is most frequently used to describe the effect of vibration on the human body. Decibel notation (VdB) is commonly used to measure RMS. Decibel notation (VdB) serves to reduce the range of numbers used to describe human response to vibration. Typically, ground-borne vibration generated by man-made activities attenuates rapidly with distance from the source of the vibration. Sensitive receivers for vibration include structures (especially older masonry structures), people (especially residents, the elderly, and sick), and vibration-sensitive equipment and/or activities

The background vibration-velocity level in residential areas is generally 50 VdB. Ground-borne vibration is normally perceptible to humans at approximately 65 VdB. For most people, a vibration-velocity level of 75 VdB is the approximate dividing line between barely perceptible and distinctly perceptible levels. Typical outdoor sources of perceptible ground-borne vibration are construction equipment, steel-wheeled trains, and traffic on rough roads. If a roadway is smooth, the ground-borne vibration is rarely perceptible. The range of interest is from approximately 50 VdB, which is the typical background vibration-velocity level, to 100 VdB, which is the general threshold where minor damage can occur in fragile buildings. Exhibit 2-C illustrates common vibration sources and the human and structural response to ground-borne vibration.

EXHIBIT 2-C: TYPICAL LEVELS OF GROUND-BORNE VIBRATION



** RMS Vibration Velocity Level in VdB relative to 10^{-6} inches/second*

Source: Federal Transit Administration (FTA) Transit Noise Impact and Vibration Assessment.

3 REGULATORY SETTING

To limit population exposure to physically and/or psychologically damaging as well as intrusive noise levels, the federal government, the State of California, various county governments, and most municipalities in the state have established standards and ordinances to control noise. In most areas, automobile and truck traffic is the major source of environmental noise. Traffic activity generally produces an average sound level that remains constant with time. Air and rail traffic, and commercial and industrial activities are also major sources of noise in some areas. Federal, state, and local agencies regulate different aspects of environmental noise. Federal and state agencies generally set noise standards for mobile sources such as aircraft and motor vehicles, while regulation of stationary sources is left to local agencies.

3.1 CITY ORANGE OPERATIONAL NOISE STANDARDS

For noise-sensitive residential property, the City Orange Municipal Code, Section 8.24.040, identifies hourly average (L_{eq}) exterior noise levels standards of 55 dBA L_{eq} for the daytime hours (7:00 a.m. to 10:00 p.m.) and 50 dBA L_{eq} during the nighttime (10:00 p.m. to 7:00 a.m.) hours. Table 3-1 presents a summary of the City Orange Municipal Code Noise Standards that are included in Appendix 3.1. Per Section 8.24.040(B), for multi-family residential or mixed use developments located within the City's Urban Mixed Use, Neighborhood Mixed Use, Old Towne Mixed Use or Medium Density Residential General Plan land use districts, exterior noise standards shall apply to common recreation areas only and shall not apply to private exterior space (such as a private yard, patio, or balcony).

TABLE 3-1: CITY ORANGE OPERATIONAL NOISE STANDARDS

Land Use	Exterior Noise Level Criteria	
	Daytime	Nighttime
Residential	55 dBA L_{eq}	50 dBA L_{eq}

City of Orange Municipal Code Section 8.24.040. Per Section 8.24.040(B), for multi-family residential or mixed use developments located within the City's Urban Mixed Use, Neighborhood Mixed Use, Old Towne Mixed Use or Medium Density Residential General Plan land use districts, exterior noise standards shall apply to common recreation areas only and shall not apply to private exterior space (such as a private yard, patio, or balcony). "Daytime" = 7:00 a.m. to 10:00 p.m.; "Nighttime" = 10:00 p.m. to 7:00 a.m.

3.2 CITY ORANGE CONSTRUCTION NOISE STANDARDS

To control noise impacts associated with the construction of the proposed Project the City Orange has established limits to the hours of construction. According to Section 8.24.50 of the City's Municipal Code the following activities are exempt from the provisions of the noise control ordinance:

- *Any mechanical device, apparatus or equipment used, related to or connected with emergency machinery, vehicle or work (Section 8.24.50[D])*
- *Noise sources associated with construction, repair, remodeling, or grading of any real property, provided said activities take place between the hours of 7:00 a.m. and 8:00 p.m.*

on any day except for Sunday or a Federal holiday, or between the hours of 9:00 a.m. and 8:00 p.m. on Sunday or a Federal holiday (Section 8.24.50[E])

- *Any maintenance or construction activity undertaken by a public agency or utility within street right of way (Section 8.24.50[K])*

Neither the City's General Plan nor Municipal Code establish numeric maximum acceptable construction source noise levels at potentially affected receivers, which would allow for a quantified determination of what CEQA constitutes a *substantial temporary or periodic noise increase*.

3.3 CONSTRUCTION NOISE CRITERIA

To evaluate whether the Project will generate potentially significant construction noise levels at off-site sensitive receiver locations, a construction-related noise level threshold is adopted from the Federal Transit Administration (FTA) *Transit Noise and Vibration Impact Assessment Manual.* (9) The FTA criteria recognizes that project construction noise criteria should consider the existing noise environment, the absolute noise levels during construction activities, the duration of the construction, and the adjacent land use. Therefore, this analysis relies on the FTA construction noise level guidelines that can be considered as reasonable criteria for assessment. As shown on Table 3-2 for residential use, the FTA establishes an absolute daytime noise level limit of 80 dBA L_{eq}, and a nighttime noise level limit of 70 dBA L_{eq}.

TABLE 3-2: FTA CONSTRUCTION NOISE CRITERIA

Land Use	Exterior Construction Noise Level Criteria		
	Daytime	Nighttime	24-Hour
Residential	80 dBA L_{eq}	70 dBA L_{eq}	75 dBA CNEL
Commercial	85 dBA L_{eq}	85 dBA L_{eq}	80 dBA $L_{eq(24hr)}$
Industrial	90 dBA L_{eq}	90 dBA L_{eq}	85 dBA $L_{eq(24hr)}$

FTA Transit Noise and Vibration Impact Assessment Manual, 2018 (Table 7-3). For the purpose of this analysis, the 24-hour Ldn noise levels have been expressed as CNEL in order to account for the noise sensitive evening hours consistent with the City of Orange General Plan Noise Element. "Daytime" = 7:00 a.m. to 10:00 p.m.; "Nighttime" = 10:00 p.m. to 7:00 a.m.

In addition, to the daytime and nighttime hourly construction noise level criteria, the FTA includes a 30-day average noise level threshold of 75 dBA L_{dn} to account for long-term construction noise impacts. For the purpose of this analysis, the 24-hour Ldn noise levels have been expressed as CNEL in order to account for the noise sensitive evening hours consistent with the City of Orange General Plan Noise Element. The 24-hour CNEL exterior construction noise level criteria is the most restrictive since it includes penalties for nighttime construction noise level events.

3.5 CONSTRUCTION VIBRATION CRITERIA

Construction activity can result in varying degrees of ground-borne vibration, depending on the equipment and methods used, distance to the affected structures and soil type. Construction vibration is generally associated with pile driving and rock blasting. Other construction

equipment such as air compressors, light trucks, hydraulic loaders, etc., generates little or no ground vibration. (9) Occasionally large bulldozers and loaded trucks can cause perceptible vibration levels at close proximity.

To analyze vibration impacts originating from the operation and construction of the Well 28, vibration-generating activities are appropriately evaluated against standards established under a City's Municipal Code, if such standards exist. However, the City Orange does not identify specific vibration level limits. Therefore, for analysis purposes, the Caltrans *Transportation and Construction Vibration Guidance Manual*, (1 p. 38) Table 19 and 20, vibration damage and annoyance criteria are used in this noise study to assess potential temporary construction-related impacts at adjacent receiver locations.

3.5.1 BUILDING DAMAGE:

While ground vibrations from construction activities do not often reach the levels that can damage structures, fragile buildings must receive special consideration. The construction vibration damage potential criteria include consideration of the building conditions. (4 p. 182) Table 3-3 describes the maximum acceptable transient and continuous vibration building damage potential levels by structure type and condition.

TABLE 3-3: BUILDING DAMAGE VIBRATION CRITERIA

Structure and Condition	Maximum Transient Vibration Levels PPV (in/sec)	Maximum Continuous Vibration Levels PPV (in/sec)
Extremely fragile historic buildings	0.12	0.08
Fragile buildings	0.2	0.1
Historic and some old buildings	0.5	0.25
Older residential structures	0.5	0.3
New residential structures	1.0	0.5
Modern industrial/commercial buildings	2.0	0.5

Caltrans Transportation and Construction Vibration Guidance Manual, April 2020, Tables 19, p. 38.

Most of the buildings near the Project site can described as older residential buildings with a maximum acceptable transient vibration threshold of 0.5 PPV (in/sec) and a maximum continuous vibration threshold of 0.3 PPV (in/sec). For the nearby historic buildings, the maximum acceptable continuous vibration threshold is reduced to 0.25 PPV (in/sec).

3.5.2 HUMAN ANNOYANCE

For sensitive residential receiver locations, potential annoyance due to construction-related vibration levels is evaluated based on the Caltrans annoyance potential criteria. Table 3-4 describes the maximum acceptable criteria used to describe the transient and continuous sources of vibration. To describe the human annoyance due to construction vibration levels, this analysis relies on the *distinctly perceptible* maximum transient vibration threshold of 0.25 PPV (in/sec) and the continuous vibration threshold of 0.04 PPV (in/sec).

TABLE 3-4: HUMAN ANNOYANCE VIBRATION CRITERIA

Human Response	Maximum Transient Vibration Levels PPV (in/sec)	Maximum Continuous Vibration Levels PPV (in/sec)
Barely perceptible	0.04	0.01
Distinctly perceptible	0.25	0.04
Strongly perceptible	0.9	0.10
Severe	2.0	0.4

Caltrans Transportation and Construction Vibration Guidance Manual, April 2020, Tables 20, p. 38.

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4 SIGNIFICANCE CRITERIA

The following significance criteria are based on currently adopted guidance provided by Appendix G of the California Environmental Quality Act (CEQA) Guidelines. (11) For the purposes of this report, impacts would be potentially significant if the Project results in or causes:

A. Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?

B. Generation of excessive ground-borne vibration or ground-borne noise levels?

C. For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

The City Orange General Plan Guidelines provide direction on noise compatibility and establish noise standards by land use type that are sufficient to assess the significance of noise impacts.. CEQA Appendix G Guideline C applies to nearby public and private airports, if any, and the Project's land use compatibility.

4.1 CEQA GUIDELINES NOT FURTHER ANALYZED

The Project site is not located within two miles of a public airport or within an airport land use plan; nor is the Project within the vicinity of a private airstrip. As such, the Project site would not be exposed to excessive noise levels from airport operations, and therefore, impacts are considered *less than significant,* and no further noise analysis is conducted in relation to Guideline C.

4.2 INCREMENTAL NOISE LEVEL INCREASES

Noise level increases resulting from the Project are evaluated based on the Appendix G CEQA Guidelines described above at the closest receiver locations. Under CEQA, consideration must be given to the magnitude of the increase, the existing ambient noise levels, and the location of noise-sensitive receivers to determine if a noise increase represents a significant adverse environmental impact. (12)

There is no completely satisfactory way to measure the subjective effects of noise or of the corresponding human reactions of annoyance and dissatisfaction, primarily because of the wide variation in individual thresholds of annoyance and differing individual experiences with noise. Thus, an effective way of determining a person's subjective reaction to a new noise is the comparison of it to the existing environment to which one has adapted—the so-called *ambient* environment. In general, the more a new noise exceeds the previously existing ambient noise level, the less acceptable the new noise will typically be judged.

To describe the amount to which a given noise level increase is considered acceptable, the City Orange General Plan has adopted criteria for determining appropriate mitigation under the California Environmental Quality Act (CEQA). An increase in ambient noise levels is assumed to be a significant noise impact if a project causes ambient noise levels to exceed the following:

- Where the existing ambient noise level is less than 65 dBA, a project related permanent increase in ambient noise levels of 5 dBA CNEL or greater.
- Where the existing ambient noise level is greater than 65 dBA, a project related permanent increase in ambient noise levels of 3 dBA CNEL or greater.

4.3 SIGNIFICANCE CRITERIA

Noise impacts shall be considered significant if any of the following occur as a direct result of the proposed development. Table 4-1 shows the significance criteria summary matrix.

OPERATIONAL NOISE

- If Project-related operational (stationary-source) noise levels exceed the exterior 55 dBA Leq daytime or 50 dBA Leq nighttime noise level standards at nearby sensitive receiver locations (City Orange Municipal Code Section 8.24.040)
- If the existing ambient noise levels at the nearby noise-sensitive receivers near the Project site:
    - are less than 65 dBA L_{eq} and the Project creates a *readily perceptible* 5 dBA L_{eq} or greater Project-related noise level increase: or
    - are greater than 65 dBA L_{eq} and the Project creates a *barely perceptible* 3 dBA L_{eq} or greater Project-related noise level increase.

CONSTRUCTION NOISE

- If Project-related construction activities create noise levels which exceed an absolute daytime noise level limit of 80 dBA Leq, and a nighttime noise level limit of 70 dBA Leq or 75 dBA CNEL noise level.. (FTA Transit Noise and Vibration Impact Assessment Manual, 2018, Table 7-3).

CONSTRUCTION VIBRATION

- If Project-related construction vibration levels exceed the Caltrans building damage by structure type as shown on Table 3-3. (Caltrans, *Transportation and Construction Vibration Guidance Manual,* Table 19).
- If Project-related construction vibration levels exceed the *distinctly perceptible* vibration annoyance thresholds as shown on Table 3-4. (Caltrans, *Transportation and Construction Vibration Guidance Manual,* Table 20).

TABLE 4-1: SIGNIFICANCE CRITERIA SUMMARY

Analysis	Receiving Land Use	Condition(s)	Significance Criteria	
			Daytime	**Nighttime**
Operational Noise	Residential	Exterior Noise Level Standards[1]	55 dBA L_{eq}	50 dBA L_{eq}
		If ambient is < 65 dBA L_{eq}[2]	≥ 5 dBA L_{eq} Project increase	
		If ambient is < 65 dBA L_{eq}[2]	≥ 3 dBA L_{eq} Project increase	
Construction Noise	Residential	Noise Level Threshold[3]	80 dBA L_{eq}	70 dBA L_{eq}
			75 dBA CNEL	
Construction Vibration	Residential	Building Damage Threshold[4]	see Table 3-3	
		Human Annoyance Threshold[4]	see Table 3-4	

[1] City of Orange Municipal Code Section 8.24.040.
[2] City of Orange General Plan Noise Element, Table N-3.
[3] FTA, Transit Noise and Vibration Impact Assessment, Table 7-3, p.179.
[4] Caltrans Transportation and Construction Vibration Guidance Manual, April 2020, Tables 19 & 20, p. 38.

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5 EXISTING NOISE LEVEL MEASUREMENTS

To assess the existing noise level environment, long-term noise level measurements were taken at seven locations in the Project study area. The measurements locations were selected to describe and document the existing noise environment within the Project study area. Exhibit 5-A provides the boundaries of the Project study area and the noise level measurement locations. To fully describe the existing noise conditions, noise level measurements were collected by Urban Crossroads, Inc. during typical weekday conditions on Friday, August 14, 2020. Appendix 5.1 includes study area photos.

5.1 MEASUREMENT PROCEDURE AND CRITERIA

To describe the existing noise environment, the hourly noise levels were measured during typical weekday conditions over a 24-hour period. By collecting individual hourly noise level measurements, it is possible to describe the daytime and nighttime hourly noise levels and calculate the 24-hour CNEL. The long-term noise readings were recorded using Piccolo Type 2 integrating sound level meter and dataloggers. The Piccolo sound level meters were calibrated using a Larson-Davis calibrator, Model CAL 150. All noise meters were programmed in "slow" mode to record noise levels in "A" weighted form. The sound level meters and microphones were equipped with a windscreen during all measurements. All noise level measurement equipment satisfies the American National Standards Institute (ANSI) standard specifications for sound level meters ANSI S1.4-2014/IEC 61672-1:2013. (13)

5.2 NOISE MEASUREMENT LOCATIONS

The long-term noise level measurements were positioned as close to the nearest sensitive receiver locations as possible to assess the existing ambient hourly noise levels surrounding the Project site. Both Caltrans and the FTA recognize that it is not reasonable to collect noise level measurements that can fully represent every part of a private yard, patio, deck, or balcony normally used for human activity when estimating impacts for new development projects. This is demonstrated in the Caltrans general site location guidelines which indicate that, *sites must be free of noise contamination by sources other than sources of interest. Avoid sites located near sources such as barking dogs, lawnmowers, pool pumps, and air conditioners unless it is the express intent of the analyst to measure these sources*. (3) Further, FTA guidance states, t*hat it is not necessary nor recommended that existing noise exposure be determined by measuring at every noise-sensitive location in the project area. Rather, the recommended approach is to characterize the noise environment for clusters of sites based on measurements or estimates at representative locations in the community*. (9)

Based on recommendations of Caltrans and the FTA, it is not necessary to collect measurements at each individual building or residence, because each receiver measurement represents a group of buildings that share acoustical equivalence. (9) Collecting reference ambient noise level measurements at the nearest sensitive receiver locations allows for a comparison of the before and after Project noise levels and is necessary to assess potential noise impacts due to the Project's contribution to the ambient noise levels.

EXHIBIT 5-A: NOISE MEASUREMENT LOCATIONS

5.3 NOISE MEASUREMENT RESULTS

The noise measurements presented below focus on the average or equivalent sound levels (L_{eq}). The equivalent sound level (L_{eq}) represents a steady state sound level containing the same total energy as a time varying signal over a given sample period. Table 5-1 identifies the hourly daytime (7:00 a.m. to 10:00 p.m.) and nighttime (10:00 p.m. to 7:00 a.m.) noise levels at each noise level measurement location during typical weekday Friday conditions and weekend Saturday conditions. Appendix 5.2 provides a summary of the existing hourly ambient noise levels described below:

TABLE 5-1: 24-HOUR AMBIENT NOISE LEVEL MEASUREMENTS

Location[1]	Description	Energy Average Noise Level (dBA L_{eq})[2]		CNEL
		Daytime	Nighttime	
L1	Located northeast of the Project site near existing multi-family residential homes at 224 North Olive Street.	63.5	51.9	63.1
L2	Located east of the Project site near existing multi-family residential homes at 214 North Olive Street.	63.6	51.4	63.2
L3	Located east of the Project site near the Chapman University Elliott Alumni House at 204 North Olive Street.	65.0	51.7	64.2
L4	Located southeast of the Project site on Maple Avenue near existing multi-family residential homes at 210 West Maple Avenue.	67.3	57.1	67.4
L5	Located south of the Project site on Maple Avenue near existing single-family residential home at 193 North Lemon Street.	70.9	55.4	69.7
L6	Located southwest of the Project site on Lemon Avenue and Maple Avenue near the Old Town West Parking Structure.	75.7	59.6	74.4
L7	Located northwest of the Project site near Chapman University Dodge College at 283 North Cypress Street.	64.3	59.3	67.2

[1] See Exhibit 5-A for the noise level measurement locations.
[2] Energy (logarithmic) average levels. The long-term 24-hour measurement worksheets are included in Appendix 5.2.
"Daytime" = 7:00 a.m. to 10:00 p.m.; "Nighttime" = 10:00 p.m. to 7:00 a.m.

Table 5-1 provides the (energy average) noise levels used to describe the daytime and nighttime ambient conditions. These daytime and nighttime energy average noise levels represent the average of all hourly noise levels observed during these time periods expressed as a single number. Appendix 5.2 provides summary worksheets of the noise levels for each hour as well as

the minimum, maximum, L_1, L_2, L_5, L_8, L_{25}, L_{50}, L_{90}, L_{95}, and L_{99} percentile noise levels observed during the daytime and nighttime periods. The background ambient noise levels in the Project study area are dominated by the transportation-related noise associated with surface streets.

6 RECEIVER LOCATIONS

To assess the potential for operational and construction noise impacts, the following receiver locations, as shown on Exhibit 6-A, were identified as representative locations for analysis. Sensitive receivers are generally defined as locations where people reside or where the presence of unwanted sound could otherwise adversely affect the use of the land. The City Orange General Plan Noise Element defines noise-sensitive uses as residences, hospitals, convalescent and day care facilities, schools, and libraries. (14) Moderately noise-sensitive land uses typically include multi-family dwellings, hotels, motels, dormitories, out-patient clinics, cemeteries, golf courses, country clubs, athletic/tennis clubs, and equestrian clubs. Land uses that are considered relatively insensitive to noise include business, commercial, and professional developments. Land uses that are typically not affected by noise include: industrial, manufacturing, utilities, agriculture, undeveloped land, parking lots, warehousing, liquid and solid waste facilities, salvage yards, and transit terminals.

To assess the Project related noise impacts, six receiver locations in the vicinity of the Project site were identified. The selection of receiver locations is based on FHWA guidelines and is consistent with additional guidance provided by Caltrans and the FTA. All distances are measured from the Project site boundary to the outdoor common recreation areas or at the building façade, whichever is closer to the Project site.

The nearest receiver where an individual can stay for a 24-hour period is represented by 214 N Olive Street (Receiver R2) located 25 feet east of the Project site. Other sensitive land uses in the Project study area that are located at greater distances than those identified in this noise study will experience lower noise levels than those presented in this report due to the additional attenuation from distance and the shielding of intervening structures. Distance is measured in a straight line from the project boundary to each receiver location.

R1: Location R1 represents the exterior façade of the multi-family residential community located at 224 N Olive Street roughly 36 feet northeast of the Project site. Since there are no outdoor common recreation areas at this location the noise sensitive receiver is placed at the building façade of the older residential structure.

R2: Location R2 represents the existing noise sensitive multi-family residential community located at 214 N Olive Street, roughly 25 feet east of the Project site. Since there are no outdoor common recreation areas facing the Project site, receiver R2 is placed at the façade of the older residential structure.

R3: Location R3 represents the Chapman University Elliott Alumni House located at 204 N Olive Street. This historic building is located roughly 56 feet east of the Project site. Since there are outdoor common recreation areas facing the Project site, receiver R3 is placed at the building façade.

R4: Location R4 represents the noise sensitive two-story multi-family residential community located at 210 W Maple Avenue roughly 79 feet southeast of the Project site. Since the only outdoor common recreation areas is located behind the older residential building structure in the central courtyard, receiver R4 is placed at the building façade.

R5: Location R5 represents the existing noise sensitive residential dwelling unit located at 193 N Lemon Street within the Old Towne Mixed Use General Plan land use district. Since there are no private outdoor living areas (e.g. backyards) facing the Project site, receiver R5 is placed at the historic building façade.

R6: Location R6 represents the Old Town West Parking Structure. This non-noise sensitive receiver is located approximately 108 feet southwest of the Project site.

R7: Location R7 represents the exterior building façade of the Chapman University Dodge College facility. This institutional land use located 187 feet northwest of the Project site is used primarily during the daytime and evening hours.

EXHIBIT 6-A: RECEIVER LOCATIONS

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7 OPERATIONAL NOISE IMPACTS

This section analyzes the potential stationary-source operational noise impacts at the nearby receiver locations, identified in Section 6, resulting from the typical daily operation of the proposed Well 28 Project. Exhibit 6-A identifies the noise source locations and receiver locations used to assess the operational noise levels.

7.1 OPERATIONAL NOISE SOURCES

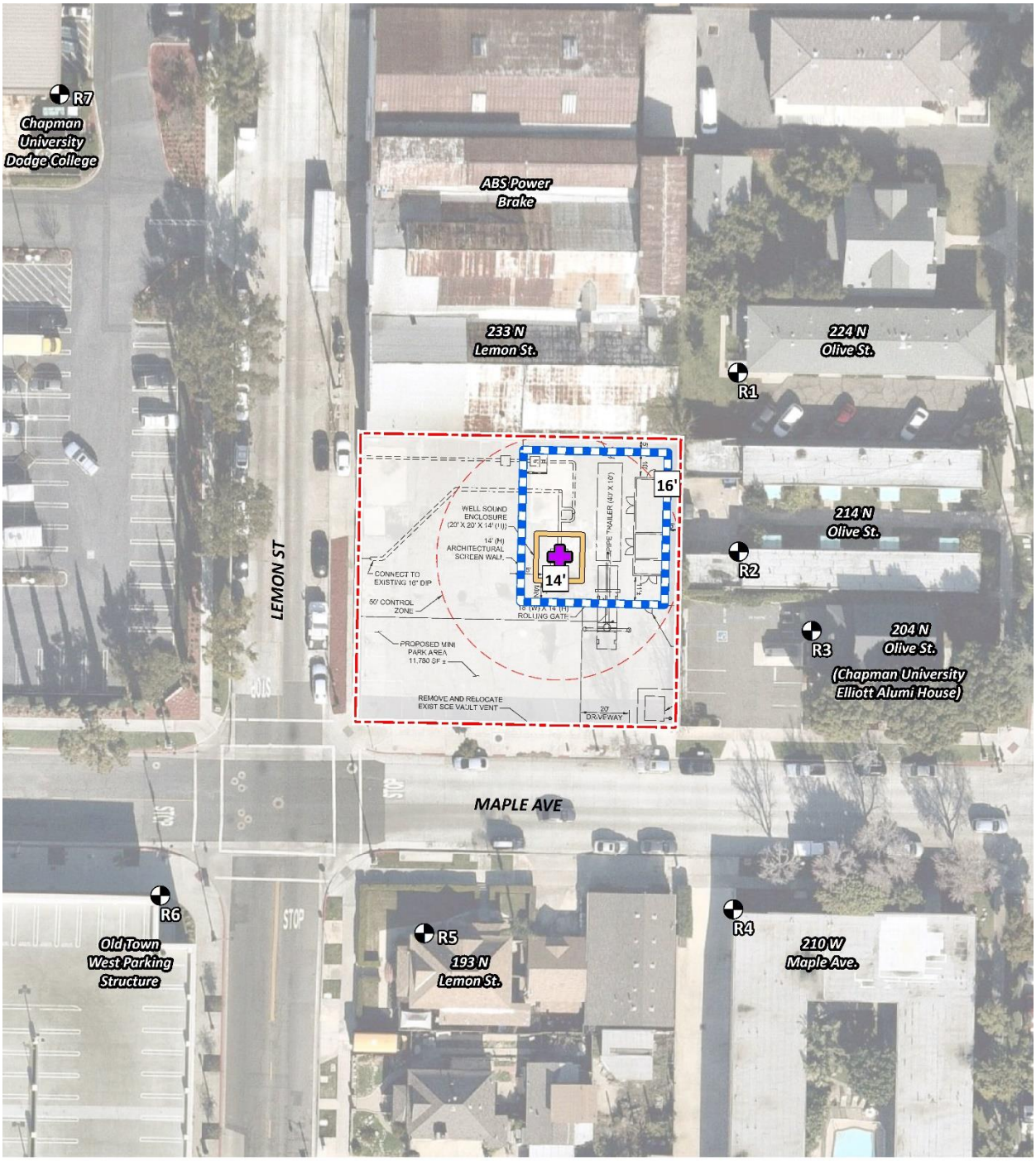
The proposed well is expected to produce 3,000 gallons of water per minute and have a depth of 1,200 feet. It will be powered by a 350-horsepower pump. Site improvements include a 14-foot high well enclosure with an additional 16-foot-high screen wall, man-gate, 18-foot-wide automatic rolling gate, 20-foot-wide driveway, 6-foot-high metal fence, AC pavement and concrete pads within the well site. At a distance of 3.3 feet from the primary noise source, the well pump is expected to produce a noise level of 90 dBA L_{eq}. This translates into a reference sound power level of 107 PWL. While sound pressure levels (e.g. L_{eq}) quantify in decibels the intensity of given sound sources at a reference distance, sound power levels (PWL) are connected to the sound source and are independent of distance. Sound pressure levels vary substantially with distance from the source and diminish as a result of intervening obstacles and barriers, air absorption, wind, and other factors. Sound power is the acoustical energy emitted by the sound source and is an absolute value that is not affected by the environment.

7.2 CADNAA NOISE PREDICTION MODEL

To fully describe the exterior operational noise levels from the Project, Urban Crossroads, Inc. developed a noise prediction model using the CadnaA (Computer Aided Noise Abatement) computer program. CadnaA can analyze the noise level of multiple types of noise sources and calculates the noise levels at any location using the spatially accurate Project site plan, georeferenced Nearmap aerial imagery, topography, buildings, and multiple barriers in its calculations using the ISO 9613 protocol to predict outdoor noise levels. Appendix 7.1 includes the detailed noise model inputs used to estimate the Project operational noise levels presented in this section.

The operational noise level calculations provided in this noise study account for the distance attenuation provided due to geometric spreading, when sound from a localized stationary source (i.e., a point source) propagates uniformly outward in a spherical pattern. Hard site conditions are used in the operational noise analysis which result in noise levels that attenuate (or decrease) at a rate of 6 dBA for each doubling of distance from a point source, based on existing conditions in the Project study area. A default ground attenuation factor of 0.0 was used in the CadnaA noise analysis to account for hard site conditions.

EXHIBIT 7-A: OPERATIONAL NOISE SOURCE LOCATIONS



7.3 PROJECT OPERATIONAL NOISE LEVELS

Using the reference operational noise source levels and the CadnaA noise prediction model, calculations of the Project operational noise level impacts at the nearby receiver locations were completed. As shown on Table 7-1, the operational noise levels are expected to range from 39.8 to 47.3 dBA L_{eq} at the nearby receiver locations. Appendix 7.1 includes the detailed CadnaA operational noise model inputs.

7.4 PROJECT OPERATIONAL NOISE LEVEL COMPLIANCE

To demonstrate compliance with local noise regulations, the Project-only operational noise levels are evaluated against exterior noise level thresholds based on the exterior noise level standards at nearby receiver locations. Table 7-1 shows the operational noise levels associated with Well 28 Project will satisfy the City Orange 55 dBA L_{eq} daytime and 50 dBA L_{eq} nighttime exterior noise level standards with the planned 14-foot high well enclosure and the 16-foot high screen wall as shown on Exhibit 7-A. Therefore, the operational noise impacts are considered *less than significant* at the nearby noise-sensitive receiver locations.

TABLE 7-1: OPERATIONAL NOISE LEVEL COMPLIANCE

Receiver Location[1]	Project Operational Noise Levels (dBA Leq)[2]		Noise Level Standards (dBA Leq)[3]		Noise Level Standards Exceeded?[4]	
	Daytime	Nighttime	Daytime	Nighttime	Daytime	Nighttime
R1	46.5	46.5	55	50	No	No
R2	47.3	47.3	55	50	No	No
R3	47.0	47.0	55	50	No	No
R4	44.4	44.4	55	50	No	No
R5	44.2	44.2	55	50	No	No
R6	41.8	41.8	55	50	No	No
R7	39.8	39.8	55	50	No	No

[1] See Exhibit 7-A for the receiver locations.
[2] CadnaA noise model inputs are included in Appendix 7.1. Project noise levels include the planned 14-foot high well enclosure and the 14-foot high screen wall as shown on Exhibit 7-A.
[3] City of Orange Municipal Code Section 8.24.040.
[4] Do the estimated Project operational noise source activities exceed the noise level standards?
"Daytime" = 7:00 a.m. to 10:00 p.m.; "Nighttime" = 10:00 p.m. to 7:00 a.m.

7.5 PROJECT OPERATIONAL NOISE LEVEL INCREASES

To describe the Project operational noise level increases, the Project operational noise levels are combined with the existing ambient noise levels measurements for the nearby receiver locations potentially impacted by Project operational noise sources. Since the units used to measure noise, decibels (dB), are logarithmic units, the Project-operational and existing ambient noise levels cannot be combined using standard arithmetic equations. (9) Instead, they must be logarithmically added using the following base equation:

$$SPL_{Total} = 10\log_{10}[10^{SPL1/10} + 10^{SPL2/10} + \ldots 10^{SPLn/10}]$$

Where "SPL1," "SPL2," etc. are equal to the sound pressure levels being combined, or in this case, the Project-operational and existing ambient noise levels. The difference between the combined Project and ambient noise levels describe the Project noise level increases to the existing ambient noise environment. Noise levels that would be experienced at receiver locations when Project-source noise is added to the daytime and nighttime ambient conditions are presented on Tables 7-2 and 7-3, respectively. As indicated on Tables 7-2 and 7-3, the Project will generate a daytime and nighttime operational noise level increases ranging from 0.0 to 1.4 dBA L_{eq} at the nearby receiver locations. Project-related operational noise level increases will satisfy the operational noise level increase significance criteria presented in Table 4-1. Therefore, the Project related noise level increases at the nearest sensitive receiver locations will be *less than significant.*

TABLE 7-2: DAYTIME PROJECT OPERATIONAL NOISE LEVEL INCREASES

Receiver Location[1]	Total Project Operational Noise Level[2]	Measurement Location[3]	Reference Ambient Noise Levels[4]	Combined Project and Ambient[5]	Project Increase[6]	Increase Criteria[7]	Increase Criteria Exceeded?[7]
R1	46.5	L1	63.5	63.6	0.1	5	No
R2	47.3	L2	63.6	63.7	0.1	5	No
R3	47.0	L3	65.0	65.1	0.1	3	No
R4	44.4	L4	67.3	67.3	0.0	3	No
R5	44.2	L5	70.9	70.9	0.0	3	No
R6	41.8	L6	75.7	75.7	0.0	3	No
R7	39.8	L7	64.3	64.3	0.0	5	No

[1] See Exhibit 7-A for the noise source and sensitive receiver locations.
[2] Total Project daytime operational noise levels as shown on Table 7-1.
[3] Reference noise level measurement locations as shown on Exhibit 5-A.
[4] Observed daytime ambient noise levels as shown on Table 5-1.
[5] Represents the combined ambient conditions plus the Project activities.
[6] The noise level increase expected with the addition of the proposed Project activities.
[7] Significance Criteria as shown on Table 4-1.

TABLE 7-3: NIGHTTIME PROJECT OPERATIONAL NOISE LEVEL INCREASES

Receiver Location[1]	Total Project Operational Noise Level[2]	Measurement Location[3]	Reference Ambient Noise Levels[4]	Combined Project and Ambient[5]	Project Increase[6]	Increase Criteria[7]	Increase Criteria Exceeded?[7]
R1	46.5	L1	51.9	53.0	1.1	5	No
R2	47.3	L2	51.4	52.8	1.4	5	No
R3	47.0	L3	51.7	53.0	1.3	5	No
R4	44.4	L4	57.1	57.3	0.2	5	No
R5	44.2	L5	55.4	55.7	0.3	5	No
R6	41.8	L6	59.6	59.7	0.1	5	No
R7	39.8	L7	59.3	59.3	0.0	5	No

[1] See Exhibit 7-A for the noise source and sensitive receiver locations.
[2] Total Project nighttime operational noise levels as shown on Table 7-1.
[3] Reference noise level measurement locations as shown on Exhibit 5-A.
[4] Observed nighttime ambient noise levels as shown on Table 5-1.
[5] Represents the combined ambient conditions plus the Project activities.
[6] The noise level increase expected with the addition of the proposed Project activities.
[7] Significance Criteria as shown on Table 4-1.

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8 CONSTRUCTION IMPACTS

This section analyzes potential impacts resulting from the construction noise and vibration activities associated with the development of the Project. Exhibit 8-A shows the construction noise source locations and receiver locations used to assess the construction noise levels.

8.1 CONSTRUCTION NOISE SOURCES

Noise generated by the Project construction equipment will include a combination of trucks, power tools, concrete mixers, and portable generators that when combined can reach high levels. The Project is construction noise sources are expected to include a combination of loaders, cranes, welders, drill rigs, diesel generators, concrete pumps and mixture of other construction equipment.

8.2 REFERENCE CONSTRUCTION NOISE LEVELS

The FTA *Transit Noise and Vibration Impact Assessment Manual* recognizes that construction projects are accomplished in several different stages. Each stage has a specific equipment mix, depending on the work to be completed during that stage. As a result of the equipment mix, each stage has its own noise characteristics; some stages have higher continuous noise levels than others, and some have higher impact noise levels than others. The Project construction activities are expected to occur in the following stages:

- Mobilization
- Well Drilling
- Casing
- Well Testing
- Well Mechanical
- Well Surveying/Demobilization

This construction noise analysis was prepared using reference construction equipment noise levels from the Federal Highway Administration (FHWA) published the Roadway Construction Noise Model (RCNM), which includes a national database of construction equipment reference noise emission levels. (15) The RCNM equipment database, provides a comprehensive list of the noise generating characteristics for specific types of construction equipment. In addition, the database provides an acoustical usage factor to estimate the fraction of time each piece of construction equipment is operating at full power (i.e., its loudest condition) during a construction operation. The usage factor is a key input variable of the RCNM noise prediction model that is used to calculate the average L_{eq} noise levels using the reference L_{max} noise levels measured at 50 feet. Table 8-1 provides a summary of the reference average L_{eq} noise levels used to describe each stage of construction.

Noise levels generated by heavy construction equipment can range from approximately 68 dBA to more than 80 dBA when measured at 50 feet. However, these noise levels diminish with distance from the construction site at a rate of 6 dBA per doubling of distance. For example, a noise level of 80 dBA measured at 50 feet from the noise source to the receiver would be reduced

to 74 dBA at 100 feet from the source to the receiver, and would be further reduced to 68 dBA at 200 feet from the source to the receiver. A default ground attenuation factor of 0.0 was used in the CadnaA noise prediction model to account for hard site conditions.

EXHIBIT 8-A: CONSTRUCTION NOISE SOURCE AND RECEIVER LOCATIONS

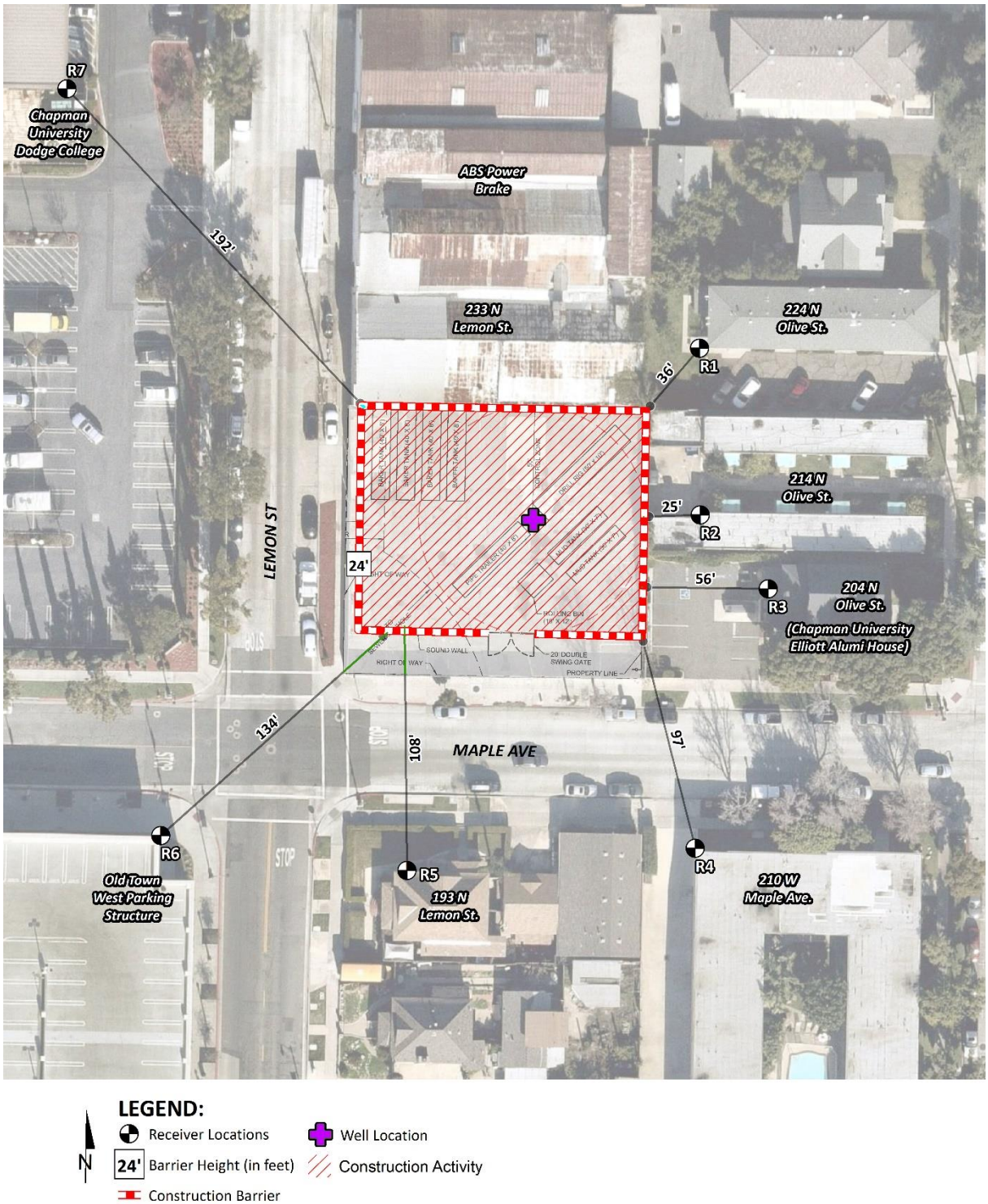


TABLE 8-1: CONSTRUCTION REFERENCE NOISE LEVELS

Construction Stage	Typical Equipment	Reference Noise Level @ 50 Feet (dBA L_{eq})[1]	Highest Reference Noise Level (dBA L_{eq})
Mobilization	Tractor/Loader/Backhoes	74	74
	Cranes	73	
	Welders	70	
Well Drilling	Drill Rig	77	78
	Drill Rig Truck	72	
	Generator Sets	78	
Casing	Tractor/Loader/Backhoes	74	74
	Cranes	73	
	Concrete Pump Trucks	74	
Well Testing	Cranes	73	78
	Forklifts	68	
	Generator Sets	78	
Well Mechanical	Drill Rig	77	78
	Drill Rig Truck	72	
	Generator Sets	78	
Well Surveying/ Demobilization	Tractor/Loader/Backhoes	74	74
	Cranes	73	
	Welders	70	

[1] FHWA's Roadway Construction Noise Model, January 2006.

8.3 CONSTRUCTION NOISE LEVELS

Using the reference construction equipment noise levels and the CadnaA noise prediction model, calculations of the Project construction noise level impacts at the nearby receiver locations were completed. To assess the worst-case construction noise levels, the Project construction noise analysis relies on the highest noise level impacts when the equipment with the highest reference noise level is operating at the closest point from the edge of primary construction activity (Project construction boundary) to each receiver location. As shown on Tables 8-2 and 8-3, the daytime and nighttime construction noise levels with the planned 24-foot high construction noise barrier are expected to range from 47.0 to 60.8 dBA L_{eq} at the nearby receiver locations. Table 8-4 shows that with the nighttime and evening noise penalties, the 24-hour CNEL noise levels will range from 53.6 to 67.5 dBA CNEL. Appendix 8.1 includes the detailed CadnaA construction noise model inputs.

TABLE 8-2: DAYTIME CONSTRUCTION EQUIPMENT NOISE LEVELS

Receiver Location[1]	Distance to Const. Activity (Feet)[2]	Construction Noise Levels (dBA L_{eq})[3]							Threshold (dBA L_{eq})[4]	Threshold Exceeded[5]
		Mobil-ization	Well Drilling	Casing	Well Testing	Well Mechanical	Well Survey	Highest Levels[2]		
R1	36'	50.9	54.9	50.9	54.9	54.9	50.9	54.9	80	No
R2	25'	52.0	56.0	52.0	56.0	56.0	52.0	56.0	80	No
R3	56'	50.4	54.4	50.4	54.4	54.4	50.4	54.4	80	No
R4	79'	56.1	60.1	56.1	60.1	60.1	56.1	60.1	80	No
R5	87'	56.8	60.8	56.8	60.8	60.8	56.8	60.8	80	No
R6	108'	51.2	55.2	51.2	55.2	55.2	51.2	55.2	80	No
R7	187'	47.0	51.0	47.0	51.0	51.0	47.0	51.0	80	No

[1] Noise receiver locations are shown on Exhibit 8-A.
[2] Distance from receiver location to project site boundary.
[3] CadnaA noise model inputs are included in Appendix 8.1. Project noise levels include the planned 24-foot high construction noise barrier as shown on Exhibit 8-A.
[4] FTA, Transit Noise and Vibration Impact Assessment, Table 7-3, p.179.
[5] Do the estimated Project operational noise source activities exceed the noise level standards?

TABLE 8-3: NIGHTTIME CONSTRUCTION EQUIPMENT NOISE LEVELS

Receiver Location[1]	Distance to Const. Activity (Feet)[2]	Construction Noise Levels (dBA L_{eq})[3]							Threshold (dBA L_{eq})[4]	Threshold Exceeded[5]
		Mobil-ization	Well Drilling	Casing	Well Testing	Well Mechanical	Well Survey	Highest Levels[2]		
R1	36'	50.9	54.9	50.9	54.9	54.9	50.9	54.9	70	No
R2	25'	52.0	56.0	52.0	56.0	56.0	52.0	56.0	70	No
R3	56'	50.4	54.4	50.4	54.4	54.4	50.4	54.4	70	No
R4	79'	56.1	60.1	56.1	60.1	60.1	56.1	60.1	70	No
R5	87'	56.8	60.8	56.8	60.8	60.8	56.8	60.8	70	No
R6	108'	51.2	55.2	51.2	55.2	55.2	51.2	55.2	70	No
R7	187'	47.0	51.0	47.0	51.0	51.0	47.0	51.0	70	No

[1] Noise receiver locations are shown on Exhibit 8-A.
[2] Distance from receiver location to project site boundary.
[3] CadnaA noise model inputs are included in Appendix 8.1. Project noise levels include the planned 24-foot high construction noise barrier as shown on Exhibit 8-A.
[4] FTA, Transit Noise and Vibration Impact Assessment, Table 7-3, p.179.
[5] Do the estimated Project operational noise source activities exceed the noise level standards?

TABLE 8-4: 24-HOUR CONSTRUCTION EQUIPMENT NOISE LEVELS

Receiver Location[1]	Distance to Const. Activity (Feet)[2]	Construction Noise Levels (dBA CNEL)[3]							Threshold (dBA CNEL)[4]	Threshold Exceeded[5]
		Mobil-ization	Well Drilling	Casing	Well Testing	Well Mechanical	Well Survey	Highest Levels[2]		
R1	36'	57.5	61.5	57.5	61.5	61.5	57.5	61.5	75	No
R2	25'	58.6	62.6	58.6	62.6	62.6	58.6	62.6	75	No
R3	56'	57.1	61.1	57.1	61.1	61.1	57.1	61.1	75	No
R4	79'	62.8	66.8	62.8	66.8	66.8	62.8	66.8	75	No
R5	87'	63.5	67.5	63.5	67.5	67.5	63.5	67.5	75	No
R6	108'	57.9	61.9	57.9	61.9	61.9	57.9	61.9	75	No
R7	187'	53.6	57.6	53.6	57.6	57.6	53.6	57.6	75	No

[1] Noise receiver locations are shown on Exhibit 8-A.
[2] Distance from receiver location to project site boundary.
[3] CadnaA noise model inputs are included in Appendix 8.1. Project noise levels include the planned 24-foot high construction noise barrier as shown on Exhibit 8-A.
[4] FTA, Transit Noise and Vibration Impact Assessment, Table 7-3, p.179.
[5] Do the estimated Project operational noise source activities exceed the noise level standards?

8.4 CONSTRUCTION NOISE LEVEL COMPLIANCE

To evaluate whether the Project will generate potentially significant short-term noise levels at nearby receiver locations, a construction related daytime noise level limit of 80 dBA L_{eq}, a nighttime noise level limit of 70 dBA L_{eq} and 24-hour 75 dBA CNEL (FTA Transit Noise and Vibration Impact Assessment Manual, 2018, Table 7-3). The construction noise analysis shows that the nearby receiver locations will satisfy the daytime, nighttime and 24-hour significance thresholds during Project construction activities with the planned 24-foot high construction noise barrier. Therefore, the noise impacts due to Project construction noise is considered *less than significant* at all receiver locations.

8.5 CONSTRUCTION VIBRATION ASSESSMENT

Construction activity can 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 vibration levels associated with various types of construction equipment are summarized on Table 8-3. Based on the representative vibration levels presented for various construction equipment types, it is possible to estimate the potential for human response (annoyance) and building damage using the following vibration assessment methods defined by the FTA. To describe the vibration impacts the FTA provides the following equation: $PPV_{equip} = PPV_{ref} \times (25/D)^{1.5}$

TABLE 8-3: VIBRATION SOURCE LEVELS FOR CONSTRUCTION EQUIPMENT

Equipment	PPV (in/sec) at 25 feet
Small bulldozer	0.003
Jackhammer	0.035
Loaded trucks	0.076
Caisson drilling	0.089

Federal Transit Administration, Transit Noise and Vibration Impact Assessment, September 2018, p. 184.

8.6 CONSTRUCTION VIBRATION LEVELS

Construction activity can result in varying degrees of ground vibration, depending on the equipment and methods used, distance to the affected structures and soil type. It is expected that ground-borne vibration from typical Project construction activities would cause only intermittent or transient, localized intrusion. The proposed Project's construction activities most likely to cause vibration impacts are:

- Heavy Construction Equipment: Although all heavy mobile construction equipment has the potential of causing at least some perceptible vibration while operating close to building, the

vibration is usually short-term (transient) and is not of enough magnitude to cause building damage.

- Trucks: Trucks hauling building materials to construction sites can be sources of transient vibration intrusion if the haul routes pass through residential neighborhoods on streets with bumps or potholes. Repairing the bumps and potholes generally eliminates the problem.

To assess the Project construction vibration levels, this analysis describes both the transient vibration levels associated with typical construction equipment activities and the continuous vibration levels associated with the well drilling activities.

8.6.1 TYPICAL CONSTRUCTION ACTIVITY VIBRATION LEVELS

Table 8-4 presents the expected Project related typical construction activity vibration levels at each of the receiver locations. At distances ranging from 25 to 187 feet from Project construction activity, the transient construction vibration velocity levels are estimated to range from 0.004 to 0.076 PPV in/sec, as shown on Table 8-4. Based on the vibration standards outlined in Tables 3-3 and 3-4, the typical Project construction vibration levels will satisfy the transient human annoyance and building damage thresholds. Therefore, the vibration impacts due to Project typical construction activities are considered *less than significant*.

In addition, the typical construction vibration levels at the closest sensitive receiver are unlikely to be sustained during the entire construction period but will occur rather only during the times that heavy construction equipment is operating adjacent to the Project site boundaries.

8.6.2 WELL DRILLING VIBRATION LEVELS

Exhibit 8-B shows the continuous well drilling activity in relation to the nearby receiver locations. At distances ranging from 74 to 281 feet from Project well drilling activity, the continuous construction vibration velocity levels are estimated to range from 0.002 to 0.017 PPV in/sec, as shown on Table 8-5. Based on the vibration standards outlined in Tables 3-3 and 3-4, the well drilling vibration levels will satisfy the continuous human annoyance and building damage thresholds. Therefore, the vibration impacts due to Project well drilling are considered *less than significant*.

TABLE 8-4: CONSTRUCTION EQUIPMENT VIBRATION LEVELS

Receiver[1]	Receiver Structure Type and Condition[2]	Distance to Const. Activity (Feet)[3]	Typical Construction Vibration Levels PPV (in/sec)[4]				Thresholds PPV (in/sec)[5]		Thresholds Exceeded?[6]	
			Small Bulldozer (< 80k lbs)	Jack-hammer	Loaded Trucks	Highest Vibration Level	Human Annoyance	Building Damage	Human Annoyance	Building Damage
R1	Older residential structures	36'	0.002	0.020	0.044	0.044	0.25	0.50	No	No
R2	Older residential structures	25'	0.003	0.035	0.076	0.076	0.25	0.50	No	No
R3	Historic and some old buildings	56'	0.001	0.010	0.023	0.023	0.25	0.50	No	No
R4	Older residential structures	79'	0.001	0.006	0.014	0.014	0.25	0.50	No	No
R5	Historic and some old buildings	87'	0.000	0.005	0.012	0.012	0.25	0.50	No	No
R6	Modern industrial/commercial buildings	108'	0.000	0.004	0.008	0.008	0.25	2.00	No	No
R7	Modern industrial/commercial buildings	187'	0.000	0.002	0.004	0.004	0.25	2.00	No	No

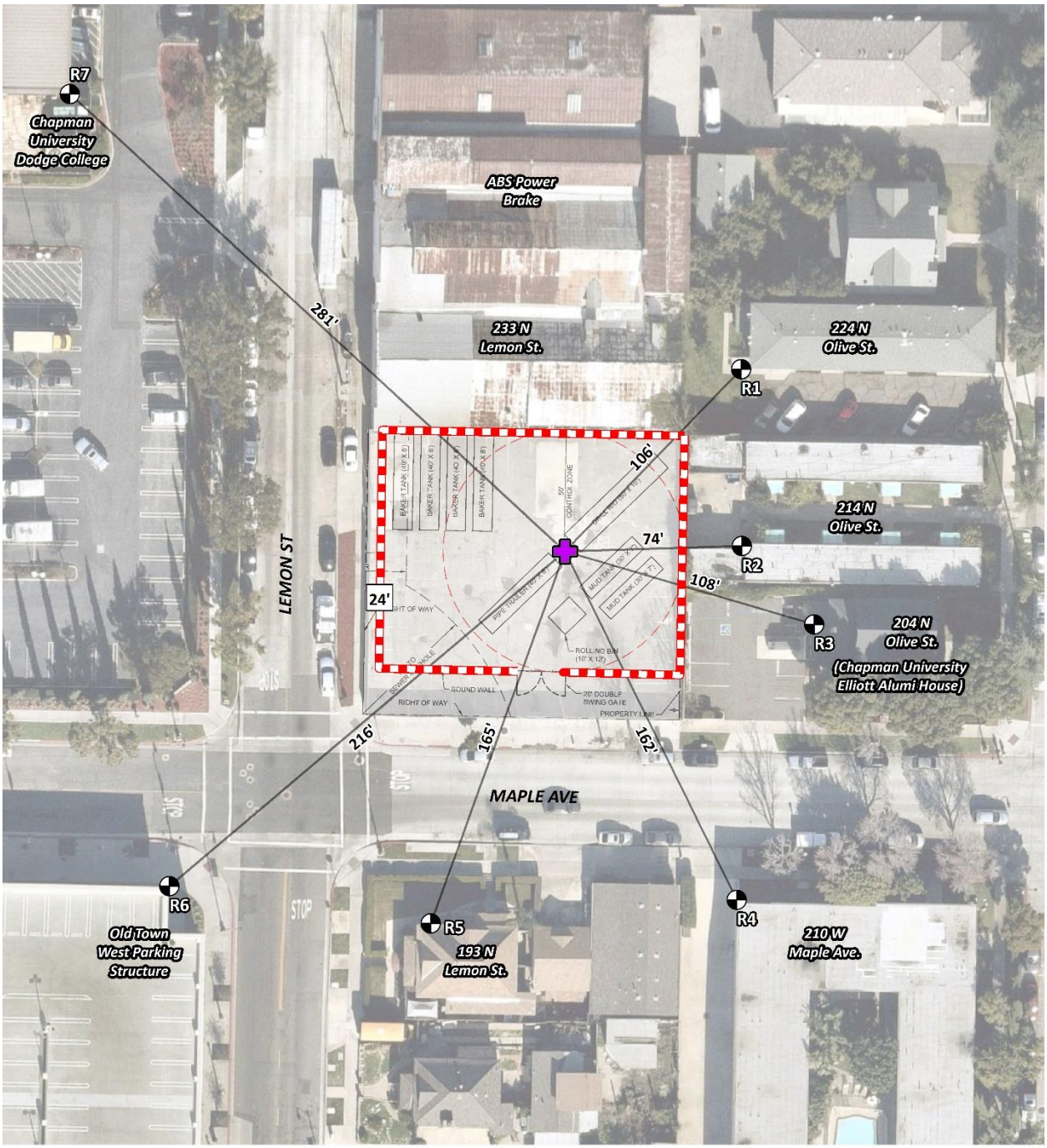
[1] Receiver locations are shown on Exhibit 8-A.
[2] Caltrans Transportation and Construction Vibration Guidance Manual, April 2020, Tables 19, p. 38.
[3] Distance from receiver location to Project construction boundary.
[4] Based on the Vibration Source Levels of Construction Equipment (Table 8-3).
[5] Thresholds for transient sources associated with typical construction activities, Caltrans Transportation and Construction Vibration Manual, April 2020 p.38. (see Tables 3-3 & 3-4).
[6] Does the peak vibration exceed the acceptable vibration thresholds?
"PPV" = Peak Particle Velocity

TABLE 8-5: WELL DRILLING VIBRATION LEVELS

Receiver[1]	Receiver Structure Type and Condition[2]	Distance to Well Drilling (Feet)[3]	Well Drilling Vibration Levels PPV (in/sec)[4]	Thresholds PPV (in/sec)[5]		Thresholds Exceeded?[6]	
				Human Annoyance	Building Damage	Human Annoyance	Building Damage
R1	Older residential structures	106'	0.010	0.04	0.50	No	No
R2	Older residential structures	74'	0.017	0.04	0.50	No	No
R3	Historic and some old buildings	108'	0.010	0.04	0.50	No	No
R4	Older residential structures	162'	0.005	0.04	0.50	No	No
R5	Historic and some old buildings	165'	0.005	0.04	0.50	No	No
R6	Modern industrial/commercial buildings	216'	0.004	0.04	2.00	No	No
R7	Modern industrial/commercial buildings	281'	0.002	0.04	2.00	No	No

[1] Receiver location and distances to well drilling activity as shown on Exhibit 7-B.
[2] Caltrans Transportation and Construction Vibration Guidance Manual, April 2020, Tables 19, p. 38.
[3] Distance from receiver to well drilling location.
[4] Based on the Vibration Source Levels of Construction Equipment (Caisson Drilling - Table 7-3).
[5] Thresholds for continuous sources associated with well drilling activities, Caltrans Transportation and Construction Vibration Manual, April 2020 p.38. (see Tables 3-3 & 3-4).
[6] Does the peak vibration exceed the acceptable vibration thresholds?
"PPV" = Peak Particle Velocity

EXHIBIT 8-B: WELL DRILLING NOISE SOURCE AND RECEIVER LOCATIONS



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9 REFERENCES

1. **California Department of Transportation.** *Transportation and Construction Vibration Guidance Manual.* April 2020.
2. **City of Orange.** *City of Orange Zoning Map.* 2016.
3. **California Department of Transportation Environmental Program.** *Technical Noise Supplement - A Technical Supplement to the Traffic Noise Analysis Protocol.* Sacramento, CA : s.n., September 2013.
4. **Environmental Protection Agency Office of Noise Abatement and Control.** *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety.* March 1974. EPA/ONAC 550/9/74-004.
5. **U.S. Department of Transportation, Federal Highway Administration, Office of Environment and Planning, Noise and Air Quality Branch.** *Highway Traffic Noise Analysis and Abatement Policy and Guidance.* December 2011.
6. **U.S. Department of Transportation, Federal Highway Administration.** *Highway Traffic Noise in the United States, Problem and Response.* April 2000. p. 3.
7. **U.S. Environmental Protection Agency Office of Noise Abatement and Control.** *Noise Effects Handbook-A Desk Reference to Health and Welfare Effects of Noise.* October 1979 (revised July 1981). EPA 550/9/82/106.
8. **Occupational Safety and Health Administration.** *Standard 29 CRF, Part 1910.*
9. **U.S. Department of Transportation, Federal Transit Administration.** *Transit Noise and Vibration Impact Assessment Manual.* September 2018.
10. **State of California.** *California Environmental Quality Act, Appendix G.* 2019.
11. **California Court of Appeal.** *Gray v. County of Madera, F053661.* 167 Cal.App.4th 1099; - Cal.Rptr.3d, October 2008.
12. **American National Standards Institute (ANSI).** *Specification for Sound Level Meters ANSI S1.4-2014/IEC 61672-1:2013.*
13. **City of Orange.** *General Plan Noise Element.* March 2010.
14. **U.S. Department of Transportation, Federal Highway Administration, Office of Environment and Planning.** *FHWA Roadway Construction Noise Model.* January, 2006.

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10 CERTIFICATION

The contents of this noise study report represent an accurate depiction of the noise environment and impacts associated with the proposed Well 28 Project. The information contained in this noise study report is based on the best available data at the time of preparation. If you have any questions, please contact me directly at (949) 336-5979.

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260 E. Baker Street, Suite 200
Costa Mesa, CA 92626
(949) 336-5979
blawson@urbanxroads.com

EDUCATION

Master of Science in Civil and Environmental Engineering
California Polytechnic State University, San Luis Obispo • December, 1993

Bachelor of Science in City and Regional Planning
California Polytechnic State University, San Luis Obispo • June, 1992

PROFESSIONAL REGISTRATIONS

PE – Registered Professional Traffic Engineer – TR 2537 • January, 2009
AICP – American Institute of Certified Planners – 013011 • June, 1997–January 1, 2012
PTP – Professional Transportation Planner • May, 2007 – May, 2013
INCE – Institute of Noise Control Engineering • March, 2004

PROFESSIONAL AFFILIATIONS

ASA – Acoustical Society of America
ITE – Institute of Transportation Engineers

PROFESSIONAL CERTIFICATIONS

Certified Acoustical Consultant – County of Orange • February, 2011
FHWA-NHI-142051 Highway Traffic Noise Certificate of Training • February, 2013

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APPENDIX 3.1:

CITY ORANGE MUNICIPAL CODE

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Chapter 8.24 - NOISE CONTROL[2]

Sections:

Footnotes:

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Editor's note— Ord. No. 1-14, § I, adopted August 12, 2014, repealed the former Ch. 8.24, §§ 8.24.010—8.24.110 and enacted a new Ch. 8.24 as set out herein. The former Ch. 8.24 pertained to similar subject matter and derived from Prior Code 9500.1—9500.16; Ord. Nos. 49-74, 17-74, 1-80, and 26-96.

8.24.010 - Policy.

A. In order to control unnecessary, excessive and annoying sounds emanating from the City, it is the policy of the City to regulate such sounds generated from all sources as specified in this chapter. The intent of this chapter is to protect residential land uses from unnecessary, excessive and annoying sounds.

B. It is determined that certain sound levels are detrimental to the public health, welfare and safety, and contrary to public interest.

(Ord. No. 1-14, § I, 8-12-14)

8.24.020 - Definitions.

The following words, phrases and terms as used in this chapter shall have the meaning as indicated below:

A. "Ambient noise level" means the all-encompassing noise level associated with a given environment, being a composite of sounds from all sources, excluding the alleged offensive noise, at the location and approximate time at which a comparison with the alleged offensive noise is to be made.

B. "Adjusted ambient noise level" means the measured ambient noise level plus 3 dB (A). Three (3) dB (A) is the industry-accepted threshold of human perceptibility for a change in the noise environment.

C. "Decibel (dB)" means a unit which denotes the ratio between two quantities which are proportional to power: the number of decibels corresponding to the ratio of two amounts of power is ten times the logarithm to the base ten of this ratio.

D. "Emergency machinery, vehicle or work" means any machinery, vehicle or work used, employed or performed in an effort to protect, provide or restore safe conditions in the community or for the citizenry, or work by private or public utilities when restoring utility service.

E. "Fixed noise source" means a stationary noise source which creates sounds while fixed or motionless, including but not limited to construction equipment, industrial and commercial machinery and equipment, pumps, fans, compressors, generators, air conditioners and refrigeration equipment.

F. "Grading" means any excavating or filling of earth material or any combination thereof conducted to prepare a site for construction or other improvements thereon.

G. "Hourly Average" (L_{eq}) means the energy mean or average sound level over a one (1) hour period of time.

H. "Impact noise" means the noise produced by the collision of one mass in motion with a second mass which may be either in motion or at rest.

I. "Mobile noise source" means any noise source other than a fixed noise source.

J. "Noise level" means the "A" weighted sound pressure level in decibels obtained by using a sound level meter at slow response with a reference pressure of twenty (20) micronewtons per square meter. The unit of measurement shall be designated as dB(A).

K. "Person" means a person, firm, association, co-partnership, joint venture, corporation or any entity, public or private in nature.

L. "Recurring impulsive noise" means a noise of short duration, usually less than one (1) second, with an abrupt onset and rapid decay, which occurs repeatedly or in a cyclical manner. Examples include jack hammering, pile driving, or operational noise from a generator or other mechanical equipment that is cyclical in nature.

M. "Residential property" means a parcel of real property which is developed and used either in part or in whole for residential purposes, other than transient uses such as hotels and motels.

N. "Simple tone noise" means a noise characterized by a predominant frequency or frequencies so that other frequencies cannot be readily distinguished.

O. "Sound level meter" means an instrument meeting American National Standard Institute's Standard Sl.4- 1983 for Type 1 sound level meters or an instrument and the associated recording and analyzing equipment which will provide equivalent data.

P. "Sound pressure level" of a sound, in decibels, means twenty times the logarithm to the base ten of the ratio of the pressure of the sound to a reference pressure, which reference pressure shall be explicitly stated.

(Ord. No. 1-14, § I, 8-12-14)

8.24.030 - Noise Level Measurement Criteria.

Any noise level measurements made pursuant to the provisions of this chapter shall be performed using a sound level meter as defined in Section 8.24.020P.

(Ord. No. 1-14, § I, 8-12-14)

8.24.040 - Exterior Standards.

A. The following noise standards for fixed noise sources, unless otherwise specifically indicated, shall apply to all residential property:

Table 8.24.040 Exterior Noise Standards

	Noise Level	Time Period
Hourly Average (L_{eq})	55 dB (A)	7:00 a.m.—10:00 p.m.
	50 dB (A)	10:00 p.m.—7:00 a.m.
Maximum Level	70 dB (A)	7:00 a.m.—10:00 p.m.
	65 dB (A)	10:00 p.m.—7:00 a.m.

B. It is unlawful for any person at any location within 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 to exceed the noise standards identified in Table 8.24.040. For multi-family residential or mixed use developments located within the City's Urban Mixed Use, Neighborhood Mixed Use, Old Towne Mixed Use or Medium Density Residential General Plan land use districts, exterior noise standards shall apply to common recreation areas only and shall not apply to private exterior space (such as a private yard, patio, or balcony).

C. In the event the ambient noise level exceeds the noise standards identified in Table 8.24.040 of this section, the "adjusted ambient noise level" shall be applied as the noise standard. In cases where the noise standard is adjusted due to a high ambient noise level, the noise standard shall not exceed the "adjusted ambient noise level", or 70 dB (A), whichever is less. In cases where the ambient noise level is already greater than 70 dB (A), the ambient noise level shall be applied as the noise standard.

D. Each of the noise limits specified in Table 8.24.040 shall be reduced by 5 dB(A) for impact or simple tone noises, recurring impulsive noises, or for noises consisting of speech or music.

(Ord. No. 1-14, § I, 8-12-14)

8.24.050 - Exemptions from Chapter Provisions.

The following activities shall be exempted from the provisions of this chapter:

A. School bands, school athletic and school entertainment events;

B. Outdoor gatherings, public dances, shows, and sporting and entertainment events provided such events are conducted pursuant to any permit requirements established by the City;

C. Activities conducted on public parks, public playgrounds, and public or private school grounds;

D. Any mechanical device, apparatus or equipment used, related to or connected with emergency machinery, vehicle or work;

E. Noise sources associated with construction, repair, remodeling, or grading of any real property, provided said activities take place between the hours of 7:00 a.m. and 8:00 p.m. on any day except for Sunday or a Federal holiday, or between the hours of 9:00 a.m. and 8:00 p.m. on Sunday or a Federal holiday. Noise generated outside of the hours specified are subject to the noise standards identified in Table 8.24.040;

F. All mechanical devices, apparatus or equipment which are utilized for the protection or salvage of agricultural crops during periods of potential or actual frost damage or other adverse weather conditions;

G. Noise sources associated with agricultural operations provided such operations take place between the hours of 7:00 a.m. and 8:00 p.m. on any day except Sunday or a Federal holiday, or between the hours of 9:00 a.m. and 8:00 p.m. on Sunday or a Federal holiday;

H. Noise sources associated with agricultural pest control through pesticide application, provided that the application is made in accordance with restricted material permits issued by or regulations enforced by the Agricultural Commissioner;

I. Noise sources associated with the maintenance of real property, provided such activities take place between the hours of 7:00 a.m. and 8:00 p.m. on any day except Sunday or a Federal holiday, or between the hours of 9:00 a.m. and 8:00 p.m. on Sunday or a Federal holiday. Operation of leaf blowers are regulated under OMC Chapter 8.26;

J. Industrial or commercial noise affecting residential units, when the residential unit is associated with said industrial or commercial use (e.g. caretaker's dwellings);

K. Any maintenance or construction activity undertaken by a public agency or utility within street right of way;

L. Mobile noise sources including but not limited to operational noise from trains, or automobiles or trucks traveling on roadways. Transportation noise as related to noise/land use compatibility is subject to the City's General Plan Noise Element;

M. Any activity to the extent regulation thereof has been preempted by State or Federal Law.

(Ord. No. 1-14, § I, 8-12-14)

8.24.060 - Special Provisions for Schools, Hospitals and Churches.

It is unlawful for any person to create any noise which causes the noise level at any school, hospital or church, while the same is in use, to exceed the noise limits as specified in Section 8.24.040, or which noise level unreasonably interferes with the use of such institutions.

(Ord. No. 1-14, § I, 8-12-14)

8.24.070 - Measurement of Noise Levels.

The location selected for measuring exterior noise levels shall be the point closest to the noise source along the perimeter of the outdoor activity area (such as a private yard, patio, balcony, or common recreation area, as applicable pursuant to Section 8.24.040B. of this chapter) of the affected residential receiving property. If the location of the outdoor activity area is unknown or unclear, the noise standard shall be applied at the point closest to the noise source along the property line of the affected residential receiving property.

(Ord. No. 1-14, § I, 8-12-14)

8.24.080 - Enforcement Authority.

A. The Chief Building Official or his/her designee are directed to enforce the provisions of this chapter. The Chief Building Official or his/her designee are authorized, pursuant to Penal Code Section 836.5, to arrest any person without a warrant when they have reasonable cause to believe that such person has committed a misdemeanor in their presence.

B. No person shall interfere with, oppose or resist any authorized person charged with the enforcement of this chapter while such person is engaged in the performance of his duty.

(Ord. No. 1-14, § I, 8-12-14)

8.24.090 - Violation—Public Nuisance.

Any violation of this chapter is a public nuisance and may be abated in accordance with law. The expense of such abatement may, by resolution of the City Council, be declared to be a lien against the property on which such nuisance is maintained, and such lien shall be made a personal obligation of the property owner.

(Ord. No. 1-14, § I, 8-12-14)

8.24.100 - Alternative Noise Prohibition.

Notwithstanding any other provisions of this chapter and in addition thereto, it is unlawful for any person to willfully make, continue, maintain, permit or cause to be made, continued, maintained, or permitted, any loud, unnecessary and unusual noise which disturbs the peace or quiet of any residential property or which causes discomfort or annoyance to any reasonable person of normal sensitivity residing in the area. It shall be a prima facie violation of this section if any power tool, radio, receiving set, television, music amplifier, tape player, record player, compact disc player, musical instrument or similar device is played, used or permitted to be played or used between the hours of 10:00 p.m. and 7:00 a.m. when audible from a distance of one hundred (100) feet from the property line of the noise source or from a distance of one hundred fifty (150) feet from any non-stationary noise source. For the purpose of this chapter, these prohibitions shall also be applied to stationary vehicles parked on the street or on private property. The determination may be made by a peace officer or may be proven by the testimony of any other person. Furthermore, and in addition to the provisions of this chapter, noise prohibitions pursuant to Penal Code Section 415 and Orange Municipal Code Chapter 9.39 may also be applied.

(Ord. No. 1-14, § I, 8-12-14)

8.24.110 - Violation—Misdemeanor.

Any person violating any of the provisions of this chapter shall be deemed guilty of a misdemeanor. Each day such violation is committed or permitted to continue shall constitute a separate offense and shall be punishable as such. The provisions of this chapter shall not be construed as permitting conduct not prescribed herein and shall not affect the enforceability of any other applicable provisions of law.

(Ord. No. 1-14, § I, 8-12-14)

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APPENDIX 5.1:

STUDY AREA PHOTOS

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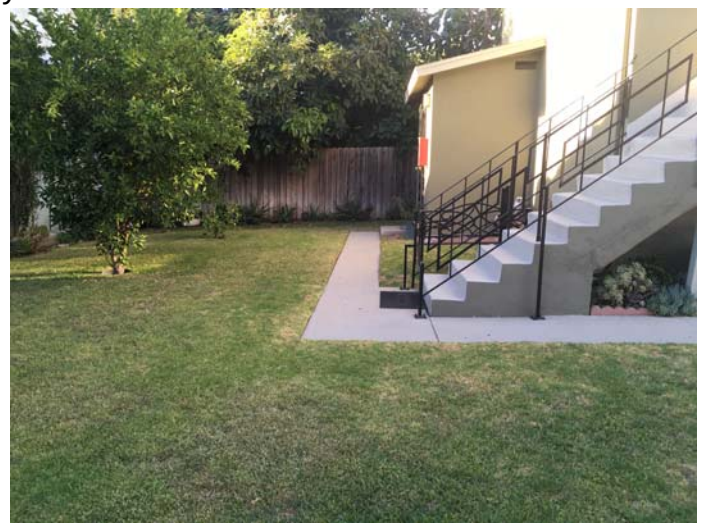

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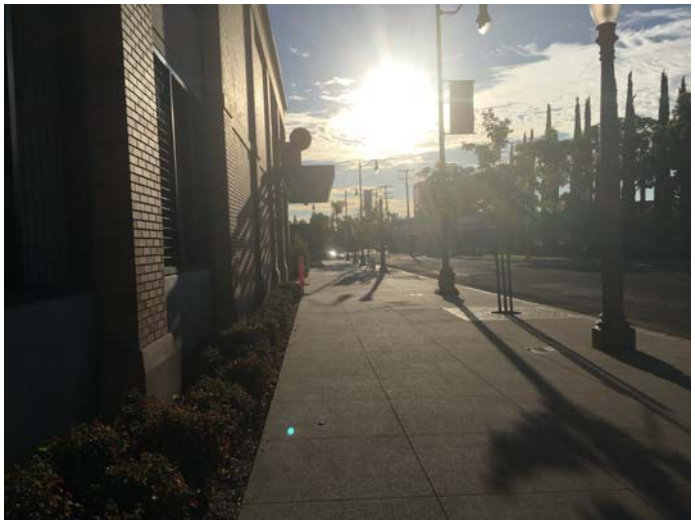

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APPENDIX 5.2:

NOISE LEVEL MEASUREMENT WORKSHEETS

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24-Hour Noise Level Measurement Summary

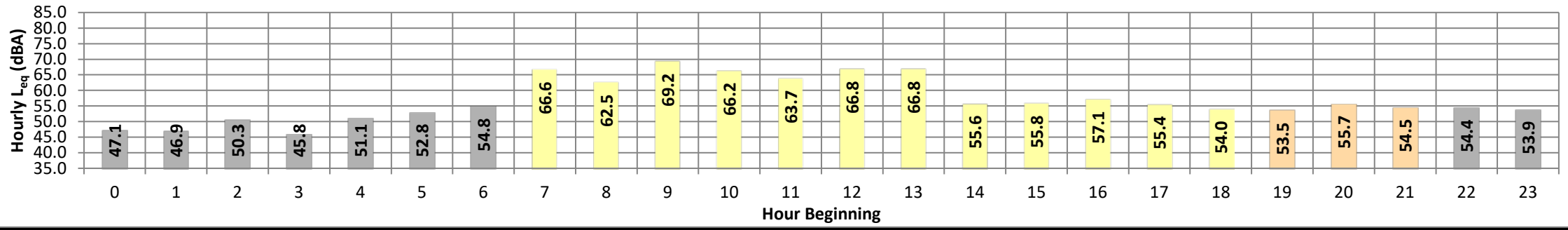
Date: Friday, August 14, 2020
Project: Well 28

Location: L1 - Located northeast of the Project site near existing multi-family residential homes at 224 North Olive Street.

Meter: Piccolo II

JN: 11981
Analyst: P. Mara

Hourly L_{eq} dBA Readings (unadjusted)



Timeframe	Hour	L_{eq}	L_{max}	L_{min}	L1%	L2%	L5%	L8%	L25%	L50%	L90%	L95%	L99%	L_{eq}	Adj.	Adj. L_{eq}
Night	0	47.1	51.2	45.2	50.9	50.5	49.6	48.9	47.4	46.6	45.6	45.4	45.3	47.1	10.0	57.1
	1	46.9	53.6	43.0	53.3	52.9	51.5	50.5	47.5	45.1	43.6	43.4	43.2	46.9	10.0	56.9
	2	50.3	58.4	43.6	58.1	57.5	56.3	55.2	50.4	47.2	44.9	44.4	43.8	50.3	10.0	60.3
	3	45.8	54.0	42.9	53.3	52.0	50.1	48.7	45.6	44.4	43.4	43.3	43.0	45.8	10.0	55.8
	4	51.1	58.5	46.5	58.0	57.3	56.0	55.0	51.6	49.0	47.2	46.9	46.6	51.1	10.0	61.1
	5	52.8	61.0	47.6	60.5	60.1	58.8	57.2	52.7	50.1	48.3	48.0	47.8	52.8	10.0	62.8
	6	54.8	61.7	50.8	61.3	60.8	59.5	58.4	55.1	53.0	51.5	51.2	50.9	54.8	10.0	64.8
Day	7	66.6	70.5	60.1	70.2	70.0	69.5	69.1	67.9	66.6	61.9	61.2	60.5	66.6	0.0	66.6
	8	62.5	66.9	59.5	66.4	66.0	65.1	64.7	63.2	62.1	60.4	60.1	59.7	62.5	0.0	62.5
	9	69.2	73.2	63.5	72.9	72.6	72.1	71.8	70.6	68.7	65.0	64.5	63.7	69.2	0.0	69.2
	10	66.2	71.2	60.9	70.9	70.5	69.7	69.2	67.5	65.3	62.2	61.7	61.1	66.2	0.0	66.2
	11	63.7	70.1	56.3	69.7	69.1	68.0	67.2	64.9	62.5	57.9	57.2	56.5	63.7	0.0	63.7
	12	66.8	71.3	60.6	71.0	70.8	70.1	69.7	68.2	66.0	62.3	61.4	60.8	66.8	0.0	66.8
	13	66.8	72.3	56.7	71.9	71.5	70.8	70.3	68.1	65.9	59.9	58.7	57.0	66.8	0.0	66.8
	14	55.6	62.1	50.9	61.7	61.3	60.3	59.4	56.0	54.0	51.7	51.4	51.1	55.6	0.0	55.6
	15	55.8	63.9	51.0	63.4	62.9	61.1	60.0	55.7	53.3	51.7	51.4	51.2	55.8	0.0	55.8
	16	57.1	64.7	51.9	64.3	63.7	62.6	61.8	57.2	54.7	52.6	52.3	52.1	57.1	0.0	57.1
	17	55.4	65.1	48.1	64.4	63.6	61.1	59.9	55.2	52.3	49.2	48.8	48.3	55.4	0.0	55.4
	18	54.0	62.7	47.3	62.2	61.6	59.7	58.3	53.8	51.3	48.3	47.9	47.5	54.0	0.0	54.0
Evening	19	53.5	62.0	47.3	61.5	60.9	59.5	58.2	53.4	50.4	48.1	47.8	47.5	53.5	5.0	58.5
	20	55.7	65.1	48.4	64.6	64.2	62.3	60.5	55.3	51.5	49.2	48.9	48.6	55.7	5.0	60.7
	21	54.5	63.8	49.4	63.4	62.7	60.4	58.6	53.6	51.8	50.1	49.8	49.5	54.5	5.0	59.5
Night	22	54.4	63.2	48.8	62.6	62.1	60.4	58.6	54.5	51.6	49.6	49.3	48.9	54.4	10.0	64.4
	23	53.9	63.4	47.4	62.8	62.3	61.0	59.4	51.8	49.6	48.0	47.8	47.5	53.9	10.0	63.9

Timeframe	Hour	L_{eq}	L_{max}	L_{min}	L1%	L2%	L5%	L8%	L25%	L50%	L90%	L95%	L99%
Day	Min	54.0	62.1	47.3	61.7	61.3	59.7	58.3	53.8	51.3	48.3	47.9	47.5
	Max	69.2	73.2	63.5	72.9	72.6	72.1	71.8	70.6	68.7	65.0	64.5	63.7
Energy Average		64.3	Average:		67.4	67.0	65.8	65.1	62.4	60.2	56.9	56.4	55.8
Evening	Min	53.5	62.0	47.3	61.5	60.9	59.5	58.2	53.4	50.4	48.1	47.8	47.5
	Max	55.7	65.1	49.4	64.6	64.2	62.3	60.5	55.3	51.8	50.1	49.8	49.5
Energy Average		54.6	Average:		63.2	62.6	60.7	59.1	54.1	51.2	49.1	48.8	48.5
Night	Min	45.8	51.2	42.9	50.9	50.5	49.6	48.7	45.6	44.4	43.4	43.3	43.0
	Max	54.8	63.4	50.8	62.8	62.3	61.0	59.4	55.1	53.0	51.5	51.2	50.9
Energy Average		51.9	Average:		57.9	57.3	55.9	54.7	50.7	48.5	46.9	46.6	46.3

L_{eq} (dBA)		
24-Hour	Daytime	Nighttime
61.6	63.5	51.9

24-Hour CNEL (dBA)
63.1

24-Hour Noise Level Measurement Summary

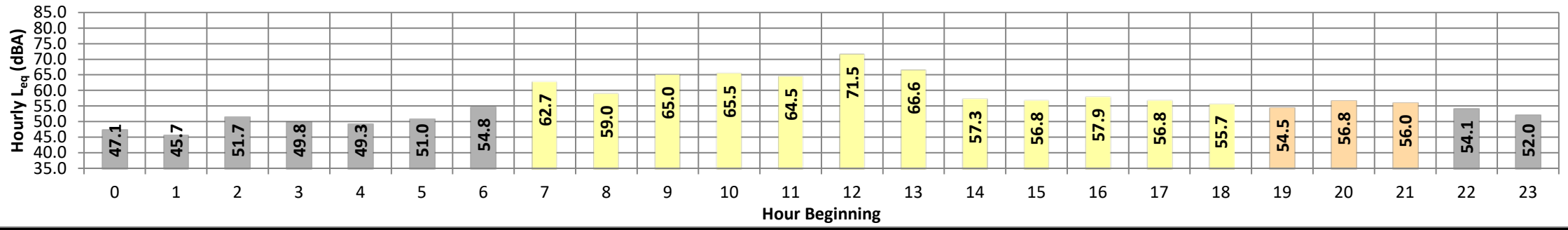
Date: Friday, August 14, 2020
Project: Well 28

Location: L2 - Located east of the Project site near existing multi- family residential homes at 214 North Olive Street.

Meter: Piccolo II

JN: 11981
Analyst: P. Mara

Hourly L_{eq} dBA Readings (unadjusted)



Timeframe	Hour	L_{eq}	L_{max}	L_{min}	L1%	L2%	L5%	L8%	L25%	L50%	L90%	L95%	L99%	L_{eq}	Adj.	Adj. L_{eq}
Night	0	47.1	53.5	45.0	53.0	52.4	50.7	49.4	47.0	46.2	45.5	45.3	45.1	47.1	10.0	57.1
	1	45.7	50.3	43.2	50.1	49.8	48.9	48.2	46.3	44.9	43.6	43.5	43.3	45.7	10.0	55.7
	2	51.7	61.1	45.0	60.8	60.4	59.1	58.1	48.7	46.5	45.5	45.3	45.1	51.7	10.0	61.7
	3	49.8	57.5	46.2	57.2	56.7	55.0	53.7	49.6	47.4	46.6	46.5	46.3	49.8	10.0	59.8
	4	49.3	55.0	46.5	54.7	54.2	52.9	52.0	49.6	48.2	47.1	46.9	46.7	49.3	10.0	59.3
	5	51.0	58.5	47.8	57.9	57.2	55.8	54.2	50.9	49.2	48.2	48.1	47.9	51.0	10.0	61.0
	6	54.8	62.9	50.5	62.3	61.3	59.5	58.2	55.0	52.9	51.2	50.9	50.6	54.8	10.0	64.8
Day	7	62.7	67.0	55.8	66.7	66.4	65.8	65.5	64.0	62.5	57.7	56.9	56.0	62.7	0.0	62.7
	8	59.0	64.3	55.2	63.8	63.3	62.0	61.3	59.6	58.2	56.2	55.9	55.4	59.0	0.0	59.0
	9	65.0	69.8	59.3	69.4	69.1	68.4	68.0	66.5	64.1	60.6	60.1	59.5	65.0	0.0	65.0
	10	65.5	72.3	60.8	71.5	70.9	69.6	68.8	66.1	64.1	61.8	61.3	60.9	65.5	0.0	65.5
	11	64.5	71.7	57.7	71.0	70.4	69.1	68.3	65.6	62.9	59.0	58.4	57.9	64.5	0.0	64.5
	12	71.5	76.5	64.0	76.0	75.7	75.3	74.9	73.5	70.4	65.0	64.6	64.2	71.5	0.0	71.5
	13	66.6	73.6	60.7	73.1	72.4	71.1	70.2	67.8	64.9	61.5	61.2	60.8	66.6	0.0	66.6
	14	57.3	65.5	51.1	64.9	64.3	62.5	61.6	57.7	54.9	52.0	51.7	51.2	57.3	0.0	57.3
	15	56.8	62.7	53.9	62.4	62.1	60.8	59.7	57.1	55.5	54.4	54.3	54.1	56.8	0.0	56.8
	16	57.9	66.9	53.7	66.3	65.6	63.6	61.6	57.4	55.4	54.2	54.1	53.8	57.9	0.0	57.9
	17	56.8	65.4	53.0	64.8	64.0	61.7	60.2	56.4	54.7	53.5	53.3	53.1	56.8	0.0	56.8
	18	55.7	63.9	51.7	63.4	62.6	60.4	58.9	55.5	53.9	52.5	52.2	51.8	55.7	0.0	55.7
Evening	19	54.5	60.4	51.4	60.1	59.7	58.6	57.4	54.8	53.2	52.0	51.8	51.6	54.5	5.0	59.5
	20	56.8	67.1	51.2	66.5	65.3	62.2	60.9	56.1	53.3	51.8	51.6	51.3	56.8	5.0	61.8
	21	56.0	63.1	52.9	62.6	62.1	60.6	59.3	55.8	54.4	53.5	53.3	53.1	56.0	5.0	61.0
Night	22	54.1	60.5	51.5	60.1	59.6	58.2	57.1	54.0	52.8	51.9	51.8	51.7	54.1	10.0	64.1
	23	52.0	76.3	49.1	75.7	74.5	72.1	69.3	54.0	50.7	49.5	49.4	49.2	52.0	10.0	62.0

Timeframe	Hour	L_{eq}	L_{max}	L_{min}	L1%	L2%	L5%	L8%	L25%	L50%	L90%	L95%	L99%
Day	Min	55.7	62.7	51.1	62.4	62.1	60.4	58.9	55.5	53.9	52.0	51.7	51.2
	Max	71.5	76.5	64.0	76.0	75.7	75.3	74.9	73.5	70.4	65.0	64.6	64.2
Energy Average		64.5	Average:		67.8	67.2	65.9	64.9	62.3	60.1	57.4	57.0	56.6
Evening	Min	54.5	60.4	51.2	60.1	59.7	58.6	57.4	54.8	53.2	51.8	51.6	51.3
	Max	56.8	67.1	52.9	66.5	65.3	62.2	60.9	56.1	54.4	53.5	53.3	53.1
Energy Average		55.8	Average:		63.1	62.4	60.5	59.2	55.6	53.6	52.4	52.2	52.0
Night	Min	45.7	50.3	43.2	50.1	49.8	48.9	48.2	46.3	44.9	43.6	43.5	43.3
	Max	54.8	76.3	51.5	75.7	74.5	72.1	69.3	55.0	52.9	51.9	51.8	51.7
Energy Average		51.4	Average:		59.1	58.4	56.9	55.6	50.6	48.8	47.7	47.5	47.3

L_{eq} (dBA)		
24-Hour	*Daytime*	*Nighttime*
61.7	**63.6**	**51.4**

24-Hour CNEL (dBA)

63.2

24-Hour Noise Level Measurement Summary

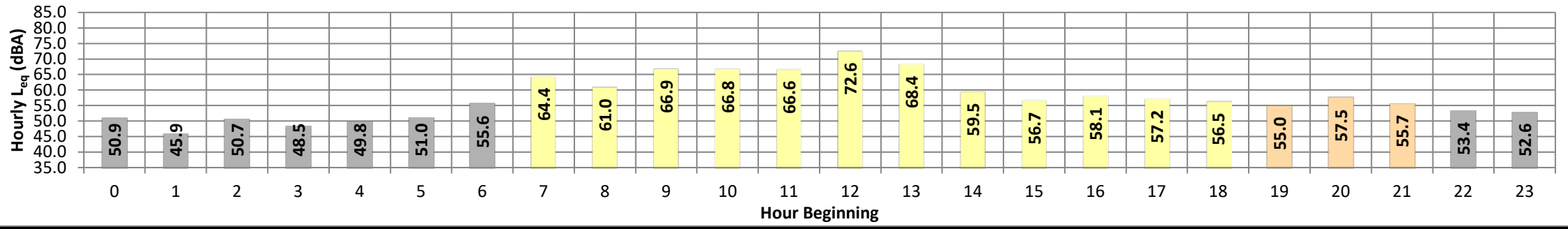
Date: Friday, August 14, 2020
Project: Well 28

Location: L3 - Located east of the Project site near the Chapman University Elliott Alumni House at 204 North Olive Street.

Meter: Piccolo II

JN: 11981
Analyst: P. Mara

Hourly L_{eq} dBA Readings (unadjusted)



Timeframe	Hour	L_{eq}	L_{max}	L_{min}	L1%	L2%	L5%	L8%	L25%	L50%	L90%	L95%	L99%	L_{eq}	Adj.	Adj. L_{eq}
Night	0	50.9	55.8	49.2	55.5	55.0	53.6	52.6	50.7	50.3	49.8	49.6	49.4	50.9	10.0	60.9
	1	45.9	51.7	42.3	51.5	51.0	49.6	48.7	46.8	44.4	42.8	42.6	42.4	45.9	10.0	55.9
	2	50.7	59.6	43.6	59.2	58.8	57.5	56.0	50.3	46.3	44.5	44.1	43.8	50.7	10.0	60.7
	3	48.5	57.0	43.2	56.6	56.0	54.1	52.8	48.6	45.9	43.9	43.5	43.3	48.5	10.0	58.5
	4	49.8	57.1	46.5	56.6	55.9	54.5	53.2	50.0	48.1	47.0	46.7	46.6	49.8	10.0	59.8
	5	51.0	59.1	46.5	58.6	58.0	56.7	55.0	51.1	48.6	47.1	46.9	46.6	51.0	10.0	61.0
	6	55.6	64.0	50.6	63.5	62.8	61.0	59.5	55.6	53.3	51.3	51.0	50.7	55.6	10.0	65.6
Day	7	64.4	71.0	56.9	70.2	69.6	68.4	67.8	65.4	63.7	58.9	58.1	57.2	64.4	0.0	64.4
	8	61.0	66.7	56.2	66.1	65.6	64.7	64.0	61.8	60.3	57.2	56.8	56.3	61.0	0.0	61.0
	9	66.9	72.8	61.0	72.3	71.8	70.8	70.0	68.1	65.9	62.2	61.7	61.2	66.9	0.0	66.9
	10	66.8	74.2	62.2	73.5	72.5	71.0	70.2	67.5	65.4	63.1	62.6	62.3	66.8	0.0	66.8
	11	66.6	74.6	58.8	73.8	73.1	71.8	70.9	67.4	64.4	60.2	59.6	59.0	66.6	0.0	66.6
	12	72.6	77.6	66.0	77.1	76.8	76.2	75.8	74.4	71.4	67.2	66.6	66.1	72.6	0.0	72.6
	13	68.4	75.1	62.3	74.6	74.0	72.9	72.2	69.5	66.7	63.2	62.8	62.4	68.4	0.0	68.4
	14	59.5	67.8	51.2	67.2	66.7	65.3	64.3	60.1	56.2	52.4	52.0	51.4	59.5	0.0	59.5
	15	56.7	64.5	52.0	64.2	63.6	62.0	60.6	56.9	54.3	52.5	52.3	52.1	56.7	0.0	56.7
	16	58.1	67.3	52.7	66.8	66.3	64.4	62.6	57.6	55.0	53.2	53.0	52.8	58.1	0.0	58.1
	17	57.2	66.5	52.2	65.8	64.9	62.8	61.4	56.9	54.6	52.7	52.5	52.3	57.2	0.0	57.2
	18	56.5	65.7	50.9	64.8	63.9	61.9	60.4	56.2	54.1	52.1	51.7	51.1	56.5	0.0	56.5
Evening	19	55.0	61.7	51.3	61.2	60.7	59.6	58.6	55.3	53.2	51.7	51.6	51.4	55.0	5.0	60.0
	20	57.5	66.6	50.8	66.2	65.6	64.2	62.9	56.8	53.5	51.4	51.1	50.9	57.5	5.0	62.5
	21	55.7	65.2	50.5	64.6	63.9	61.8	60.3	54.9	52.6	51.1	50.8	50.6	55.7	5.0	60.7
Night	22	53.4	61.6	49.2	61.2	60.5	58.8	57.3	53.1	51.1	49.7	49.5	49.3	53.4	10.0	63.4
	23	52.6	72.6	47.6	72.1	71.5	69.9	64.9	53.9	49.6	48.1	47.9	47.7	52.6	10.0	62.6

Timeframe	Hour	L_{eq}	L_{max}	L_{min}	L1%	L2%	L5%	L8%	L25%	L50%	L90%	L95%	L99%
Day	Min	56.5	64.5	50.9	64.2	63.6	61.9	60.4	56.2	54.1	52.1	51.7	51.1
	Max	72.6	77.6	66.0	77.1	76.8	76.2	75.8	74.4	71.4	67.2	66.6	66.1
Energy Average		65.9	Average:		69.7	69.1	67.7	66.7	63.5	61.0	57.9	57.5	57.0
Evening	Min	55.0	61.7	50.5	61.2	60.7	59.6	58.6	54.9	52.6	51.1	50.8	50.6
	Max	57.5	66.6	51.3	66.2	65.6	64.2	62.9	56.8	53.5	51.7	51.6	51.4
Energy Average		56.2	Average:		64.0	63.4	61.9	60.6	55.7	53.1	51.4	51.2	51.0
Night	Min	45.9	51.7	42.3	51.5	51.0	49.6	48.7	46.8	44.4	42.8	42.6	42.4
	Max	55.6	72.6	50.6	72.1	71.5	69.9	64.9	55.6	53.3	51.3	51.0	50.7
Energy Average		51.7	Average:		59.4	58.8	57.3	55.5	51.1	48.6	47.1	46.9	46.6

L_{eq} (dBA)		
24-Hour	*Daytime*	*Nighttime*
63.1	**65.0**	**51.7**

24-Hour CNEL (dBA)
64.2

24-Hour Noise Level Measurement Summary

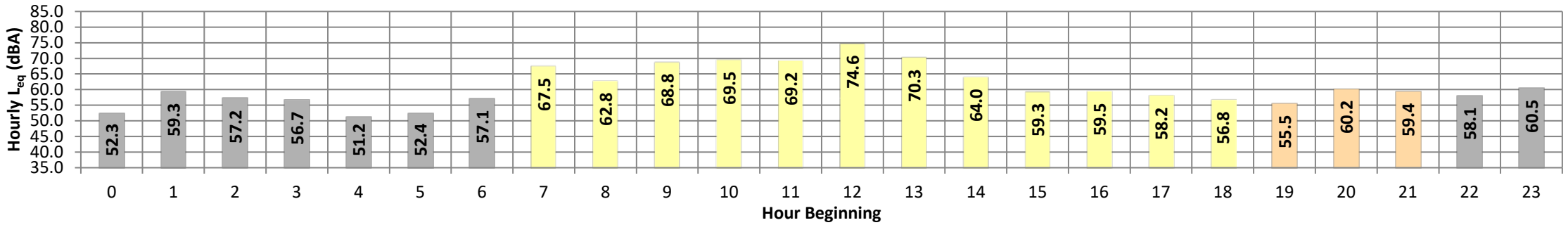
Date: Friday, August 14, 2020
Project: Well 28

Location: L4 - Located southeast of the Project site on Maple Avenue near existing multi-family residential homes at 210 West Maple Avenue.

Meter: Piccolo II

JN: 11981
Analyst: P. Mara

Hourly L_{eq} dBA Readings (unadjusted)



Timeframe	Hour	L_{eq}	L_{max}	L_{min}	L1%	L2%	L5%	L8%	L25%	L50%	L90%	L95%	L99%	L_{eq}	Adj.	Adj. L_{eq}
Night	0	52.3	58.9	49.6	58.6	58.0	55.8	54.2	52.0	51.4	50.4	50.2	49.9	52.3	10.0	62.3
	1	59.3	62.3	51.5	62.1	62.0	61.7	61.5	60.9	59.0	55.5	54.1	52.1	59.3	10.0	69.3
	2	57.2	61.8	52.4	61.5	61.1	60.4	59.6	57.8	56.7	54.6	54.0	52.9	57.2	10.0	67.2
	3	56.7	60.7	53.3	60.4	59.9	58.9	58.2	57.2	56.5	55.1	54.6	53.8	56.7	10.0	66.7
	4	51.2	59.3	48.1	58.8	58.1	56.0	54.4	51.0	49.1	48.4	48.3	48.1	51.2	10.0	61.2
	5	52.4	60.3	48.9	60.0	59.3	57.5	56.1	52.4	50.1	49.2	49.1	48.9	52.4	10.0	62.4
	6	57.1	67.0	51.4	66.4	65.8	63.2	61.4	56.2	53.7	52.0	51.8	51.5	57.1	10.0	67.1
Day	7	67.5	74.2	59.0	73.5	72.6	71.5	70.9	68.8	66.7	61.1	60.1	59.3	67.5	0.0	67.5
	8	62.8	69.3	57.4	68.8	68.4	67.4	66.4	63.5	61.5	58.7	58.2	57.6	62.8	0.0	62.8
	9	68.8	74.3	63.1	73.9	73.6	72.9	72.0	69.7	67.8	64.3	63.8	63.3	68.8	0.0	68.8
	10	69.5	76.7	66.1	76.0	75.0	73.2	72.0	70.0	68.4	66.7	66.4	66.2	69.5	0.0	69.5
	11	69.2	78.8	59.7	77.8	77.0	75.4	74.2	69.3	65.7	61.2	60.5	59.9	69.2	0.0	69.2
	12	74.6	81.1	69.0	80.4	79.9	79.0	78.4	75.6	73.2	70.1	69.6	69.1	74.6	0.0	74.6
	13	70.3	77.0	65.2	76.6	76.1	75.1	74.3	71.3	68.2	65.8	65.5	65.3	70.3	0.0	70.3
	14	64.0	72.6	51.8	72.1	71.6	70.0	69.1	65.2	60.1	53.5	52.7	52.0	64.0	0.0	64.0
	15	59.3	69.4	50.5	69.0	68.5	66.5	64.3	58.4	54.3	51.3	51.0	50.7	59.3	0.0	59.3
	16	59.5	69.4	51.7	69.0	68.5	66.7	64.5	58.7	55.3	52.4	52.0	51.8	59.5	0.0	59.5
	17	58.2	68.0	50.4	67.4	66.7	64.5	62.7	57.9	54.4	51.1	50.8	50.5	58.2	0.0	58.2
	18	56.8	66.6	48.6	66.0	65.3	62.7	60.9	57.0	53.3	49.8	49.2	48.7	56.8	0.0	56.8
Evening	19	55.5	65.1	48.3	64.7	64.0	61.8	60.2	55.1	51.6	49.1	48.8	48.5	55.5	5.0	60.5
	20	60.2	72.4	49.6	71.6	70.7	67.7	64.9	57.5	53.7	50.6	50.1	49.7	60.2	5.0	65.2
	21	59.4	70.2	54.3	69.2	68.2	65.3	62.9	58.2	56.3	55.0	54.8	54.5	59.4	5.0	64.4
Night	22	58.1	63.0	55.8	62.6	62.2	60.8	60.0	58.3	57.5	56.5	56.3	55.9	58.1	10.0	68.1
	23	60.5	72.0	50.0	71.4	70.8	68.9	66.9	56.3	53.4	50.9	50.6	50.1	60.5	10.0	70.5

Timeframe	Hour	L_{eq}	L_{max}	L_{min}	L1%	L2%	L5%	L8%	L25%	L50%	L90%	L95%	L99%
Day	Min	56.8	66.6	48.6	66.0	65.3	62.7	60.9	57.0	53.3	49.8	49.2	48.7
	Max	74.6	81.1	69.0	80.4	79.9	79.0	78.4	75.6	73.2	70.1	69.6	69.1
Energy Average		68.1	Average:		72.5	71.9	70.4	69.1	65.4	62.4	58.8	58.3	57.9
Evening	Min	55.5	65.1	48.3	64.7	64.0	61.8	60.2	55.1	51.6	49.1	48.8	48.5
	Max	60.2	72.4	54.3	71.6	70.7	67.7	64.9	58.2	56.3	55.0	54.8	54.5
Energy Average		58.8	Average:		68.5	67.6	64.9	62.7	56.9	53.9	51.5	51.2	50.9
Night	Min	51.2	58.9	48.1	58.6	58.0	55.8	54.2	51.0	49.1	48.4	48.3	48.1
	Max	60.5	72.0	55.8	71.4	70.8	68.9	66.9	60.9	59.0	56.5	56.3	55.9
Energy Average		57.1	Average:		62.4	61.9	60.3	59.2	55.8	54.2	52.5	52.1	51.5

L_{eq} (dBA)		
24-Hour	Daytime	Nighttime
65.5	67.3	57.1

24-Hour CNEL (dBA)
67.4

24-Hour Noise Level Measurement Summary

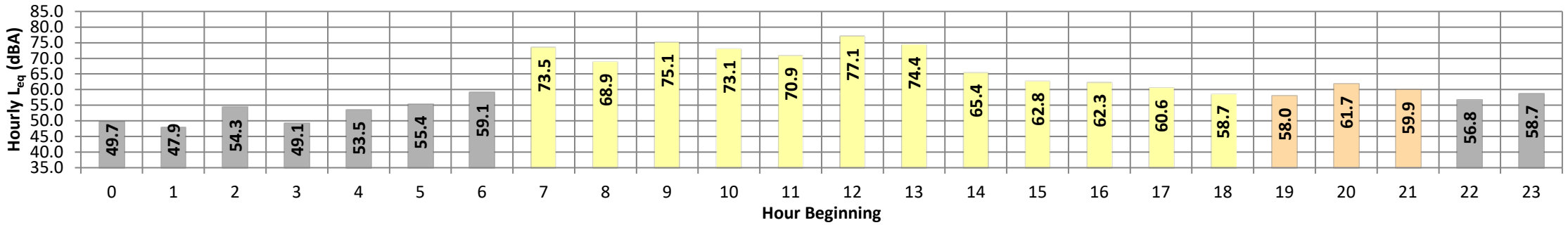
Date: Friday, August 14, 2020
Project: Well 28

Location: L5 - Located south of the Project site on Maple Avenue near existing single-family residential home at 193 North Lemon Street.

Meter: Piccolo II

JN: 11981
Analyst: P. Mara

Hourly L_{eq} dBA Readings (unadjusted)



Timeframe	Hour	L_{eq}	L_{max}	L_{min}	L1%	L2%	L5%	L8%	L25%	L50%	L90%	L95%	L99%	L_{eq}	Adj.	Adj. L_{eq}
Night	0	49.7	57.8	45.7	57.5	57.1	55.3	53.6	49.0	47.4	46.1	46.0	45.8	49.7	10.0	59.7
	1	47.9	53.6	44.4	53.3	53.1	52.0	51.2	48.8	45.8	44.7	44.6	44.5	47.9	10.0	57.9
	2	54.3	64.5	46.7	63.4	62.6	61.0	59.3	53.9	50.3	47.2	47.1	46.9	54.3	10.0	64.3
	3	49.1	60.6	44.3	59.8	58.1	55.4	53.3	47.3	45.5	44.6	44.6	44.4	49.1	10.0	59.1
	4	53.5	63.0	47.5	62.6	61.5	59.5	57.9	53.6	49.9	48.0	47.8	47.6	53.5	10.0	63.5
	5	55.4	64.8	48.0	64.3	63.6	61.8	60.6	55.1	51.0	48.7	48.4	48.2	55.4	10.0	65.4
	6	59.1	68.0	52.8	67.5	66.9	65.1	63.7	59.0	55.9	53.6	53.3	53.0	59.1	10.0	69.1
Day	7	73.5	78.4	65.3	78.0	77.5	76.7	76.2	74.9	73.3	67.8	66.5	65.6	73.5	0.0	73.5
	8	68.9	74.3	64.4	73.7	73.2	72.3	71.4	69.7	68.2	65.8	65.3	64.6	68.9	0.0	68.9
	9	75.1	79.4	70.4	79.1	78.8	78.3	77.8	76.2	74.5	71.5	71.1	70.6	75.1	0.0	75.1
	10	73.1	79.6	68.9	78.9	78.2	76.6	75.8	73.7	72.2	69.9	69.4	69.0	73.1	0.0	73.1
	11	70.9	79.1	61.0	78.4	77.7	76.7	75.9	71.5	67.4	62.8	62.0	61.3	70.9	0.0	70.9
	12	77.1	84.4	72.1	83.5	82.7	81.1	80.1	77.7	75.9	73.1	72.7	72.2	77.1	0.0	77.1
	13	74.4	83.3	65.4	82.8	82.0	79.9	78.8	75.2	71.2	67.0	66.5	65.6	74.4	0.0	74.4
	14	65.4	73.2	53.7	72.5	71.9	70.7	69.9	66.8	62.7	56.1	54.6	53.9	65.4	0.0	65.4
	15	62.8	73.8	54.3	73.3	72.3	69.5	67.3	61.6	57.8	55.2	54.9	54.5	62.8	0.0	62.8
	16	62.3	71.0	55.1	70.5	70.0	68.5	67.3	62.4	58.7	56.1	55.7	55.2	62.3	0.0	62.3
	17	60.6	70.4	51.1	69.9	69.1	67.0	65.6	60.5	56.7	52.3	51.8	51.3	60.6	0.0	60.6
	18	58.7	68.3	49.6	67.8	67.0	65.1	63.3	58.6	54.8	50.9	50.3	49.8	58.7	0.0	58.7
Evening	19	58.0	67.9	49.5	67.4	66.7	65.2	63.5	56.9	53.5	50.3	49.9	49.6	58.0	5.0	63.0
	20	61.7	73.6	50.2	72.9	71.9	69.3	66.3	59.4	54.8	51.2	50.8	50.3	61.7	5.0	66.7
	21	59.9	71.2	52.0	70.5	69.4	66.3	64.5	58.4	55.1	52.9	52.5	52.1	59.9	5.0	64.9
Night	22	56.8	65.7	51.6	65.5	65.0	62.8	61.3	55.9	53.8	52.4	52.1	51.8	56.8	10.0	66.8
	23	58.7	70.1	49.3	69.5	68.8	66.2	64.2	55.8	52.1	50.0	49.7	49.5	58.7	10.0	68.7

Timeframe	Hour	L_{eq}	L_{max}	L_{min}	L1%	L2%	L5%	L8%	L25%	L50%	L90%	L95%	L99%
Day	Min	58.7	68.3	49.6	67.8	67.0	65.1	63.3	58.6	54.8	50.9	50.3	49.8
	Max	77.1	84.4	72.1	83.5	82.7	81.1	80.1	77.7	75.9	73.1	72.7	72.2
Energy Average		71.8	Average:		75.7	75.0	73.5	72.5	69.1	66.1	62.4	61.7	61.1
Evening	Min	58.0	67.9	49.5	67.4	66.7	65.2	63.5	56.9	53.5	50.3	49.9	49.6
	Max	61.7	73.6	52.0	72.9	71.9	69.3	66.3	59.4	55.1	52.9	52.5	52.1
Energy Average		60.1	Average:		70.3	69.3	66.9	64.8	58.2	54.4	51.5	51.1	50.7
Night	Min	47.9	53.6	44.3	53.3	53.1	52.0	51.2	47.3	45.5	44.6	44.6	44.4
	Max	59.1	70.1	52.8	69.5	68.8	66.2	64.2	59.0	55.9	53.6	53.3	53.0
Energy Average		55.4	Average:		62.6	61.9	59.9	58.3	53.2	50.2	48.4	48.2	47.9

L_{eq} (dBA)		
24-Hour	Daytime	Nighttime
68.9	70.9	55.4

24-Hour CNEL (dBA)

69.7

24-Hour Noise Level Measurement Summary

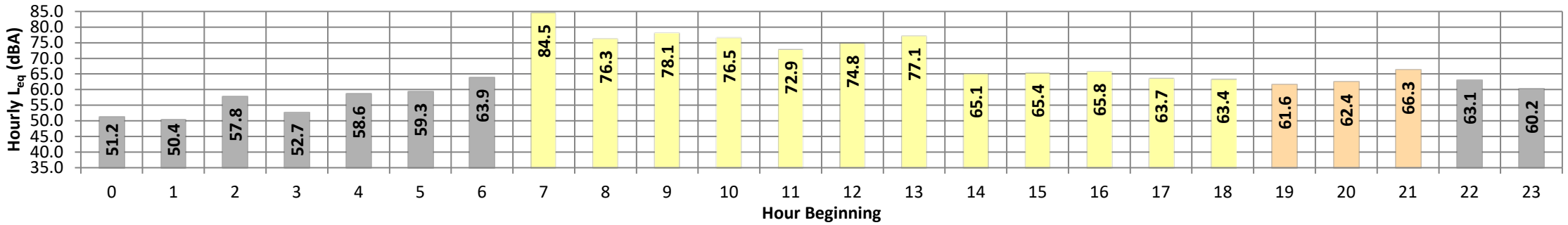
Date: Friday, August 14, 2020
Project: Well 28

Location: L6 - Located southwest of the Project site on Lemon Avenue and Maple Avenue near the Old Town West Parking Structure.

Meter: Piccolo II

JN: 11981
Analyst: P. Mara

Hourly L_{eq} dBA Readings (unadjusted)



Timeframe	Hour	L_{eq}	L_{max}	L_{min}	L1%	L2%	L5%	L8%	L25%	L50%	L90%	L95%	L99%	L_{eq}	Adj.	Adj. L_{eq}
Night	0	51.2	58.1	48.7	57.6	57.0	55.2	54.0	51.1	49.9	49.1	49.0	48.8	51.2	10.0	61.2
	1	50.4	57.6	48.2	57.1	56.4	54.2	52.7	50.0	49.2	48.5	48.4	48.3	50.4	10.0	60.4
	2	57.8	69.4	48.3	68.1	67.5	65.9	63.4	54.6	50.4	48.8	48.6	48.4	57.8	10.0	67.8
	3	52.7	63.5	48.5	62.9	61.3	58.8	56.8	50.6	49.7	48.9	48.8	48.6	52.7	10.0	62.7
	4	58.6	68.6	50.5	68.0	67.2	65.7	64.2	58.3	53.0	51.1	50.9	50.6	58.6	10.0	68.6
	5	59.3	69.2	50.8	68.8	68.2	66.2	65.2	57.9	54.0	51.5	51.2	50.9	59.3	10.0	69.3
	6	63.9	72.5	56.6	71.9	71.3	70.2	68.9	64.0	60.2	57.3	57.0	56.7	63.9	10.0	73.9
Day	7	84.5	88.9	73.9	88.7	88.4	88.1	87.8	86.4	83.7	77.1	75.5	74.3	84.5	0.0	84.5
	8	76.3	83.3	72.1	82.5	81.6	80.3	79.4	76.7	75.1	73.0	72.6	72.2	76.3	0.0	76.3
	9	78.1	82.5	73.3	82.0	81.7	81.2	80.7	79.1	77.6	74.9	74.3	73.6	78.1	0.0	78.1
	10	76.5	84.1	70.4	83.3	82.6	81.1	80.0	77.1	75.0	71.8	71.1	70.6	76.5	0.0	76.5
	11	72.9	80.5	64.4	80.0	79.4	78.0	77.1	74.4	70.1	65.6	65.1	64.5	72.9	0.0	72.9
	12	74.8	80.6	68.6	80.1	79.7	78.9	78.4	76.2	73.2	69.7	69.3	68.8	74.8	0.0	74.8
	13	77.1	84.0	64.0	83.9	83.7	83.1	82.6	77.9	74.0	66.9	65.4	64.2	77.1	0.0	77.1
	14	65.1	74.2	54.4	73.9	73.4	72.0	70.9	64.9	60.4	55.7	55.1	54.6	65.1	0.0	65.1
	15	65.4	77.2	56.6	76.7	75.8	72.6	70.1	62.6	59.5	57.4	57.0	56.7	65.4	0.0	65.4
	16	65.8	75.4	58.9	75.0	74.4	72.3	70.4	65.0	62.1	59.8	59.4	59.0	65.8	0.0	65.8
	17	63.7	74.4	53.3	74.0	73.3	70.9	68.7	62.4	58.4	54.3	53.9	53.5	63.7	0.0	63.7
	18	63.4	73.8	52.7	73.1	72.3	70.2	68.6	62.5	58.8	54.4	53.8	52.9	63.4	0.0	63.4
Evening	19	61.6	72.4	51.2	71.8	71.0	68.9	66.8	60.5	55.8	52.1	51.8	51.3	61.6	5.0	66.6
	20	62.4	73.4	52.2	72.9	72.4	70.3	67.8	60.5	56.0	53.0	52.7	52.3	62.4	5.0	67.4
	21	66.3	72.8	64.0	72.3	71.8	70.3	68.9	66.1	65.1	64.7	64.6	64.3	66.3	5.0	71.3
Night	22	63.1	71.7	58.4	71.2	70.6	67.8	65.4	62.6	61.8	60.3	59.7	58.8	63.1	10.0	73.1
	23	60.2	73.2	50.6	72.6	71.2	68.1	64.7	54.9	53.0	51.3	51.1	50.8	60.2	10.0	70.2

Timeframe	Hour	L_{eq}	L_{max}	L_{min}	L1%	L2%	L5%	L8%	L25%	L50%	L90%	L95%	L99%
Day	Min	63.4	73.8	52.7	73.1	72.3	70.2	68.6	62.4	58.4	54.3	53.8	52.9
	Max	84.5	88.9	73.9	88.7	88.4	88.1	87.8	86.4	83.7	77.1	75.5	74.3
Energy Average		76.6	Average:		79.4	78.9	77.4	76.2	72.1	69.0	65.0	64.4	63.7
Evening	Min	61.6	72.4	51.2	71.8	71.0	68.9	66.8	60.5	55.8	52.1	51.8	51.3
	Max	66.3	73.4	64.0	72.9	72.4	70.3	68.9	66.1	65.1	64.7	64.6	64.3
Energy Average		64.0	Average:		72.3	71.8	69.8	67.8	62.4	59.0	56.6	56.3	56.0
Night	Min	50.4	57.6	48.2	57.1	56.4	54.2	52.7	50.0	49.2	48.5	48.4	48.3
	Max	63.9	73.2	58.4	72.6	71.3	70.2	68.9	64.0	61.8	60.3	59.7	58.8
Energy Average		59.6	Average:		66.5	65.6	63.6	61.7	56.0	53.5	51.9	51.6	51.3

L_{eq} (dBA)		
24-Hour	Daytime	Nighttime
73.7	75.7	59.6

24-Hour CNEL (dBA)

74.4

24-Hour Noise Level Measurement Summary

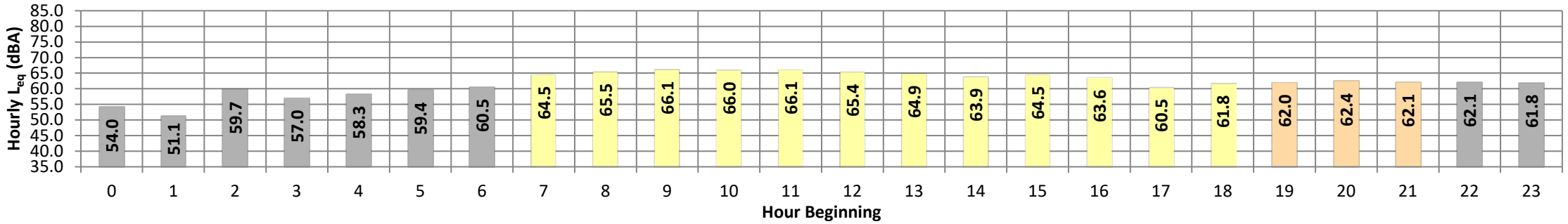
Date: Friday, August 14, 2020
Project: Well 28

Location: L7 - Located northwest of the Project site near Chapman University Dodge College at 283 North Cypress Street.

Meter: Piccolo II

JN: 11981
Analyst: P. Mara

Hourly L_{eq} dBA Readings (unadjusted)



Timeframe	Hour	L_{eq}	L_{max}	L_{min}	L1%	L2%	L5%	L8%	L25%	L50%	L90%	L95%	L99%	L_{eq}	Adj.	Adj. L_{eq}
Night	0	54.0	57.4	52.6	57.1	56.8	55.9	55.2	54.2	53.8	52.9	52.8	52.7	54.0	10.0	64.0
	1	51.1	55.8	48.9	55.5	55.1	54.0	53.3	51.9	50.2	49.2	49.1	49.0	51.1	10.0	61.1
	2	59.7	64.7	57.8	64.6	64.4	63.4	62.6	59.8	58.5	58.0	57.9	57.9	59.7	10.0	69.7
	3	57.0	59.2	56.5	59.0	58.7	58.0	57.6	56.9	56.8	56.7	56.6	56.6	57.0	10.0	67.0
	4	58.3	63.7	56.8	63.5	63.2	61.7	60.9	58.1	57.2	56.9	56.9	56.8	58.3	10.0	68.3
	5	59.4	66.4	57.0	66.1	65.7	64.2	63.0	59.1	57.7	57.1	57.1	57.0	59.4	10.0	69.4
	6	60.5	67.4	57.9	66.7	66.1	64.6	63.5	60.6	59.1	58.2	58.1	58.0	60.5	10.0	70.5
Day	7	64.5	68.9	60.2	68.6	68.2	67.5	67.1	65.5	64.1	61.0	60.6	60.3	64.5	0.0	64.5
	8	65.5	70.5	63.7	70.0	69.4	68.3	67.5	65.6	64.9	64.0	63.9	63.7	65.5	0.0	65.5
	9	66.1	68.3	64.8	68.1	67.8	67.5	67.2	66.5	66.0	65.2	65.1	64.9	66.1	0.0	66.1
	10	66.0	69.1	64.4	68.7	68.4	67.9	67.5	66.6	65.7	64.8	64.6	64.5	66.0	0.0	66.0
	11	66.1	71.0	63.9	70.5	70.0	69.1	68.5	66.8	65.2	64.2	64.1	64.0	66.1	0.0	66.1
	12	65.4	68.9	63.7	68.5	68.1	67.4	67.0	65.7	65.0	64.1	63.9	63.8	65.4	0.0	65.4
	13	64.9	67.5	63.5	67.2	67.0	66.5	66.3	65.2	64.6	63.8	63.7	63.5	64.9	0.0	64.9
	14	63.9	66.4	63.0	66.2	66.0	65.4	64.9	64.2	63.7	63.2	63.2	63.1	63.9	0.0	63.9
	15	64.5	67.3	63.7	67.1	66.7	66.0	65.5	64.7	64.3	63.9	63.9	63.7	64.5	0.0	64.5
	16	63.6	66.3	62.5	66.0	65.7	65.1	64.7	63.8	63.3	62.8	62.7	62.6	63.6	0.0	63.6
	17	60.5	65.7	58.2	65.3	64.9	63.5	62.7	61.0	59.7	58.6	58.5	58.3	60.5	0.0	60.5
	18	61.8	66.6	60.1	66.1	65.7	64.6	63.7	61.9	61.1	60.4	60.3	60.2	61.8	0.0	61.8
Evening	19	62.0	65.0	61.0	64.7	64.4	63.6	63.1	62.2	61.6	61.2	61.1	61.1	62.0	5.0	67.0
	20	62.4	66.3	61.2	66.1	65.7	64.5	63.8	62.4	61.8	61.4	61.4	61.3	62.4	5.0	67.4
	21	62.1	67.2	61.1	66.7	66.0	64.2	63.4	62.0	61.5	61.3	61.2	61.2	62.1	5.0	67.1
Night	22	62.1	67.2	61.0	66.9	66.3	64.4	63.3	61.9	61.5	61.2	61.1	61.0	62.1	10.0	72.1
	23	61.8	65.6	60.9	65.3	65.1	64.0	63.1	61.7	61.4	61.1	61.1	61.0	61.8	10.0	71.8

Timeframe	Hour	L_{eq}	L_{max}	L_{min}	L1%	L2%	L5%	L8%	L25%	L50%	L90%	L95%	L99%
Day	Min	60.5	65.7	58.2	65.3	64.9	63.5	62.7	61.0	59.7	58.6	58.5	58.3
	Max	66.1	71.0	64.8	70.5	70.0	69.1	68.5	66.8	66.0	65.2	65.1	64.9
Energy Average		64.7	Average:		67.7	67.3	66.6	66.1	64.8	64.0	63.0	62.9	62.7
Evening	Min	62.0	65.0	61.0	64.7	64.4	63.6	63.1	62.0	61.5	61.2	61.1	61.1
	Max	62.4	67.2	61.2	66.7	66.0	64.5	63.8	62.4	61.8	61.4	61.4	61.3
Energy Average		62.2	Average:		65.8	65.4	64.1	63.5	62.2	61.7	61.3	61.2	61.2
Night	Min	51.1	55.8	48.9	55.5	55.1	54.0	53.3	51.9	50.2	49.2	49.1	49.0
	Max	62.1	67.4	61.0	66.9	66.3	64.6	63.5	61.9	61.5	61.2	61.1	61.0
Energy Average		59.3	Average:		62.7	62.4	61.1	60.3	58.3	57.4	56.8	56.7	56.7

L_{eq} (dBA)		
24-Hour	*Daytime*	*Nighttime*
63.0	**64.3**	**59.3**

24-Hour CNEL (dBA)
67.2

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APPENDIX 7.1:

CADNAA OPERATIONAL NOISE MODEL INPUTS

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11981

CadnaA Noise Prediction Model: 11981_Operational.cna
Date: 09.04.20
Analyst: B. Lawson

Receiver Noise Levels

Name	M.	ID	Level Lr			Limit. Value			Land Use			Height		Coordinates		
			Day	Night	CNEL	Day	Night	CNEL	Type	Auto	Noise Type			X	Y	Z
			(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)				(ft)		(ft)	(ft)	(ft)
RECEIVERS		R1	46.5	46.5	53.1	55.0	50.0	0.0				5.00	a	6074130.84	2234904.35	5.00
RECEIVERS		R2	47.3	47.3	54.0	55.0	50.0	0.0				5.00	a	6074131.10	2234830.65	5.00
RECEIVERS		R3	47.0	47.0	53.7	55.0	50.0	0.0				5.00	a	6074161.20	2234797.99	5.00
RECEIVERS		R4	44.4	44.4	51.0	55.0	50.0	0.0				5.00	a	6074128.91	2234683.35	5.00
RECEIVERS		R5	44.2	44.2	50.9	55.0	50.0	0.0				5.00	a	6074001.47	2234673.52	5.00
RECEIVERS		R6	41.8	41.8	48.5	55.0	50.0	0.0				5.00	a	6073892.68	2234689.03	5.00
RECEIVERS		R7	39.8	39.8	46.5	55.0	50.0	0.0				5.00	a	6073851.20	2235018.90	5.00

Area Source(s)

ID	Result. PWL			Result. PWL''			Lw / Li		Operating Time			Moving Pt. Src			Height
	Day	Evening	Night	Day	Evening	Night	Type	Value	Day	Special	Night	Number			
	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)			(min)	(min)	(min)	Day	Evening	Night	(ft)
WELL	88.3	88.3	88.3	73.0	73.0	73.0	Li	107							14

Name	Height				Coordinates			
	Begin		End		x	y	z	Ground
	(ft)		(ft)		(ft)	(ft)	(ft)	(ft)
WELLENCLOSURE	14.00	r			6074047.75	2234837.97	14.00	0.00
					6074047.29	2234818.78	14.00	0.00
					6074066.38	2234818.50	14.00	0.00
					6074066.75	2234837.64	14.00	0.00
					6074047.75	2234838.01	14.00	0.00
					6074047.75	2234837.97	14.00	0.00

Barrier(s)

Name	M.	ID	Absorption		Z-Ext.	Cantilever		Height			Coordinates			
			left	right		horz.	vert.	Begin		End	x	y	z	Ground
					(ft)	(ft)	(ft)	(ft)		(ft)	(ft)	(ft)	(ft)	(ft)
BARRIERS		ProposedBarrier						14.00	a		6074042.32	2234872.56	14.00	0.00
											6074101.90	2234871.39	14.00	0.00
											6074100.44	2234808.75	14.00	0.00
											6074041.01	2234810.06	14.00	0.00
											6074042.32	2234872.56	14.00	0.00

Building(s)

Name	M.	ID	RB	Residents	Absorption	Height		Coordinates			
						Begin		x	y	z	Ground
						(ft)		(ft)	(ft)	(ft)	(ft)
BUILDING		BUILDING00003	x	0		20.00	a	6073783.16	2234688.62	20.00	0.00
								6073890.80	2234687.75	20.00	0.00
								6073890.80	2234668.65	20.00	0.00
								6073905.55	2234667.78	20.00	0.00
								6073901.21	2234418.65	20.00	0.00
								6073771.01	2234422.12	20.00	0.00
BUILDING		BUILDING00004	x	0		20.00	a	6074068.78	2234690.47	20.00	0.00
								6074105.27	2234689.50	20.00	0.00
								6074105.27	2234633.95	20.00	0.00
								6074067.81	2234635.24	20.00	0.00
BUILDING		BUILDING00005	x	0		20.00	a	6074044.55	2234671.09	20.00	0.00
								6074068.43	2234670.76	20.00	0.00
								6074067.98	2234644.90	20.00	0.00
								6074043.91	2234645.26	20.00	0.00
BUILDING		BUILDING00006	x	0		20.00	a	6073995.78	2234672.71	20.00	0.00
								6074037.45	2234671.42	20.00	0.00
								6074036.80	2234644.93	20.00	0.00
								6074043.91	2234645.26	20.00	0.00
								6074044.55	2234634.60	20.00	0.00
								6074007.73	2234635.57	20.00	0.00
								6074007.73	2234642.67	20.00	0.00
								6073994.81	2234642.99	20.00	0.00
								6073994.81	2234646.87	20.00	0.00
								6073989.64	2234646.87	20.00	0.00
								6073990.29	2234667.86	20.00	0.00
								6073996.10	2234667.54	20.00	0.00
BUILDING		BUILDING00007	x	0		20.00	a	6074167.61	2234808.36	20.00	0.00
								6074211.54	2234807.39	20.00	0.00
								6074212.83	2234781.88	20.00	0.00

Name	M.	ID	RB	Residents	Absorption	Height		Coordinates			
						Begin		x	y	z	Ground
						(ft)		(ft)	(ft)	(ft)	(ft)
								6074174.39	2234783.49	20.00	0.00
								6074174.07	2234795.44	20.00	0.00
								6074167.29	2234794.80	20.00	0.00
BUILDING		BUILDING00008	x	0		20.00	a	6074133.37	2234873.61	20.00	0.00
								6074231.56	2234872.96	20.00	0.00
								6074231.56	2234856.17	20.00	0.00
								6074132.73	2234858.75	20.00	0.00
BUILDING		BUILDING00009	x	0		20.00	a	6074132.73	2234831.62	20.00	0.00
								6074230.91	2234830.00	20.00	0.00
								6074230.91	2234814.50	20.00	0.00
								6074132.73	2234816.44	20.00	0.00
BUILDING		BUILDING00010	x	0		20.00	a	6074134.99	2234931.74	20.00	0.00
								6074236.41	2234930.45	20.00	0.00
								6074236.08	2234901.38	20.00	0.00
								6074134.34	2234904.29	20.00	0.00
BUILDING		BUILDING00011	x	0		20.00	a	6074175.04	2234982.13	20.00	0.00
								6074212.83	2234982.45	20.00	0.00
								6074211.54	2234938.85	20.00	0.00
								6074173.42	2234938.85	20.00	0.00
BUILDING		BUILDING00012	x	0		20.00	a	6073740.62	2235291.48	20.00	0.00
								6073827.86	2235291.48	20.00	0.00
								6073827.86	2235221.17	20.00	0.00
								6073856.51	2235218.56	20.00	0.00
								6073848.70	2235023.25	20.00	0.00
								6073780.99	2235028.46	20.00	0.00
								6073778.38	2235007.63	20.00	0.00
								6073697.66	2235008.93	20.00	0.00
								6073700.26	2235034.97	20.00	0.00
								6073665.10	2235036.27	20.00	0.00
								6073663.80	2235221.17	20.00	0.00
								6073738.02	2235223.77	20.00	0.00
BUILDING		BUILDING00013	x	0		20.00	a	6074144.03	2235049.35	20.00	0.00
								6074225.65	2235047.68	20.00	0.00
								6074226.13	2235013.55	20.00	0.00
								6074144.50	2235017.37	20.00	0.00
BUILDING		BUILDING00014	x	0		20.00	a	6073726.28	2234652.75	20.00	0.00
								6073748.24	2234652.60	20.00	0.00
								6073747.38	2234609.83	20.00	0.00
								6073724.83	2234610.70	20.00	0.00
BUILDING		BUILDING00015	x	0		20.00	a	6073663.27	2234646.53	20.00	0.00
								6073700.84	2234646.10	20.00	0.00
								6073699.40	2234610.55	20.00	0.00
								6073664.00	2234611.56	20.00	0.00
BUILDING		BUILDING00016	x	0		20.00	a	6074109.11	2234531.06	20.00	0.00
								6074127.34	2234531.06	20.00	0.00
								6074158.59	2234529.76	20.00	0.00
								6074158.62	2234531.06	20.00	0.00
								6074192.45	2234531.06	20.00	0.00
								6074197.66	2234643.04	20.00	0.00
								6074161.20	2234644.35	20.00	0.00
								6074158.62	2234531.06	20.00	0.00
								6074127.34	2234531.06	20.00	0.00
								6074128.64	2234682.11	20.00	0.00
								6074231.51	2234679.50	20.00	0.00
								6074227.60	2234498.51	20.00	0.00
								6074107.81	2234498.51	20.00	0.00
WELLENCLOSURE		WELL		0	1.05	14.00	r	6074047.59	2234837.97	14.00	0.00
								6074047.12	2234818.62	14.00	0.00
								6074066.54	2234818.34	14.00	0.00
								6074066.92	2234837.80	14.00	0.00
								6074047.59	2234838.18	14.00	0.00
								6074047.59	2234837.97	14.00	0.00

Vertical Area Source(s)

Name	Height				Coordinates			
	Begin		End		x	y	z	Ground
	(ft)		(ft)		(ft)	(ft)	(ft)	(ft)
WELLENCLOSURE	14.00	r			6074047.42	2234837.97	14.00	0.00
					6074047.42	2234837.97	14.00	0.00
WELLENCLOSURE	14.00	r			6074047.42	2234837.97	14.00	0.00
					6074046.95	2234818.46	14.00	0.00
WELLENCLOSURE	14.00	r			6074046.95	2234818.46	14.00	0.00
					6074066.70	2234818.17	14.00	0.00
WELLENCLOSURE	14.00	r			6074066.70	2234818.17	14.00	0.00
					6074067.08	2234837.96	14.00	0.00
WELLENCLOSURE	14.00	r			6074067.08	2234837.96	14.00	0.00

Name	Height				Coordinates			
	Begin		End		x	y	z	Ground
	(ft)		(ft)		(ft)	(ft)	(ft)	(ft)
					6074047.43	2234838.34	14.00	0.00
WELLENCLOSURE	14.00	r			6074047.43	2234838.34	14.00	0.00
					6074047.42	2234837.97	14.00	0.00

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APPENDIX 8.1:

CADNAA CONSTRUCTION NOISE MODEL INPUTS

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13281

CadnaA Noise Prediction Model: 11981_Construction_03.cna
Date: 11.04.20
Analyst: B. Lawson

Receiver Noise Levels

Name	M.	ID	Level Lr			Limit. Value			Land Use			Height		Coordinates		
			Day	Night	CNEL	Day	Night	CNEL	Type	Auto	Noise Type			X	Y	Z
			(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)				(ft)		(ft)	(ft)	(ft)
RECEIVERS		R1	54.9	54.9	61.5	0.0	0.0	75.0				5.00	a	6074130.84	2234904.35	5.00
RECEIVERS		R2	56.0	56.0	62.6	0.0	0.0	75.0				5.00	a	6074131.10	2234830.65	5.00
RECEIVERS		R3	54.4	54.4	61.1	0.0	0.0	75.0				5.00	a	6074161.20	2234797.99	5.00
RECEIVERS		R4	60.1	60.1	66.8	0.0	0.0	75.0				5.00	a	6074128.91	2234683.35	5.00
RECEIVERS		R5	60.8	60.8	67.5	0.0	0.0	75.0				5.00	a	6074001.47	2234673.52	5.00
RECEIVERS		R6	55.2	55.2	61.9	0.0	0.0	75.0				5.00	a	6073892.68	2234689.03	5.00
RECEIVERS		R7	51.0	51.0	57.6	0.0	0.0	75.0				5.00	a	6073851.20	2235018.90	5.00

Area Source(s)

ID	Result. PWL			Result. PWL''			Lw / Li		Operating Time			Moving Pt. Src			Height
	Day	Evening	Night	Day	Evening	Night	Type	Value	Day	Special	Night	Number			
	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)			(min)	(min)	(min)	Day	Evening	Night	(ft)
CONSTRUCTION	108.5	108.5	108.5	78.0	78.0	78.0	Lw''	78							16

Name	Height				Coordinates			
	Begin		End		x	y	z	Ground
	(ft)		(ft)		(ft)	(ft)	(ft)	(ft)
CONSTRUCTION	16.00	a			6073982.39	2234878.25	16.00	0.00
					6074106.25	2234875.86	16.00	0.00
					6074104.22	2234778.11	16.00	0.00
					6073980.65	2234780.75	16.00	0.00

Barrier(s)

Name	M.	ID	Absorption		Z-Ext.	Cantilever		Height				Coordinates			
			left	right		horz.	vert.	Begin		End		x	y	z	Ground
					(ft)	(ft)	(ft)	(ft)		(ft)		(ft)	(ft)	(ft)	(ft)
BARRIERS		BARRIERS00005						24.00	a			6074037.55	2234778.45	24.00	0.00
												6073979.82	2234779.76	24.00	0.00
												6073981.28	2234878.97	24.00	0.00
												6074107.14	2234876.63	24.00	0.00
												6074105.25	2234776.99	24.00	0.00
												6074057.63	2234778.10	24.00	0.00

Building(s)

Name	M.	ID	RB	Residents	Absorption	Height		Coordinates			
						Begin		x	y	z	Ground
						(ft)		(ft)	(ft)	(ft)	(ft)
BUILDING		BUILDING00003	x	0		20.00	a	6073783.16	2234688.62	20.00	0.00
								6073890.80	2234687.75	20.00	0.00
								6073890.80	2234668.65	20.00	0.00
								6073905.55	2234667.78	20.00	0.00
								6073901.21	2234418.65	20.00	0.00
								6073771.01	2234422.12	20.00	0.00
BUILDING		BUILDING00004	x	0		20.00	a	6074068.78	2234690.47	20.00	0.00
								6074105.27	2234689.50	20.00	0.00
								6074105.27	2234633.95	20.00	0.00
								6074067.81	2234635.24	20.00	0.00
BUILDING		BUILDING00005	x	0		20.00	a	6074044.55	2234671.09	20.00	0.00
								6074068.43	2234670.76	20.00	0.00
								6074067.98	2234644.90	20.00	0.00
								6074043.91	2234645.26	20.00	0.00
BUILDING		BUILDING00006	x	0		20.00	a	6073995.78	2234672.71	20.00	0.00
								6074037.45	2234671.42	20.00	0.00
								6074036.80	2234644.93	20.00	0.00
								6074043.91	2234645.26	20.00	0.00
								6074044.55	2234634.60	20.00	0.00
								6074007.73	2234635.57	20.00	0.00
								6074007.73	2234642.67	20.00	0.00
								6073994.81	2234642.99	20.00	0.00
								6073994.81	2234646.87	20.00	0.00
								6073989.64	2234646.87	20.00	0.00
								6073990.29	2234667.86	20.00	0.00
								6073996.10	2234667.54	20.00	0.00
BUILDING		BUILDING00007	x	0		20.00	a	6074167.61	2234808.36	20.00	0.00
								6074211.54	2234807.39	20.00	0.00
								6074212.83	2234781.88	20.00	0.00
								6074174.39	2234783.49	20.00	0.00

Name	M.	ID	RB	Residents	Absorption	Height		Coordinates			
						Begin		x	y	z	Ground
						(ft)		(ft)	(ft)	(ft)	(ft)
								6074174.07	2234795.44	20.00	0.00
								6074167.29	2234794.80	20.00	0.00
BUILDING		BUILDING00008	x	0		20.00	a	6074133.37	2234873.61	20.00	0.00
								6074231.56	2234872.96	20.00	0.00
								6074231.56	2234856.17	20.00	0.00
								6074132.73	2234858.75	20.00	0.00
BUILDING		BUILDING00009	x	0		20.00	a	6074132.73	2234831.62	20.00	0.00
								6074230.91	2234830.00	20.00	0.00
								6074230.91	2234814.50	20.00	0.00
								6074132.73	2234816.44	20.00	0.00
BUILDING		BUILDING00010	x	0		20.00	a	6074134.99	2234931.74	20.00	0.00
								6074236.41	2234930.45	20.00	0.00
								6074236.08	2234901.38	20.00	0.00
								6074134.34	2234904.29	20.00	0.00
BUILDING		BUILDING00011	x	0		20.00	a	6074175.04	2234982.13	20.00	0.00
								6074212.83	2234982.45	20.00	0.00
								6074211.54	2234938.85	20.00	0.00
								6074173.42	2234938.85	20.00	0.00
BUILDING		BUILDING00012	x	0		20.00	a	6073740.62	2235291.48	20.00	0.00
								6073827.86	2235291.48	20.00	0.00
								6073827.86	2235221.17	20.00	0.00
								6073856.51	2235218.56	20.00	0.00
								6073848.70	2235023.25	20.00	0.00
								6073780.99	2235028.46	20.00	0.00
								6073778.38	2235007.63	20.00	0.00
								6073697.66	2235008.93	20.00	0.00
								6073700.26	2235034.97	20.00	0.00
								6073665.10	2235036.27	20.00	0.00
								6073663.80	2235221.17	20.00	0.00
								6073738.02	2235223.77	20.00	0.00
BUILDING		BUILDING00013	x	0		20.00	a	6074144.03	2235049.35	20.00	0.00
								6074225.65	2235047.68	20.00	0.00
								6074226.13	2235013.55	20.00	0.00
								6074144.50	2235017.37	20.00	0.00
BUILDING		BUILDING00014	x	0		20.00	a	6073726.28	2234652.75	20.00	0.00
								6073748.24	2234652.60	20.00	0.00
								6073747.38	2234609.83	20.00	0.00
								6073724.83	2234610.70	20.00	0.00
BUILDING		BUILDING00015	x	0		20.00	a	6073663.27	2234646.53	20.00	0.00
								6073700.84	2234646.10	20.00	0.00
								6073699.40	2234610.55	20.00	0.00
								6073664.00	2234611.56	20.00	0.00
BUILDING		BUILDING00016	x	0		20.00	a	6074109.11	2234531.06	20.00	0.00
								6074127.34	2234531.06	20.00	0.00
								6074158.59	2234529.76	20.00	0.00
								6074158.62	2234531.06	20.00	0.00
								6074192.45	2234531.06	20.00	0.00
								6074197.66	2234643.04	20.00	0.00
								6074161.20	2234644.35	20.00	0.00
								6074158.62	2234531.06	20.00	0.00
								6074127.34	2234531.06	20.00	0.00
								6074128.64	2234682.11	20.00	0.00
								6074231.51	2234679.50	20.00	0.00
								6074227.60	2234498.51	20.00	0.00
								6074107.81	2234498.51	20.00	0.00