Appendix F
Noise Study

Holy Name of Jesus Catholic Community Project

Noise Impact Assessment

Redlands, California

Prepared For:

The Holy Name of Jesus Catholic Community
1201 East Highland Avenue,
San Bernardino, California 92404

May 2020

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LIST OF ACRONYMS AND ABBREVIATIONS

Caltrans	California Department of Transportation
City	City of Redlands
CNEL	Community Noise Equivalent Level
dB	Decibel
dBA	A-weighted decibel
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
Hz	Hertz
L_{dn}	Day/Night Noise Level
L_{eq}	Equivalent Noise Level
OPR	Office of Planning and Research
OSHA	Occupational Safety and Health Administration
PPV	Peak particle velocity
Project	Holy Name of Jesus Catholic Community
RMS	Root mean square
WEAL	Western Electro-Acoustic Laboratory, Inc.

1.0 INTRODUCTION

This report documents the results of a Noise Impact Assessment completed for the Holy Name of Jesus Catholic Community Project (Project), which includes the development of a church with a seating capacity of 1,454 and a Preschool-8th grade private school with an ultimate enrollment of 550 students in Redlands, California. This report was prepared as a comparison of predicted Project noise levels to noise standards promulgated by the City of Redlands (City) General Plan Healthy Community Element, the City's Municipal Code, and the County of San Bernardino Development Code. The purpose of this report is to estimate Project-generated noise and to determine the level of impact the Project would have on the environment.

1.1 Project Location and Description

The Project site is located at the northwest corner of East Lugonia Avenue and Dearborn Street in the city of Redlands and encompasses approximately ±18.6 acres of land consisting of one parcel (see Figure 1. *Project Location*). The Project consists of approximately 101,273 square feet of building space, 403,316 square feet of open space, and 307,053 square feet of hardscape (including 543 parking spaces on the site). The main buildings are a 26,282-square-foot church building with a 1,454-seating capacity, a 33,925-square-foot parish hall center (great room, meeting rooms, offices and kitchen), and a 42,000-square-foot education center (pre-Kindergarten to 8th grade).

The Project construction would occur in three phases if approved. The Parish Hall would be completed in 2022, the Sanctuary is proposed to be completed in 2028, and the school would be completed in 2030.

The Project site is bounded by residential development to the north, south, east, and west (with the closest being directly adjacent to the west). Agricultural uses border the Project site to the far southeast and on half of the northern Project border. To the west of the site is a newly developed single-family residential neighborhood. Highway 38 is located directly adjacent to the Project site on its southern edge and Dearborn Street borders the eastern edge of the site. The Project site itself is currently graded and in use for agriculture.

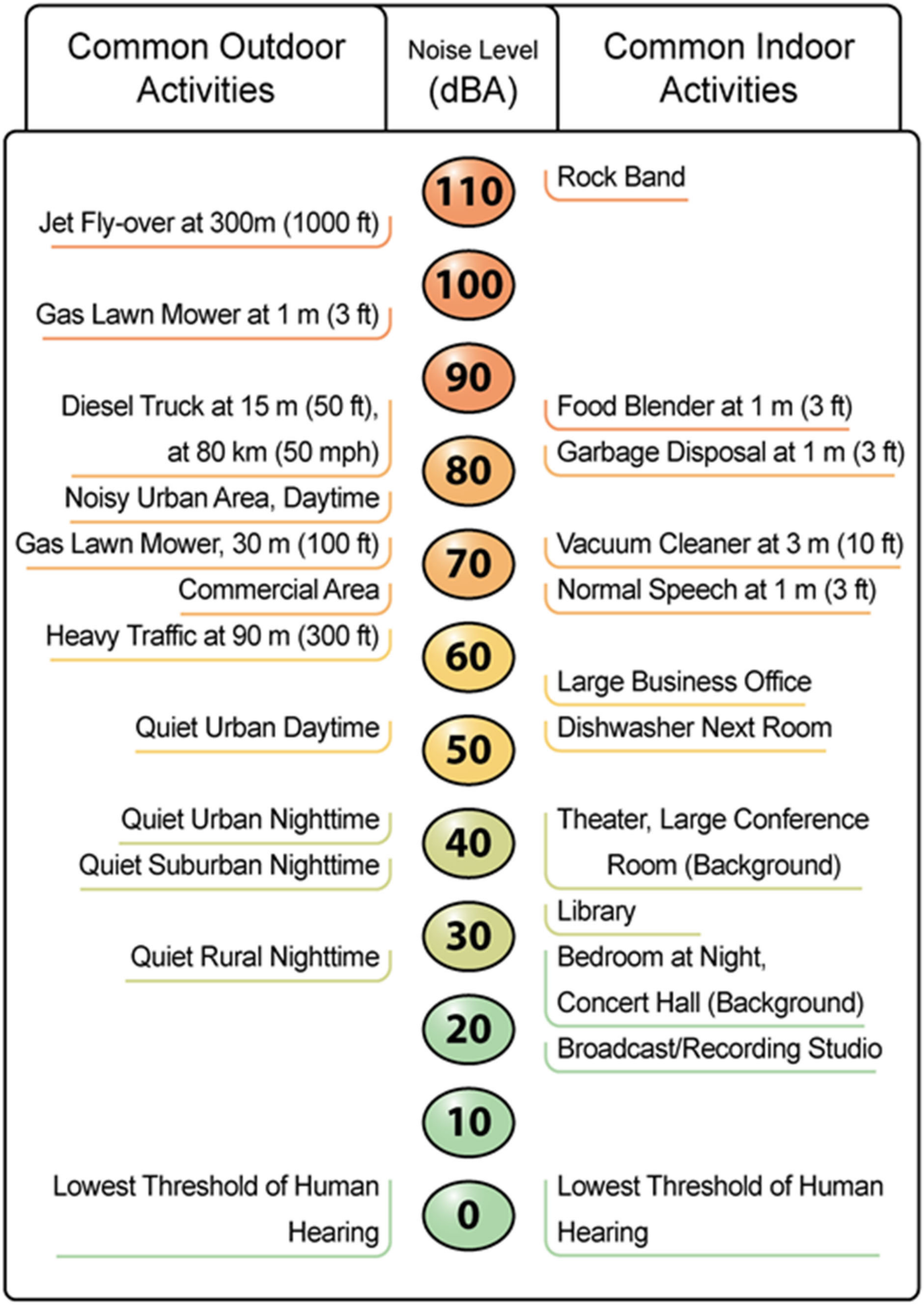
2.0 NOISE BACKGROUND

2.1 Fundamentals of Sound and Environmental Noise

2.1.1 Addition of Decibels

The decibel (dB) scale is logarithmic, not linear, and therefore sound levels cannot be added or subtracted through ordinary arithmetic. Two sound levels 10 dB apart differ in acoustic energy by a factor of 10. When the standard logarithmic decibel is A-weighted (dBA), an increase of 10 dBA is generally perceived as a doubling in loudness. For example, a 70-dBA sound is half as loud as an 80-dBA sound and twice as loud as a 60-dBA sound. When two identical sources are each producing sound of the same loudness, the resulting sound level at a given distance would be 3 dB higher than one source under the same conditions (Federal Transit Administration [FTA] 2018). For example, a 65-dB source of sound, such as a truck, when joined by another 65-dB source results in a sound amplitude of 68 dB, not 130 dB (i.e., doubling the source strength increases the sound pressure by 3 dB). Under the dB scale, three sources of equal loudness together would produce an increase of 5 dB.

Typical noise levels associated with common noise sources are depicted in Figure 1.



Source: California Department of Transportation (Caltrans) 2020a

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Figure 1. Common Noise Levels

Holy Name of Jesus- 2019-110

2.1.2 Sound Propagation and Attenuation

Noise can be generated by a number of sources, including mobile sources such as automobiles, trucks and airplanes, and stationary sources such as construction sites, machinery, and industrial operations. Sound spreads (propagates) uniformly outward in a spherical pattern, and the sound level decreases (attenuates) at a rate of approximately 6 dB for each doubling of distance from a stationary or point source. Sound from a line source, such as a highway, propagates outward in a cylindrical pattern, often referred to as cylindrical spreading. Sound levels attenuate at a rate of approximately 3 dB for each doubling of distance from a line source, such as a roadway, depending on ground surface characteristics (Federal Highway Administration [FHWA] 2011). No excess attenuation is assumed for hard surfaces like a parking lot or a body of water. Soft surfaces, such as soft dirt or grass, can absorb sound, so an excess ground-attenuation value of 1.5 dB per doubling of distance is normally assumed. For line sources, an overall attenuation rate of 3 dB per doubling of distance is assumed (FHWA 2011).

Noise levels may also be reduced by intervening structures; generally, a single row of detached buildings between the receptor and the noise source reduces the noise level by about 5 dBA (FHWA 2006), while a solid wall or berm generally reduces noise levels by 10 to 20 dBA (FHWA 2011). However, noise barriers or enclosures specifically designed to reduce site-specific construction noise can provide a sound reduction of 35 dBA or greater (Western Electro-Acoustic Laboratory, Inc. [WEAL] 2000). To achieve the most potent noise-reducing effect, a noise enclosure/barrier must physically fit in the available space, must completely break the “line of sight” between the noise source and the receptors, must be free of degrading holes or gaps, and must not be flanked by nearby reflective surfaces. Noise barriers must be sizable enough to cover the entire noise source and extend length-wise and vertically as far as feasibly possible to be most effective. The limiting factor for a noise barrier is not the component of noise transmitted through the material, but rather the amount of noise flanking around and over the barrier. In general, barriers contribute to decreasing noise levels only when the structure breaks the "line of sight" between the source and the receiver.

The manner in which older homes in California were constructed generally provides a reduction of exterior-to-interior noise levels of about 20 to 25 dBA with closed windows (Caltrans 2002). The exterior-to-interior reduction of newer residential units is generally 30 dBA or more (Harris Miller, Miller & Hanson Inc. [HMMH] 2006). Generally, in exterior noise environments ranging from 60 decibels (dBA) Community Noise Equivalent Level (CNEL) to 65 dBA CNEL, interior noise levels can typically be maintained below 45 dBA, a typical residential interior noise standard, with the incorporation of an adequate forced-air mechanical ventilation system, and standard thermal-pane residential windows/doors with a minimum rating of Sound Transmission Class (STC) 28. (STC is an integer rating of how well a building partition attenuates airborne sound. In the U.S., it is widely used to rate interior partitions, ceilings, floors, doors, windows, and exterior wall configurations.) In exterior noise environments of 65 dBA CNEL or greater, a combination of forced-air mechanical ventilation and sound-rated construction methods is often required to meet the interior noise level limit. Attaining the necessary noise reduction from exterior-to-interior spaces is readily achievable in noise environments less than 75 dBA CNEL with proper wall construction techniques following California Building Code methods, the selections of proper windows and doors, and the incorporation of forced-air mechanical ventilation systems.

2.1.3 Noise Descriptors

The dB scale alone does not adequately characterize how humans perceive noise. The dominant frequencies of a sound have a substantial effect on the human response to that sound. Several rating scales have been developed to analyze the adverse effect of community noise on people. Because environmental noise fluctuates over time, these scales consider that the effect of noise on people is largely dependent on the total acoustical energy content of the noise, as well as the time of day when the noise occurs. The L_{eq} is a measure of ambient noise, while the L_{dn} and Community Noise Equivalent Level (CNEL) are measures of community noise. Each is applicable to this analysis and are defined in Table 1.

The dBA sound level scale gives greater weight to the frequencies of sound to which the human ear is most sensitive. Because sound levels can vary markedly over a short period of time, a method for describing either the average character of the sound or the statistical behavior of the variations must be utilized. Most commonly, environmental sounds are described in terms of an average level that has the same acoustical energy as the summation of all the time-varying events.

The scientific instrument used to measure noise is the sound level meter. Sound level meters can accurately measure environmental noise levels to within about plus or minus 1 dBA. Various computer models are used to predict environmental noise levels from sources, such as roadways and airports. The accuracy of the predicted models depends on the distance between the receptor and the noise source. Close to the noise source, the models are accurate to within about plus or minus 1 to 2 dBA.

Table 1. Common Acoustical Descriptors

Descriptor	Definition
Decibel, dB	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure. The reference pressure for air is 20.
Sound Pressure Level	Sound pressure is the sound force per unit area, usually expressed in micropascals (or 20 micronewtons per square meter), where 1 pascal is the pressure resulting from a force of 1 newton exerted over an area of 1 square meter. The sound pressure level is expressed in decibels as 20 times the logarithm to the base 10 of the ratio between the pressures exerted by the sound to a reference sound pressure (e.g., 20 micropascals). Sound pressure level is the quantity that is directly measured by a sound level meter.
Frequency, Hertz (Hz)	The number of complete pressure fluctuations per second above and below atmospheric pressure. Normal human hearing is between 20 Hz and 20,000 Hz. Infrasonic sound are below 20 Hz and ultrasonic sounds are above 20,000 Hz.
A-Weighted Sound Level, dBA	The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise.
Equivalent Noise Level, L_{eq}	The average acoustic energy content of noise for a stated period of time. Thus, the L_{eq} of a time-varying noise and that of a steady noise are the same if they deliver the same acoustic energy to the ear during exposure. For evaluating community impacts, this rating scale does not vary, regardless of whether the noise occurs during the day or the night.
L_{max}, L_{min}	The maximum and minimum A-weighted noise level during the measurement period.
L_{01}, L_{10}, L_{50}, L_{90}	The A-weighted noise levels that are exceeded 1 percent, 10 percent, 50 percent, and 90 percent of the time during the measurement period.
Day/Night Noise Level, L_{dn} or DNL	A 24-hour average L_{eq} with a 10 dBA “weighting” added to noise during the hours of 10:00 p.m. to 7:00 a.m. to account for noise sensitivity in the nighttime. The logarithmic effect of these additions is that a 60 dBA 24-hour L_{eq} would result in a measurement of 66.4 dBA L_{dn}.
Community Noise Equivalent Level, CNEL	A 24-hour average L_{eq} with a 5 dBA “weighting” during the hours of 7:00 p.m. to 10:00 p.m. and a 10 dBA “weighting” added to noise during the hours of 10:00 p.m. to 7:00 a.m. to account for noise sensitivity in the evening and nighttime, respectively. The logarithmic effect of these additions is that a 60 dBA 24-hour L_{eq} would result in a measurement of 66.7 dBA CNEL.
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
Intrusive	Noise that intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends on its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.

2.1.4 Human Response to Noise

The human response to environmental noise is subjective and varies considerably from individual to individual. Noise in the community has often been cited as a health problem, not in terms of actual physiological damage, such as hearing impairment, but in terms of inhibiting general well-being and contributing to undue stress and annoyance. The health effects of noise in the community arise from interference with human activities, including sleep, speech, recreation, and tasks that demand concentration or coordination. Hearing loss can occur at the highest noise-intensity levels.

Noise environments and consequences of human activities are usually well represented by median noise levels during the day or night or over a 24-hour period. Environmental noise levels are generally considered low when the CNEL is below 60 dBA, moderate in the 60 to 70 dBA range, and high above 70 dBA. Examples of low daytime levels are isolated, natural settings with noise levels as low as 20 dBA and quiet, suburban, residential streets with noise levels around 40 dBA. Noise levels above 45 dBA at night can disrupt sleep. Examples of moderate-level noise environments are urban residential or semicommercial areas (typically 55 to 60 dBA) and commercial locations (typically 60 dBA). People may consider louder environments adverse, but most will accept the higher levels associated with noisier urban residential or residential-commercial areas (60 to 75 dBA) or dense urban or industrial areas (65 to 80 dBA). Regarding increases in dBA noise levels, the following relationships should be noted in understanding this analysis:

- Except in carefully controlled laboratory experiments, a change of 1 dBA cannot be perceived by humans.
- Outside of the laboratory, a 3-dBA change is considered a just-perceivable difference.
- A change in level of at least 5 dBA is required before any noticeable change in community response would be expected. An increase of 5 dBA is typically considered substantial.
- A 10-dBA change is subjectively heard as an approximate doubling in loudness and would almost certainly cause an adverse change in community response.

2.1.5 Effects of Noise on People

Hearing Loss

While physical damage to the ear from an intense noise impulse is rare, a degradation of auditory acuity can occur even within a community noise environment. Hearing loss occurs mainly due to chronic exposure to excessive noise, but may be due to a single event such as an explosion. Natural hearing loss associated with aging may also be accelerated from chronic exposure to loud noise.

The Occupational Safety and Health Administration (OSHA) has a noise exposure standard that is set at the noise threshold where hearing loss may occur from long-term exposures. The maximum allowable level is 90 dBA averaged over eight hours. If the noise is above 90 dBA, the allowable exposure time is correspondingly shorter.

Annoyance

Attitude surveys are used for measuring the annoyance felt in a community for noises intruding into homes or affecting outdoor activity areas. In these surveys, it was determined that causes for annoyance include interference with speech, radio and television, house vibrations, and interference with sleep and rest. The L_{dn} as a measure of noise has been found to provide a valid correlation of noise level and the percentage of people annoyed. People have been asked to judge the annoyance caused by aircraft noise and ground transportation noise. There continues to be disagreement about the relative annoyance of these different sources. There continues to be disagreement about the relative annoyance of these different sources.

2.2 Fundamentals of Environmental Groundborne Vibration

2.2.1 Vibration Sources and Characteristics

Sources of groundborne vibrations include natural phenomena (earthquakes, volcanic eruptions, sea waves, landslides, etc.) or man-made causes (explosions, machinery, traffic, trains, construction equipment, etc.). Vibration sources may be continuous (e.g., factory machinery) or transient (e.g., explosions).

Groundborne vibration consists of rapidly fluctuating motions or waves with an average motion of zero. Several different methods are typically used to quantify vibration amplitude. One is the peak particle velocity (PPV), another is the root mean square (RMS) velocity. The PPV is defined as the maximum instantaneous positive or negative peak of the vibration wave. The RMS velocity is defined as the average of the squared amplitude of the signal. The PPV and RMS vibration velocity amplitudes are used to evaluate human response to vibration.

2.2.2 Vibration Sources and Characteristics

Table 2 displays the reactions of people and the effects on buildings produced by continuous vibration levels. The annoyance levels shown in the table should be interpreted with care since vibration may be found to be annoying at much lower levels than those listed, depending on the level of activity or the sensitivity of the individual. To sensitive individuals, vibrations approaching the threshold of perception can be annoying. Low-level vibrations frequently cause irritating secondary vibration, such as a slight rattling of windows, doors, or stacked dishes. The rattling sound can give rise to exaggerated vibration complaints, even though there is very little risk of actual structural damage. In high noise environments, which are more prevalent where groundborne vibration approaches perceptible levels, this rattling phenomenon may also be produced by loud airborne environmental noise causing induced vibration in exterior doors and windows.

Ground vibration can be a concern in instances where buildings shake and substantial rumblings occur. However, it is unusual for vibration from typical urban sources such as buses and heavy trucks to be perceptible. For instance, heavy-duty trucks generally generate groundborne vibration velocity levels of 0.006 PPV at 50 feet under typical circumstances, which as identified in Table 2 is considered very unlikely to cause damage to buildings of any type. Common sources for groundborne vibration are planes, trains, and construction activities such as earth moving that requires the use of heavy-duty earth-moving equipment.

For the purposes of this analysis, the PPV descriptor with units of inches per second is used to evaluate construction-generated vibration for building damage and human complaints.

Table 2. Human Reaction and Damage to Buildings for Continuous or Frequent Intermittent Vibration Levels			
Peak Particle Velocity (inches/second)	**Approximate Vibration Velocity Level (VdB)**	**Human Reaction**	**Effect on Buildings**
0.006–0.019	64–74	Range of threshold of perception	Vibrations unlikely to cause damage of any type
0.08	87	Vibrations readily perceptible	Recommended upper level to which ruins and ancient monuments should be subjected
0.1	92	Level at which continuous vibrations may begin to annoy people, particularly those involved in vibration sensitive activities	Virtually no risk of architectural damage to normal buildings
0.2	94	Vibrations may begin to annoy people in buildings	Threshold at which there is a risk of architectural damage to normal dwellings
0.4–0.6	98–104	Vibrations considered unpleasant by people subjected to continuous vibrations and unacceptable to some people walking on bridges	Architectural damage and possibly minor structural damage

Source: Caltrans 2013

2.3 Existing Environmental Noise Setting

2.3.1 Noise Sensitive Land Uses

Noise-sensitive land uses are generally considered to include those uses where noise exposure could result in health-related risks to individuals, as well as places where quiet is an essential element of their intended purpose. Residential dwellings are of primary concern because of the potential for increased and prolonged exposure of individuals to both interior and exterior noise levels. Additional land uses such as parks, historic sites, cemeteries, and recreation areas are considered sensitive to increases in exterior noise levels. Schools, churches, hotels, libraries, and other places where low interior noise levels are essential are also considered noise-sensitive land uses. The Project site is located adjacent to multiple residential neighborhoods, the nearest of which is located directly adjacent to the west.

2.3.2 Existing Ambient Noise Environment

Redlands is impacted by various noise sources. It is subject to typical urban noise such as noise generated by traffic, heavy machinery, and day-to-day outdoor activities. Mobile sources of noise, especially cars and trucks, are the most common source of noise in the community. Other sources of noise are the various land uses (i.e., residential, commercial, institutional, and recreational and parks activities) throughout the city that generate stationary-source noise. The Redlands Municipal Airport is located approximately 1 mile south of the Project site.

As previously described, the Project site is currently characterized by vacant, flat, and undeveloped land. The site is generally bounded by residential and undeveloped land to the north, a residential development to the east, East Lugonia Avenue and a residential development beyond to the south, and a new residential development to the west. In order to quantify existing ambient noise levels in the Project area, ECORP Consulting, Inc. conducted three short-term noise measurements on June 18, 2019. The noise measurement sites were representative of typical existing noise exposure within and immediately adjacent to the Project site (see Attachment A for Noise Measurement Locations). The 10-minute measurements were taken between 11:52 a.m. and 12:40 p.m. Short-term (L_{eq}) measurements are considered generally representative of the noise levels throughout the daytime. The average noise levels and sources of noise measured at each location are listed in Table 3.

Table 3. Existing (Baseline) Noise Measurements

Location Number	Location	L_{eq} dBA	L_{min} dBA	L_{max} dBA	Time
1	On Darlene Court approximately 8 feet from East Lugonia Avenue.	**70.0**	42.2	84.2	11:52 a.m. – 12:02 p.m.
2	On the parkway between Dearborn Street.	**55.1**	40.1	73.5	12:13 p.m. – 12:23 p.m.
3	Gate at the end of the cul-de sac on East Pennsylvania Avenue.	**55.8**	36.4	77.9	12:30 p.m. – 12:40 p.m.

Source: Measurements were taken by ECORP with a Larson Davis SoundExpert LxT precision sound level meter, which satisfies the American National Standards Institute for general environmental noise measurement instrumentation. Prior to the measurements, the SoundExpert LxT sound level meter was calibrated according to manufacturer specifications with a Larson Davis CAL200 Class I Calibrator. See Attachment A for noise measurement outputs.

As shown in Table 3, the ambient recorded noise levels ranged from 55.1 dBA to 70.0 dBA in the vicinity of the Project site (see Attachment A for noise measurement locations). The noise most commonly in the Project vicinity is produced by automotive vehicles (cars, trucks, buses, motorcycles). For instance, Location 1 is located on East Lugonia Avenue, which is a heavily traveled roadway within the city and accommodates a variety of vehicles. Locations 2 and 3 are not located on major roadways and accommodate less vehicle movement, and are thus substantially quieter than Location 1. Traffic moving along streets produces a sound level that remains relatively constant and is part of the Project area's minimum ambient noise level. Vehicular noise varies with the volume, speed, and type of traffic. Slower traffic produces less noise than fast moving traffic. Trucks typically generate more noise than cars. Infrequent or intermittent noise also is associated with vehicles, including sirens, vehicle alarms, slamming of doors, garbage, and honking of horns. These noises add to urban noise and are regulated by a variety of agencies.

2.3.3 Existing Roadway Noise Levels

Existing roadway noise levels were calculated for the roadway segments in the Project vicinity. This task was accomplished using the FHWA Highway Traffic Noise Prediction Model (FHWA-RD-77-108) (see Attachment B) and traffic volumes from the Project's Traffic Impact Study (Ganddini Group, Inc. 2020). The model calculates the average noise level at specific locations based on traffic volumes, average speeds, roadway geometry, and site environmental conditions. The average vehicle noise rates (energy rates) used in the FHWA model have been modified to reflect average vehicle noise rates identified for California by Caltrans. The Caltrans data shows that California automobile noise is 0.8 to 1.0 dBA higher than national levels and that medium and heavy truck noise is 0.3 to 3.0 dBA lower than national levels. The average daily noise levels along these roadway segments are presented in Table 4.

Table 4. Existing (Baseline) Traffic Noise Levels

Roadway Segment	Surrounding Uses	CNEL at 100 feet from Centerline of Roadway
Orange Street		
Between Lugonia Avenue and San Bernardino Avenue	Residential and Commercial	57.3
South of Lugonia Avenue	Residential and Commercial	57.6
North of San Bernardino Avenue	Residential and Commercial	57.5
Church Street		
North of San Bernardino Avenue	Residential	52.0
South of Lugonia Avenue	Residential	53.4
Between Lugonia Avenue and San Bernardino Avenue	Residential	53.6
University Street		
South of Lugonia Avenue	Residential	53.2
Between Lugonia Avenue and San Bernardino Avenue	Residential	47.6
Judson Street		
South of Colton Avenue	Residential	54.4
Between Colton Avenue and Lugonia Avenue	Residential	54.2
Between Lugonia Avenue and Pennsylvania Avenue	Residential	52.5
Between Pennsylvania Avenue and San Bernardino Avenue	Residential	50.9
West of San Bernardino Avenue	Residential	53.2
Dearborn Street		
South of Lugonia Avenue	Residential	52.1
Between Lugonia Avenue and Pennsylvania Avenue	Residential	51.0
Between Pennsylvania Avenue and San Bernardino Avenue	Residential	50.9
North of San Bernardino Avenue	Residential	51.9

Table 4. Existing (Baseline) Traffic Noise Levels

Roadway Segment	Surrounding Uses	CNEL at 100 feet from Centerline of Roadway
Wabash Avenue		
South of Lugonia Avenue	Residential and Commercial	52.2
North of Lugonia Avenue	Residential and Commercial	52.6
San Bernardino Avenue		
West of Orange Street	Residential	56.8
Between Orange Street and Church Street	Residential	55.9
Between Church Street and University Avenue	Residential	57.2
Between University Avenue and Judson Street	Residential	55.8
Between Judson Street and Dearborn Street	Residential	55.4
East of Dearborn Street	Residential	56.5
Pennsylvania Avenue		
West of Judson Street	Residential	45.4
Between Judson Street and Dearborn Street	Residential	38.2
Lugonia Avenue		
West of Orange Street	Residential	55.9
Between Orange Street and Church Street	Residential	58.7
Between Church Street and University Street	Residential	58.8
Between University Street and Judson Street	Residential	59.1
Between Judson Street and Dearborn Street	Residential	59.1
Between Dearborn and Wabash Avenue	Residential	55.0
East of Wabash Avenue	Residential	59.7
Colton Avenue		
West of Judson Street	Residential	52.5
East of Judson Street	Residential	53.6

Source: *Traffic noise levels were calculated by ECORP using the FHWA roadway noise prediction model in conjunction with the trip generation rate identified by Ganddini Group, Inc. (2019). Refer to Attachment B for traffic noise modeling assumptions and results.*
Note: *A total of 18 intersections were analyzed in the Traffic Impact Study; however, only roadway segments that impact sensitive receptors were included*

As shown, the existing traffic-generated noise level on Project-vicinity roadways currently ranges from 38.2 to 59.7 dBA CNEL. As previously described, CNEL is 24-hour average noise level with a 5 dBA "weighting" during the hours of 7:00 p.m. to 10:00 p.m. and a 10 dBA "weighting" added to noise during the hours of 10:00 p.m. to 7:00 a.m. to account for noise sensitivity in the evening and nighttime, respectively. It should be noted that the modeled noise levels depicted in Table 4 may differ from measured levels in Table 3 because the measurements represent noise levels at different locations around the Project site and are also reported in different noise metrics (e.g., noise measurements are the L_{eq} values and traffic noise levels are reported in CNEL).

3.0 REGULATORY FRAMEWORK

3.1 Federal

3.1.1 Occupational Safety and Health Act of 1970

OSHA regulates on-site noise levels and protects workers from occupational noise exposure. To protect hearing, worker noise exposure is limited to 90 dB with A-weighting (dBA) over an eight-hour work shift (29 Code of Federal Regulations 1910.95). Employers are required to develop a hearing conservation program when employees are exposed to noise levels exceeding 85 dBA. These programs include provision of hearing protection devices and testing employees for hearing loss on a periodic basis.

3.2 State

3.2.1 State of California General Plan Guidelines

The State of California regulates vehicular and freeway noise affecting classrooms, sets standards for sound transmission and occupational noise control, and identifies noise insulation standards and airport noise/land-use compatibility criteria. The State of California General Plan Guidelines (State of California 2003), published by the Governor's Office of Planning and Research (OPR), also provides guidance for the acceptability of projects within specific CNEL/L_{dn} contours. The guidelines also present adjustment factors that may be used in order to arrive at noise acceptability standards that reflect the noise control goals of the community, the particular community's sensitivity to noise, and the community's assessment of the relative importance of noise pollution.

3.2.2 State Office of Planning and Research Noise Element Guidelines

The State OPR Noise Element Guidelines include recommended exterior and interior noise level standards for local jurisdictions to identify and prevent the creation of incompatible land uses due to noise. The Noise Element Guidelines contain a land use compatibility table that describes the compatibility of various land uses with a range of environmental noise levels in terms of the CNEL.

3.3 Local

3.3.1 City of Redlands General Plan Public Healthy Community Element

The Healthy Community Element of the City's General Plan provides policy direction for minimizing noise impacts on the community and for coordinating with surrounding jurisdictions and other entities regarding noise control. By identifying noise-sensitive land uses and establishing compatibility guidelines for land use and noise, noise considerations will influence the general distribution, location, and intensity of future land use. The result is that effective land use planning and mitigation can alleviate the majority of noise problems.

The most basic planning strategy to minimize adverse impacts on new land uses due to noise is to avoid designating certain land uses at locations within the city that would negatively affect noise-sensitive land uses. Uses such as schools, hospitals, child care, senior care, congregate care, churches, and all types of residential use should be located outside of any area anticipated to exceed acceptable noise levels as defined by the Noise and Land Use Compatibility Guidelines, or should be protected from noise through sound attenuation measures such as site and architectural design and sound walls. The City has adopted these guidelines in a modified form as a basis for planning decisions based on noise considerations. These guidelines are shown in Table 5. In the case that the noise levels identified at a proposed project site fall within levels considered normally acceptable, the project is considered compatible with the existing noise environment.

Table 5. Land Use Compatibility for Community Noise Environments – City of Redlands

Land Use Category		Community Noise Exposure (CNEL)			
Categories	**Uses**	**Clearly Compatible (A)**	**Normally Compatible (B)**	**Normally Incompatible (C)**	**Clearly Incompatible (D)**
Residential	Single Family, Duplex Multiple Family	< - 60	N/A	61 - 75	76 ->
Residential	Mobile Homes	< - 60	N/A	61 - 75	76 ->
Commercial (Regional District)	Hotel, Motel, Transient Lodging	< - 65	66 - 75	76 - 85	86 - >
Commercial (Regional, Village District, Special)	Commercial Retail, Bank, Restaurant, Movie Theater	< - 75	76 - 85	86 - >	N/A
Commercial (Industrial Institutional)	Office Building, Research & Dev., Professional Offices, City Office Building	< - 70	71 - 80	81 - 85	86 - >
Commercial (Recreation) Institutional (Civic Center)	Amphitheater, Concert Hall, Auditorium, Meeting Hall	N/A	< - 65	66 - 75	76 - >
Commercial (Recreation)	Children's Amusement Park, Minatare Golf Course, Go-cart Track, Equestrian Center, Sports Club	< - 75	76 ->	N/A	N/A
Commercial (General, Special) Industrial, Institutional	Automobile Service Station, Auto Dealership, Manufacturing Warehouse, Wholesale, Utilities	< - 75	76- >	N/A	N/A
Institutional (General)	Hospital, Church, Library, Schools Classroom	< - 65	66 - 70	71- 80	81 - >
Open Space	Parks	< - 70	71 - 75	76 - 80	81 - >
Open Space	Golf Course, Cemeteries, Nature Centers, Wildlife Reserves, Wildlife Habitat	< - 75	76 - 80	81 - >	N/A
Agriculture	Agriculture	N/A	N/A	N/A	N/A

Source: City of Redlands 2017

Notes:

NA: Not Applicable

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

Normally Compatible – *New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning, will normally suffice. Outdoor environment will seem noisy.*

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

Clearly Incompatible – *New construction or development should generally not be undertaken. Construction costs to make the indoor environment acceptable would be prohibitive and the outdoor environment would not be usable.*

Table 6 shows the interior and exterior noise standards for the various land uses in Redlands.

Table 6. Interior and Exterior Noise Standards – City of Redlands

Land Use Categories	Interior[1] CNEL	Exterior[2] CNEL
Residential		
Single Family, Duplex, Multiple Family	45[3]	60
Mobile Home	---	60[4]
Commercial, Industrial, Institutional		
Hotel, Motel, Transit Lodging	45	65[3]
Commercial Retail, Bank, Restaurant	50	---
Office Building, Research & Development, Professional Offices, City Office Building	50	---
Amphitheater, Concert Hall, Auditorium, Meeting Hall	45	---
Gymnasium (Multipurpose)	50	---
Sports Club	55	---
Manufacturing, Warehousing, Wholesale, Utilities	60	---
Movie Theaters	45	---
Institutional		
Hospitals, Schools classrooms	45	60
Open Space		
Parks	---	60

Source: City of Redlands 2017

Notes:

1. Indoor environment excludes bathrooms, toilets, closets, corridors.

2. Outdoor environment limited to private yard of single family as measures at property line; multifamily private patio or balcony that is served by means of exit from inside; mobile home park; hospital patio; park picnic area; school playground; hotel and recreational area.

3. Noise level requirement with open window, if they are used to meet natural ventilation requirements.

4. Exterior noise levels should be such that interior level will not exceed 45 CNEL

5. Expect those areas affected by aircraft noise.

The Healthy Community Element also contains principles and implementation policies that are used to guide decisions concerning land uses that are common sources of excessive noise levels. The following relevant and applicable principles and implementation policies from the City's Healthy Community Element have been identified for the Project.

Principle 7-P.40: Protect public health and welfare by eliminating existing noise problems where feasible and by preventing significant degradation of the future acoustic environment.

Principle 7-P.41: Ensure that new development is compatible with the noise environment by continuing to use potential noise exposure as a criterion in land use planning.

Police 9.0e: Use the criteria specified in the General Plan (Table 4) to assess the compatibility of proposed land uses with the projected noise environment and apply the noise standards in the General Plan (Table 5), which prescribe interior and exterior noise standards in relation to specific land uses. Do not approve projects that would not comply with the standards in the General Plan (Table 5).

Police 9.0i: Require construction of noise barriers to mitigate sound emissions where necessary or when feasible, and encourage the use of walls and berms to protect residential or other noise sensitive land uses that are adjacent to major roads, commercial or industrial areas.

Police 9.0s: Require mitigation to ensure that indoor noise levels for residential living spaces not exceed 45 dB L_{dn}/CNEL due to the combined effects of all exterior noise sources.

3.3.2 City of Redlands Municipal Code

The City's regulations with respect to noise are included in Title 8 of the Health and Safety Code, specifically Chapter 8.06, Community Noise Control. The Noise Control provides noise standards within the city and the following references are those portions of the Noise Control that may be applicable to the Project.

Section 8.06.070 provides exterior noise limits for various land uses within the city and is presented in Table 7. As shown, the maximum permissible sound levels at the exterior of a single-family residential district is 60 dBA during the daytime and 50 dBA during the nighttime.

Table 7. Maximum Permissible Sound Levels by Receiving Land Use – City of Redlands

Receiving Land Use Category	Time Period	Noise Level-dBA
Single-family residential district	10:00 p.m. - 7:00 a.m.	50
	7:00 a.m. - 10:00 p.m.	60
Multi-family residential districts; public space; industrial	10:00 p.m. - 7:00 a.m.	50
	7:00 a.m. - 10:00 p.m.	60
Commercial	10:00 p.m. - 7:00 a.m.	60
	7:00 a.m. - 10:00 p.m.	65
Industrial	Anytime	75

Source: City of Redlands Municipal Code

Section 8.06.080 provides interior noise limits for various land uses within the city and is presented in Table 8.

Table 8. Maximum Permissible Interior Sound Levels by Receiving Land Use – City of Redlands

Receiving Land Use Category	Time Period	Noise Level-dBA
Single-family residential district	Anytime	45
Multi-family residential districts, institutional, hotels	Anytime	45
Commercial	Anytime	50
Industrial	Anytime	60

Source: City of Redlands Municipal Code

Additionally, Section 8.06.120 states that the noise standards shall not apply to noise sources associated with new construction, remodeling, rehabilitation or grading of any private property, provided such activities take place between the hours of 7:00 a.m. and 8:00 p.m. on weekdays, including Saturdays, with no activity taking place at any time on Sundays or federal holidays. All motorized equipment used in such activities shall be equipped with functioning mufflers.

3.3.3 County of San Bernardino Development Code

Unincorporated San Bernardino County limits is located directly across Wabash Avenue, approximately 0.6 mile east of the Project site. There are sensitive noise receptors consisting of single-family residences located within this unincorporated neighborhood across Wabash Avenue, which could be potentially affected by Project-instigated offsite mobile noise sources. The County's Development Code (Title 8, Development Code; Division 3, Countywide Development Standards; Chapter 83.01, General Performance Standards, Section 83.01.080) sets interior and exterior noise standards for specific land users by type of noise source, stationary sources and mobile sources. Noise standards for mobile noise sources are summarized in Table 9. It is noted that these residences located within the unincorporated neighborhood east of Wabash Avenue would not be impacted by Project construction or stationary sources. As shown, the interior mobile-source noise standards for unincorporated residential properties is 45 CNEL and the exterior mobile-source noise standard is 60 CNEL.

Table 9. Noise Standards for Mobile Noise Sources – San Bernardino County

Land Use		CNEL dBA	
Categories	**Uses**	**Interior[1]**	**Exterior[2]**
Residential	Single and multi-family, duplex, mobile homes	45	60[3]
Commercial	Hotel, motel, transient housing	45	60[3]
	Commercial retail, bank, restaurant	50	N/A
	Office building, research and development, professional offices	45	65
	Amphitheater, concert hall, auditorium, movie theater	45	N/A
Institutional/ Public	Hospital, nursing home, school classroom, religious institution, library	45	65
Open Space	Park	N/A	65

Source: County of San Bernardino Development Code, Section 83.01.080, Table 83-3

Notes. (1) The indoor environment shall exclude bathrooms, ketches, toilets, closets and corridors.

(2) The outdoor environment shall be limited to: hospital/ office buildings, hotel/motel recreation areas, mobile home parks, multi-family private patios or balconies, park picnic areas, private yard for single-family dwellings and school playgrounds.

(3) An exterior noise level of up to 65 dB(A) (or CNEL) shall be allowed provided exterior noise levels have been substantially mitigated through a reasonable application of the best available noise reduction technology, and interior noise exposure does not exceed 45 dB(A) (or CENL) with windows and doors closes. Requiring that windows and doors remain closed to achieve an acceptable interior noise level shall necessitate the use of air conditioning or mechanical ventilation.

4.0 NOISE IMPACT ASSESSMENT

4.1 Thresholds of Significance

Criteria for determining the significance of noise impacts were developed based on information contained in the California Environmental Quality Act Guidelines Appendix G. According to the guidelines, a project may have a significant effect on the environment if it would result in the following conditions:

1) 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.

2) Generation of excessive groundborne vibration or groundborne noise levels.

3) 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.

For purposes of this analysis and where applicable, the City and County noise standards were used for evaluation of Project-related noise impacts.

4.2 Methodology

This analysis of the existing and future noise environments is based on noise prediction modeling and empirical observations. Predicted construction noise levels were calculated utilizing the FHWA's Roadway Construction Model (2008). Transportation-source noise levels in the Project vicinity were calculated using the FHWA Highway Noise Prediction Model (FHWA-RD-77-108). For Project operations trip generation was updated to reflect that generated by the Project, as supplied by Ganddini Group, Inc. (2019).

Onsite stationary source noise levels have been calculated with the SoundPLAN 3D noise model (Figure 2. SoundPLAN), which predicts noise propagation from a noise source based on the location, noise level, and frequency spectra of the noise sources as well as the geometry and reflective properties of the local terrain, buildings, and barriers.

Groundborne vibration levels associated with construction-related activities for the Project were evaluated utilizing typical groundborne vibration levels associated with construction equipment. Potential groundborne vibration impacts related to structural damage and human annoyance were evaluated, taking into account the distance from construction activities to nearby structures and typically applied criteria for structural damage and human annoyance.

4.2.1 Impact Analysis

Would the Project Result in Short-Term Construction-Generated Noise in Excess of City Standards?

Construction noise associated with the Proposed Project would be temporary and would vary depending on the nature of the activities being performed. Noise generated would primarily be associated with the operation of off-road equipment for onsite construction activities. Construction noise typically occurs intermittently and varies depending on the nature or phase of construction (e.g., building construction, paving). Noise generated by construction equipment, including earth movers, material handlers, and portable generators, can reach high levels. Typical operating cycles for these types of construction equipment may involve one or two minutes of full power operation followed by three to four minutes at lower power settings. Other primary sources of acoustical disturbance would be random incidents, which would last less than one minute (such as dropping large pieces of material or the hydraulic movement of machinery lifts). During construction, exterior noise levels could negatively affect sensitive receptors in the vicinity of the construction site.

Table 10 indicates the anticipated noise levels of construction equipment. The average noise levels presented in Table 10 are based on the quantity, type, and acoustical use factor for each type of equipment that is anticipated to be used.

Table 10. Maximum Noise Levels Generated by Construction Equipment

Type of Equipment	Maximum 8-Hour Noise (L_{eq}) at 335 Feet (dBA)	Exceed 85.0 dBA Threshold?
Crane	56.1	*No*
Dozer	61.2	*No*
Excavator	60.2	*No*
Generator	61.1	*No*
Grader	64.5	*No*
Paver	57.7	*No*
Roller	56.5	*No*
Tractor	63.5	*No*
Dump Truck	55.9	*No*
Concrete Pump Truck	57.9	*No*
Welder	53.5	*No*
Combined Construction Equipment	70.6	***No***

Source: FHWA, Roadway Construction Noise Model (FHWA-HEP-05-054), dated January 2006, see Attachment B.

The nearest existing noise-sensitive land uses to the Project site are a single-family residential neighborhood directly adjacent and west of the Project site. However, it is acknowledged that the majority of construction equipment is not situated at any one location during construction activities, but rather spread throughout the Project site and at various distances from sensitive receptors. Therefore, this analysis employs FTA guidance for calculating construction noise, which recommends measuring construction noise produced by all construction equipment from the center of the Project site (FTA 2018), which in this case is 335 feet from the nearest sensitive receptor to the west. As shown, the maximum noise levels from combined construction equipment, during the combined construction phase of the project, as experienced by the nearest noise sensitive receptors west of the Project site, are expected to reach 70.6 dBA L_{eq}.

The City restricts the time that construction can take place but does not promulgate numeric thresholds pertaining to the noise associated with construction. Specifically, Section 8.06.120 of the City's Municipal Code states that the noise standards shall not apply to noise sources associated with new construction, remodeling, rehabilitation, or grading of any private property provided such activities take place between the hours of 7:00 a.m. and 8:00 p.m. on weekdays, including Saturdays, with no activity taking place at any time on Sundays or federal holidays. It is typical to regulate construction noise in this manner since construction noise is temporary, short term, intermittent in nature, and would cease on completion of the project. Furthermore, the city is a developing urban community and construction noise is generally accepted as a reality within the urban environment. Additionally, construction would occur throughout the Project site and would not be concentrated at one point.

For comparison purposes, Project construction noise is compared against the construction-related noise level threshold established in the *Criteria for a Recommended Standard: Occupational Noise Exposure* prepared in 1998 by the National Institute for Occupational Safety and Health (NIOSH). A division of the US Department of Health and Human Services, NIOSH identifies a noise level threshold based on the duration of exposure to the source. The construction-related noise level threshold starts at 85 dBA for more than 8 hours per day; for every 3-dBA increase, the exposure time is cut in half. This reduction results in noise level thresholds of 88 dBA for more than 4 hours per day, 92 dBA for more than 1 hour per day, 96 dBA for more than 30 minutes per day, and up to 100 dBA for more than 15 minutes per day. For the purposes of this analysis, the lowest, more conservative threshold of 85 dBA L_{eq} is used as an acceptable threshold for construction noise at the nearby sensitive receptors. Since this construction-related noise level threshold represents the energy average of the noise source over a given time period, the noise level is expressed in L_{eq}. As discussed, the predicted maximum eight-hour noise levels at the nearest sensitive receptor could potentially reach approximately 70.6 dBA L_{eq}, which is below the NIOSH threshold of 85 dBA.

Therefore, noise generated during construction activities, as long as conducted within the permitted hours, would not exceed City noise standards.

Would the Project Result in a Substantial Permanent Increase in Ambient Noise Levels in Excess of City Standards?

Project Land Use Compatibility

The City of Redlands land use compatibility table provides the City with a tool to gauge the compatibility of new land users relative to existing noise levels. This table, presented as Table 5, identifies clearly compatible, normally compatible, normally incompatible, and clearly incompatible noise levels for various land uses, including school classrooms and churches such as those proposed by the Project. In the case that the noise levels identified at the Project site fall within levels considered normally compatible, the Project is considered compatible with the existing noise environment. As shown in Table 5, a clearly compatible noise level for locating churches and school classrooms is 65 dBA CNEL and under. In order to quantify existing ambient noise levels in the Project Area, ECORP conducted three short-term noise measurements on June 18, 2019. The noise measurements were conducted in the middle of the day, on a weekday, and are therefore representative of typical existing noise exposure within and immediately adjacent to the Project site and are considered representative of the noise levels throughout the day. The closest noise measurement to the Project site is Location 2, located approximately 70 feet away. As shown in Table 3, the ambient noise at Location 2 is 55.1 dBA.

In addition to baseline noise measurements conducted in the Project vicinity, existing roadway noise levels were calculated for the roadway segments in the Project vicinity, as shown in Table 4. The modeled noise levels depicted in Table 4 are reported in the noise metric, CNEL, which is the same noise metric promulgated by City noise compatibility guidelines contained in Table 5. As shown in Table 5, the noise emanating from the segment of E. Lugonia Avenue traversing the southern boundary of the Project site (between Judson Street and Dearborn Street) was calculated at 59.1 dBA CNEL. The segment of Dearborn Street traversing the eastern boundary of the Project site (between E. Lugonia Avenue and Pennsylvania Avenue) was calculated as generating noise levels of 52.5 dBA CNEL.

Therefore, baseline measurements conducted nearest to the Project site and calculated traffic noise levels generated by the nearest roadways fall within the range of sound considered clearly compatible for churches and school classrooms.

Project Operations

As previously described, noise-sensitive land uses are locations where people reside or where the presence of unwanted sound could adversely affect the use of the land. Residences, schools, hospitals, guest lodging, libraries, and some passive recreation areas would each be considered noise sensitive and may warrant unique measures for protection from intruding noise. The nearest noise-sensitive land uses consist of residences located adjacent to and west of the Project site. Operational noise sources associated with the Proposed Project include mobile and stationary (i.e., mechanical equipment, onsite activity) sources.

Operational Traffic Noise

Future traffic noise levels throughout the Project vicinity (i.e., vicinity roadway segments that traverse noise sensitive residential land uses) were modeled based on the traffic volumes identified by Ganddini Group, Inc. (2019) to determine the noise levels along Project vicinity roadways. Table 11 shows the calculated offsite roadway noise levels under existing traffic levels compared to existing traffic levels plus of the Project. The calculated noise levels as a result of the Project at affected sensitive land uses are compared to the noise standards in the City General Plan (see Table 6) for all roadways west of Wabash Avenue and the County of San Bernardino Development Code (see Table 9) for all roadway segments east of Wabash Avenue. In the case that the existing ambient noise levels already exceed the applicable numeric noise threshold, an increase of more than 5 dBA over the existing ambient noise level is considered significant.

Table 11. Existing Plus Project Conditions - Predicted Traffic Noise Levels

Roadway Segment	Surrounding Uses	CNEL at 100 feet from Centerline of Roadway		Noise Standard (dBA CNEL)	Exceed Standard/ Significant Impact?
		Existing Conditions	Existing + Project Conditions		
Orange Street					
Between Lugonia Avenue and San Bernardino Avenue	Residential and Commercial	57.3	57.3	60	**No**
South of Lugonia Avenue	Residential and Commercial	57.6	57.7	60	**No**
North of San Bernardino Avenue	Residential and Commercial	57.5	57.6	60	**No**
Church Street					
North of San Bernardino Avenue	Residential	52.0	52.0	60	**No**
South of Lugonia Avenue	Residential	53.4	53.5	60	**No**
Between Lugonia Avenue and San Bernardino Avenue	Residential	53.6	53.6	60	**No**
University Street					
South of Lugonia Avenue	Residential	53.2	53.2	60	**No**
Between Lugonia Avenue and San Bernardino Avenue	Residential	47.6	47.6	60	**No**
Judson Street					
South of Colton Avenue	Residential	54.4	54.6	60	**No**
Between Colton Avenue and Lugonia Avenue	Residential	54.2	54.4	60	**No**
Between Lugonia Avenue and Pennsylvania Avenue	Residential	52.5	52.5	60	**No**
Between Pennsylvania Avenue and San Bernardino Avenue	Residential	50.9	52.2	60	**No**
West of San Bernardino Avenue	Residential	53.2	53.6	60	**No**
Dearborn Street					

Table 11. Existing Plus Project Conditions - Predicted Traffic Noise Levels

Roadway Segment	Surrounding Uses	CNEL at 100 feet from Centerline of Roadway		Noise Standard (dBA CNEL)	Exceed Standard/ Significant Impact?
		Existing Conditions	Existing + Project Conditions		
South of Lugonia Avenue	Residential	52.1	52.4	60	**No**
Between Lugonia Avenue and Pennsylvania Avenue	Residential	51.0	51.8	60	**No**
Between Pennsylvania Avenue and San Bernardino Avenue	Residential	50.9	51.7	60	**No**
North of San Bernardino Avenue	Residential	51.9	51.9	60	**No**
Wabash Avenue					
South of Lugonia Avenue	Residential and Commercial	52.2	54.8	60	**No**
North of Lugonia Avenue	Residential and Commercial	52.6	52.7	60	**No**
San Bernardino Avenue					
West of Orange Street	Residential	56.8	57.1	60	**No**
Between Orange Street and Church Street	Residential	55.9	58.1	60	**No**
Between Church Street and University Avenue	Residential	57.2	57.3	60	**No**
Between University Avenue and Judson Street	Residential	55.8	56.4	60	**No**
Between Judson Street and Dearborn Street	Residential	55.4	55.7	60	**No**
East of Dearborn Street	Residential	56.5	56.6	60	**No**
Pennsylvania Avenue					
West of Judson Street	Residential	45.4	45.3	60	**No**
Between Judson Street and Dearborn Street	Residential	38.2	40.5	60	**No**
Lugonia Avenue					
West of Orange Street	Residential	55.9	56.6	60	**No**

Table 11. Existing Plus Project Conditions - Predicted Traffic Noise Levels

Roadway Segment	Surrounding Uses	CNEL at 100 feet from Centerline of Roadway		Noise Standard (dBA CNEL)	Exceed Standard/ Significant Impact?
		Existing Conditions	Existing + Project Conditions		
Between Orange Street and Church Street	Residential	58.7	58.7	60	**No**
Between Church Street and University Street	Residential	58.8	58.9	60	**No**
Between University Street and Judson Street	Residential	59.1	59.2	60	**No**
Between Judson Street and Dearborn Street	Residential	59.1	59.2	60	**No**
Between Dearborn and Wabash Avenue	Residential	55.0	58.9	60	**No**
East of Wabash Avenue	Residential (In Unincorporated San Bernardino County)	59.7	59.8	60	**No**
Colton Avenue					
West of Judson Street	Residential	52.5	53.3	60	**No**
East of Judson Street	Residential	53.6	53.6	60	**No**

Source: Traffic noise levels were calculated by ECORP Consulting using the FHWA roadway noise prediction model in conjunction with the trip generation rate identified by Ganddini Group, Inc. 2020. Refer to Attachment B for traffic noise modeling assumptions and results.

Notes: A total of 18 intersections were analyzed in the Traffic Impact Study; however, only roadway segments that impact sensitive receptors were included for the purposes of this analysis.

As shown in Table 11, predicted increase in traffic noise levels associated with the Project would be less than City and County noise standards.

Operational Stationary Noise

The main onsite operational noise associated with the Project would be events occurring on the Project site such as masses, weddings, quinceaneras, parking lot activity/circulation, sporting events, weekly school activity, and office/hall building operations. Per information supplied by the Diocese of San Bernardino these events would mainly occur between the hours of 7:00 a.m. to 6:00 p.m., Monday thru Sunday. Table 12 summarizes representative operational onsite noise sources.

Table 12. Summary of Onsite Stationary Sources

Stationary Sources	Noise Level (dBA L_{eq}) at the Source	Estimated Time of Use
Parking Lot Activities	53.8 dBA	Anytime
Crowd Noise	62.0 dBA	7:00 a.m. – 6:00 p.m.
Playground & Sports Field	54.8 dBA	7:00 a.m. – 6:00 p.m.
Amplified Stage Noise	98.6 dBA	7:00 a.m. – 6:00 p.m.

Source: Refer to Attachment C for noise modeling input sources

Table 13 shows the predicted noise propagation associated with full operation of the Proposed Project, as predicted by the SoundPLAN 3D noise model. This includes the three locations where baseline noise measurements were taken as well as six additional locations at residences adjacent to the Project site. Additionally, a noise contour graphic (Figure 2) has been prepared to depict the predicted noise levels in the vicinity on a worst-case scenario basis. Full operation at the Project site would occur between the hours of 7:00 a.m. and 6:00 p.m.

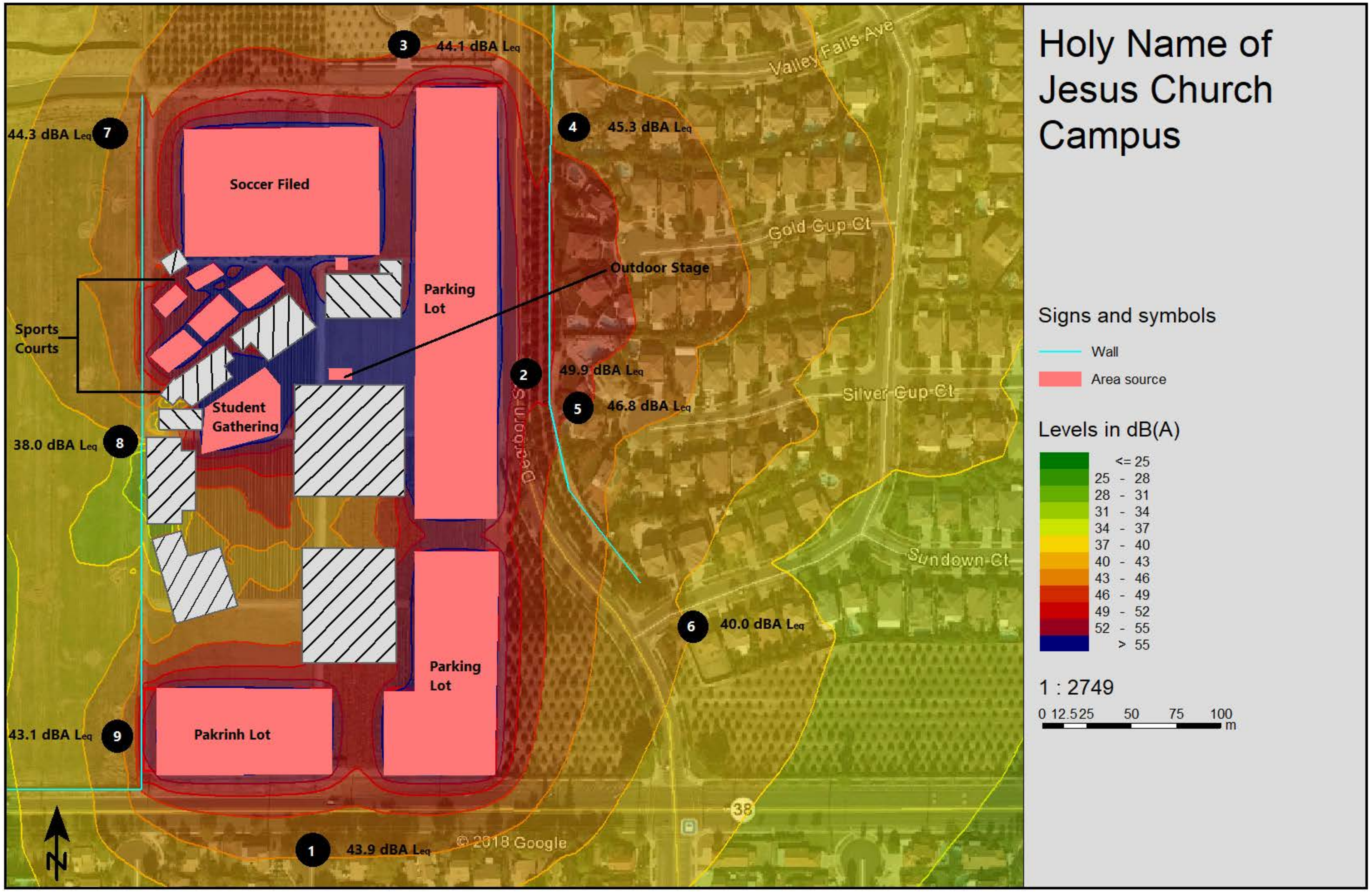
Table 13. Modeled Operational Noise Levels

Site Location	Location	Modeled Operational Noise Attributable to Project (L_{eq} dBA)	Affected Land Use	City Standards dBA	Exceed Standard?
1	On Darlene Court approximately 8 feet from East Lugonia Avenue.	43.9	Residential	60	**No**
2	On the parkway between Dearborn Street.	49.9	Agriculture/Landscape Feature	N/A	**No**
3	Gate at the end of the cul-de sac on East Pennsylvania Avenue.	44.1	Residential	60	**No**
4	Northeast of Project site at residence located behind wall across Dearborn Street.	45.3	Residential	60	**No**
5	East of Project site at residence located behind wall Dearborn Street.	46.8	Residential	60	**No**
6	East of Project site at residence south of Sundown Court.	40.0	Residential	60	**No**
7	West of Project site adjacent to proposed soccer field.	44.3	Residential	60	**No**
8	West of Project site adjacent to proposed student gathering area.	38.0	Residential	60	**No**
9	West of Project site adjacent to proposed parking lot.	43.1	Residential	60	**No**

Source: Stationary source noise levels were modeled by ECORP using SoundPLAN 3D noise model. Refer to Attachment C for noise modeling assumptions and results

As shown in Table 13, Project noise levels would reach between 38.0 and 49.9 dBA at the nearby noise-sensitive residences during Project operations between 7:00 a.m. - 10:00 p.m. These numbers fall below the City's single-family residential noise standards as depicted in the noise contour lines of Figure 2. Additionally, as previously stated, the interior-to-exterior noise reduction attributable to newer structures is generally 30 dBA or more (HMMH 2006). This reduction would reduce the depicted noise levels further, as they are experienced within the vicinity residences.

The loudest noise levels that would be generated by Project onsite sources would reach 49.9 dBA at the east side of Dearborn Street within a strip of orange trees. This landscape feature located between Dearborn Street and the residential neighborhood to the east is not considered a sensitive receptor as there is no connectivity with the residential neighborhood nor does it contain any pedestrian pathways. It is noted that SoundPLAN was used to model operational noise on a worst-case basis. All noise producing sources on the Project site was modeled for noise as if operating at the same time and at the highest activity level to produce noise levels as high as those predicted. Further, the soft surfaces and vegetative screening innate to the strip of orange trees, which can absorb sound, was not accounted for in the SoundPLAN model. Thus, it is unlikely that noise on the Project site would reach the levels of those modeled.



Map Date: *12/10/2021*
Photo (or Base) Source: *SoundPLAN*

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Figure 2. SoundPLAN Noise Graphic

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Would the Project Expose Structures to Substantial Groundborne Vibration During Construction?

Excessive groundborne vibration impacts result from continuously occurring vibration levels. Increases in groundborne vibration levels attributable to the Proposed Project would be primarily associated with short-term, construction-related activities. Construction on the Project Site would have the potential to result in varying degrees of temporary groundborne vibration, depending on the specific construction equipment used and the operations involved. Ground vibration generated by construction equipment spreads through the ground and diminishes in magnitude with increases in distance.

Construction-related ground vibration is normally associated with impact equipment such as pile drivers, jackhammers, and the operation of some heavy-duty construction equipment, such as dozers and trucks. It is noted that pile drivers would not be necessary during Project construction as such equipment is not generally necessary for the construction of single-story structures. Vibration decreases rapidly with distance and it is acknowledged that construction activities would occur throughout the Project site and would not be concentrated at the point closest to sensitive receptors. Groundborne vibration levels associated with construction equipment are summarized in Table 14.

Table 14. Vibration Source Amplitudes for Construction Equipment

Equipment Type	Peak Particle Velocity at 25 Feet (inches per second)
Large Bulldozer	0.089
Caisson Drilling	0.089
Loaded Trucks	0.076
Rock Breaker	0.082
Jackhammer	0.035
Small Bulldozer/Tractor	0.003

Source: FTA 2018; Caltrans 2013

The City does not regulate vibration associated with construction. However, a discussion of construction vibration is included for full disclosure purposes. For comparison purposes, the Caltrans (2013) recommended standard of 0.2 inch per second PPV with respect to the prevention of structural damage for residential buildings is used as a threshold. This is also the level at which vibrations may begin to annoy people in buildings.

It is acknowledged that construction activities would occur throughout the Project site and would not be concentrated at the point closest to the nearest structure. The nearest structures of concern to the construction site are residences located approximately 335 feet from the Project's center. Based on the vibration levels presented in Table 14, ground vibration generated by heavy-duty equipment would not be anticipated to exceed approximately 0.089 inch per second peak particle velocity at 25 feet. Thus, structures located at 335 feet would not be negatively affected.

Would the Project Expose Structures to Substantial Groundborne Vibration During Operations?

Project operations would not include the use of any stationary equipment that would result in excessive groundborne vibration levels.

Would the Project Expose People Residing or Working in the Project Area to Excessive Airport Noise Levels?

The Project site is located approximately one mile south of the Redlands Municipal Airport. The Project site is located outside of the 60 dBA CNEL noise contour per the Airport Hazards Map in the City's General Plan Healthy Community Element. Implementation of the Proposed Project would not affect airport operations nor result in increased exposure of noise-sensitive receptors to aircraft noise.

Cumulative Noise Impacts

Cumulative Construction Noise

Construction activities associated with the Proposed Project and other construction projects in the area may overlap, resulting in construction noise in the area. However, construction noise impacts primarily affect the areas immediately adjacent to the construction site. Construction noise for the Proposed Project was determined to be less than significant following compliance with the City Municipal Code. Cumulative development in the vicinity of the Project site could result in elevated construction noise levels at sensitive receptors in the Project area. However, each project would be required to comply with the applicable City Municipal Code limitations on construction. Therefore, the Project would not contribute to cumulative impacts during construction.

Cumulative Traffic Source Noise Impacts

Cumulative noise impacts represent the "combined" and "incremental" effects of human activities that accumulate over time. A significant impact would result only if *both* the combined and incremental effects criteria have been exceeded. For instance, although there may be a significant noise increase due to the Proposed Project in combination with other related projects (Combined effects), it must also be demonstrated that the Project, considered on its own, has an Incremental effect. In other words, a significant portion of the noise increase must be due to the Proposed Project.

Cumulative noise impacts would occur primarily as a result of increased traffic on local roadways due to construction of the Project and other projects in the vicinity. A project's contribution to a cumulative traffic noise increase could be considered substantial when the Combined effect exceeds the perception level (i.e., auditory level increase) threshold. The Combined effect compares the "Cumulative Plus Project" condition to the "Existing without Project" condition. This comparison accounts for the traffic noise increase generated by a project combined with the traffic noise increase generated by other projects in the area. The Incremental effect compares the "Cumulative Plus Project" condition to the "Cumulative No Project" condition. This comparison accounts for the effect of future traffic noise as a result of the Proposed Project only.

The following Combined effect and Incremental effect criteria have been utilized to evaluate the overall effect of the cumulative noise increase.

- **Combined Effect**. Does the Cumulative Plus Project noise level generate an increase of 3.0 dB over Existing without Project conditions, resulting noise levels exceeding the applicable exterior standard at a sensitive use?

  and

- **Incremental Effects**. Does the Cumulative Plus Project noise level cause a 1.0 dBA increase in noise over the Cumulative without Project noise level?

Although there may be a significant noise increase due to the Proposed Project in combination with other related projects (Combined effects), it must also be demonstrated that the Project has an Incremental effect. In other words, a significant portion of the noise increase must be due to the Proposed Project.

Thus, a significant impact would result only if *both* the Combined and Incremental effects criteria have been exceeded at a single roadway segment, resulting noise levels exceeding the applicable exterior standard at a sensitive use. This would indicate that there is a significant noise increase due to the Proposed Project in combination with other related projects *and* a significant portion of the noise increase is due to the Proposed Project. Noise by definition is a localized phenomenon and reduces as distance from the source increases. Consequently, only the Proposed Project and growth due to occur in the Project site's general vicinity would contribute to cumulative noise impacts. Table 15 lists the traffic noise effects along roadway segments in the Project vicinity for "Existing without Project," "Cumulative without Project," and "Cumulative Plus Project," conditions.

Table 15. Cumulative Traffic Noise Scenario

Roadway Segment	Existing	Cumulative No Project	Cumulative Plus Project	Combined Effects	Incremental Effects	Cumulatively Significant Impact?
	CNEL @ 100 Feet from Roadway Centerline	CNEL @ 100 Feet from Roadway Centerline	CNEL @ 100 Feet from Roadway Centerline	Difference in CNEL Between Existing and Cumulative + Project	Difference in CNEL Between Cumulative No Project and Cumulative + Project	
Orange Street						
Between Lugonia Avenue and San Bernardino Avenue	57.3	58.1	58.1	**0.8**	**0.0**	**No**
South of Lugonia Avenue	57.6	58.5	58.6	**1.0**	**0.1**	**No**
North of San Bernardino Avenue	57.5	59.1	59.1	**1.6**	**0.0**	**No**
Church Street						
North of San Bernardino Avenue	52.0	52.3	52.4	**0.4**	**0.1**	**No**
South of Lugonia Avenue	53.4	54.0	54.0	**0.6**	**0.0**	**No**
Between Lugonia Avenue and San Bernardino Avenue	53.6	54.0	55.0	**1.4**	**1.0**	**No**
University Street						
South of Lugonia Avenue	53.2	53.8	53.8	**0.6**	**0.0**	**No**
Between Lugonia Avenue and San Bernardino Avenue	47.6	49.1	49.1	**1.4**	**0.0**	**No**
Judson Street						
South of Colton Avenue	54.4	55.3	55.4	**1.0**	**0.1**	**No**
Between Colton Avenue and Lugonia Avenue	54.2	55.0	56.2	**2.0**	**1.2**	**No**
Between Lugonia Avenue and Pennsylvania Avenue	52.5	53.5	53.5	**1.0**	**0.0**	**No**
Between Pennsylvania Avenue and San Bernardino Avenue	50.9	52.3	53.1	**2.2**	**0.8**	**No**
West of San Bernardino Avenue	53.2	55.5	55.7	**2.5**	**0.2**	**No**
Dearborn Street						
South of Lugonia Avenue	52.1	52.9	53.1	**1.0**	**0.2**	**No**

Table 15. Cumulative Traffic Noise Scenario

Roadway Segment	Existing	Cumulative No Project	Cumulative Plus Project	Combined Effects	Incremental Effects	Cumulatively Significant Impact?
	CNEL @ 100 Feet from Roadway Centerline	CNEL @ 100 Feet from Roadway Centerline	CNEL @ 100 Feet from Roadway Centerline	Difference in CNEL Between Existing and Cumulative + Project	Difference in CNEL Between Cumulative No Project and Cumulative + Project	
Between Lugonia Avenue and Pennsylvania Avenue	51.0	53.3	53.3	**2.3**	**0.0**	**No**
Between Pennsylvania Avenue and San Bernardino Avenue	50.9	52.3	53.6	**2.7**	**1.3**	**No**
North of San Bernardino Avenue	51.9	52.4	52.4	**0.5**	**0.0**	**No**
Wabash Avenue						
South of Lugonia Avenue	52.2	56.1	56.1	**3.9**	**0.0**	**No**
North of Lugonia Avenue	52.6	53.7	53.7	**1.1**	**0.0**	**No**
San Bernardino Avenue						
West of Orange Street	56.8	58.8	58.9	**2.1**	**0.1**	**No**
Between Orange Street and Church Street	55.9	59.4	59.5	**2.1**	**0.1**	**No**
Between Church Street and University Avenue	57.2	58.6	58.7	**1.5**	**0.1**	**No**
Between University Avenue and Judson Street	55.8	57.9	58.9	**3.1**	**1.0**	**No**
Between Judson Street and Dearborn Street	55.4	57.5	57.7	**2.3**	**0.2**	**No**
East of Dearborn Street	56.5	57.7	57.7	**1.1**	**0.0**	**No**
Pennsylvania Avenue						
West of Judson Street	45.4	48.8	49.2	**3.8**	**0.4**	**No**
Between Judson Street and Dearborn Street	38.2	41.9	42.6	**4.4**	**0.7**	**No**
Lugonia Avenue						
West of Orange Street	55.9	57.4	57.5	**1.6**	**0.1**	**No**
Between Orange Street and Church Street	58.7	59.6	59.7	**1.0**	**0.1**	**No**

Table 15. Cumulative Traffic Noise Scenario

Roadway Segment	Existing	Cumulative No Project	Cumulative Plus Project	Combined Effects	Incremental Effects	Cumulatively Significant Impact?
	CNEL @ 100 Feet from Roadway Centerline	CNEL @ 100 Feet from Roadway Centerline	CNEL @ 100 Feet from Roadway Centerline	Difference in CNEL Between Existing and Cumulative + Project	Difference in CNEL Between Cumulative No Project and Cumulative + Project	
Between Church Street and University Street	58.8	59.6	60.0	**1.2**	**0.4**	**No**
Between University Street and Judson Street	59.1	60.0	60.1	**1.0**	**0.1**	**No**
Between Judson Street and Dearborn Street	59.1	60.0	60.1	**1.0**	**0.1**	**No**
Between Dearborn and Wabash Avenue	55.0	59.6	59.7	**4.7**	**0.1**	**No**
East of Wabash Avenue	59.7	60.1	60.3	**0.6**	**0.2**	**No**
Colton Avenue						
West of Judson Street	52.5	53.4	53.5	**0.9**	**0.1**	**No**
East of Judson Street	53.6	54.3	54.3	**0.7**	**0.0**	**No**

Source: Traffic noise levels were calculated by ECORP using the FHWA roadway noise prediction model in conjunction with the trip generation rate identified by Ganddini Group, Inc. 2020. Refer to Attachment B for traffic noise modeling assumptions and results.

As shown in Table 15, no significant cumulative traffic noise impact would result. As previously described, the Combined effect and Incremental effect criteria have been utilized to evaluate the overall effect of the cumulative noise increase, and a significant impact would result only if *both* the Combined and Incremental effects criteria have been exceeded at a single roadway segment. While traffic noise at a number of segments, such as that on Pennsylvania Avenue west of Judson Street, would surpass the Combined effect threshold of 3.0 dBA over Existing without Project conditions, there is no increase in noise beyond the Cumulative without Project scenario as a result of the Project, and thus no Incremental effect. Therefore, no mobile-source cumulative impacts would occur.

Cumulative Stationary Source Noise Impacts

Long-term stationary noise sources associated with the development at the Project, combined with other cumulative projects, could cause local noise level increases. Noise levels associated with the Proposed Project and related cumulative projects together could result in higher noise levels than considered separately. As previously described, onsite noise sources associated with the Proposed Project was found to not exceed City noise standards. Therefore, the Project would not contribute to cumulative impacts during operations.

5.0 REFERENCES

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LIST OF ATTACHMENTS

ATTACHMENT A

Existing (Baseline) Noise Measurements – Project Site Vicinity

Site Number: 1

Recorded By: Jerry Aguirre

Job Number: 2019-110

Date: 6/18/209

Time: 11:52 a.m.

Location: On Darlene Court approximately 8 feet from East Lugonia Avenue.

Source of Peak Noise: Vehicles on adjacent roadways.

Noise Data			
Leq (dB)	**Lmin (dB)**	**Lmax (dB)**	**Peak (dB)**
70.0	42.2	84.2	101.8

Equipment						
Category	**Type**	**Vendor**	**Model**	**Serial No.**	**Cert. Date**	**Note**
Sound	Sound Level Meter	**Larson Davis**	**LxT SE**	**0005120**	**8/05/2019**	
	Microphone	**Larson Davis**	**377B02**	**174464**	**8/05/2019**	
	Preamp	**Larson Davis**	**PRMLxT1L**	**042852**	**8/05/2019**	
	Calibrator	**Larson Davis**	**CAL200**	**14105**	**8/02/2019**	

Weather Data			
Est.	**Duration:** 10 minutes		**Sky:** Clear
	Note: dBA Offset = 0.01		**Sensor Height (ft):** 4 feet
	Wind Ave Speed (mph)	**Temperature (degrees Fahrenheit)**	**Barometer Pressure (hPa)**
	7-10	79	29.89

Photo of Measurement Location

Summary

File Name on Meter	LxT_Data.129
File Name on PC	SLM_0005120_LxT_Data_129.00.ldbin
Serial Number	0005120
Model	SoundExpert® LxT
Firmware Version	2.302
User	Jerry Aguirre
Location	Redlands, CA
Job Description	2019-110 Holy Name of Jesus Church
Note	

Measurement

Description	
Start	2019-06-18 11:52:31
Stop	2019-06-18 12:02:31
Duration	00:10:00.0
Run Time	00:10:00.0
Pause	00:00:00.0
Pre Calibration	2019-06-18 11:34:17
Post Calibration	None
Calibration Deviation	---

Overall Settings

RMS Weight	A Weighting			
Peak Weight	Z Weighting			
Detector	Fast			
Preamp	PRMLxT1L			
Microphone Correction	Off			
Integration Method	Linear			
OBA Range	Normal			
OBA Bandwidth	1/1 and 1/3			
OBA Freq. Weighting	Z Weighting			
OBA Max Spectrum	Bin Max			
Overload	122.7 dB			
	A	**C**	**Z**	
Under Range Peak	79.0	76.0	**81.0**	dB
Under Range Limit	**28.0**	26.4	34.0	dB
Noise Floor	17.3	17.3	23.7	dB

Results

LAeq	**70.0 dB**
LAE	97.8 dB

EA	669.614 µPa²h	
LZpeak (max)	2019-06-18 11:58:17	101.8 dB
LAFmax	2019-06-18 11:58:17	84.2 dB
LAFmin	2019-06-18 11:55:28	42.2 dB
SEA	-99.9 dB	

LAF > 85.0 dB (Exceedance Counts / Duration)	0	0.0 s
LAF > 115.0 dB (Exceedance Counts / Duration)	0	0.0 s
LZpeak > 135.0 dB (Exceedance Counts / Duration)	0	0.0 s
LZpeak > 137.0 dB (Exceedance Counts / Duration)	0	0.0 s
LZpeak > 140.0 dB (Exceedance Counts / Duration)	0	0.0 s

Community Noise	**Ldn**	**LDay 07:00-22:00**	**LNight 22:00-07:00**	**Lden**	**LDay 07:00-19:00**	**LEvening 19:00-22:00**
	70.0	70.0	-99.9	70.0	70.0	-99.9

LCeq	75.0 dB
LAeq	70.0 dB
LCeq - LAeq	5.0 dB
LAIeq	71.7 dB
LAeq	70.0 dB
LAIeq - LAeq	1.6 dB

	A		**C**		**Z**	
	dB	**Time Stamp**	**dB**	**Time Stamp**	**dB**	**Time Stamp**
Leq	70.0		75.0			
LF(max)	84.2	2019/06/18 11:58:17				
LF(min)	42.2	2019/06/18 11:55:28				
LPeak(max)					101.8	2019/06/18 11:58:17

# Overloads	0
Overload Duration	0.0 s
# OBA Overloads	0
OBA Overload Duration	0.0 s

Statistics

LAF5.00	75.3 dB
LAF10.00	73.8 dB
LAF33.30	69.8 dB
LAF50.00	67.1 dB
LAF66.60	62.6 dB
LAF90.00	52.1 dB

Site Number: 2			
Recorded By: Jerry Aguirre			
Job Number: 2019-110			
Date: 6/18/209			
Time: 12:13 p.m.			
Location: On the parkway between Dearborn Street.			
Source of Peak Noise: Vehicles on adjacent roadways.			
Noise Data			
Leq (dB)	**Lmin (dB)**	**Lmax (dB)**	**Peak (dB)**
55.1	40.1	73.5	94.2

Equipment						
Category	**Type**	**Vendor**	**Model**	**Serial No.**	**Cert. Date**	**Note**
Sound	Sound Level Meter	**Larson Davis**	**LxT SE**	**0005120**	**8/05/2019**	
	Microphone	**Larson Davis**	**377B02**	**174464**	**8/05/2019**	
	Preamp	**Larson Davis**	**PRMLxT1L**	**042852**	**8/05/2019**	
	Calibrator	**Larson Davis**	**CAL200**	**14105**	**8/02/2019**	

Weather Data			
Est.	**Duration:** 10 minutes		**Sky:** Clear
	Note: dBA Offset = 0.01		**Sensor Height (ft):** 4 feet
	Wind Ave Speed (mph)	**Temperature (degrees Fahrenheit)**	**Barometer Pressure (hPa)**
	7-10	79	29.89

Photo of Measurement Location

Summary

File Name on Meter	LxT_Data.130
File Name on PC	SLM_0005120_LxT_Data_130.00.ldbin
Serial Number	0005120
Model	SoundExpert® LxT
Firmware Version	2.302
User	Jerry Aguirre
Location	Redlands, CA
Job Description	2019-110 Holy Name of Jesus Church
Note	

Measurement

Description	
Start	2019-06-18 12:13:04
Stop	2019-06-18 12:23:04
Duration	00:10:00.0
Run Time	00:10:00.0
Pause	00:00:00.0
Pre Calibration	2019-06-18 11:34:17
Post Calibration	None
Calibration Deviation	---

Overall Settings

RMS Weight	A Weighting			
Peak Weight	Z Weighting			
Detector	Fast			
Preamp	PRMLxT1L			
Microphone Correction	Off			
Integration Method	Linear			
OBA Range	Normal			
OBA Bandwidth	1/1 and 1/3			
OBA Freq. Weighting	Z Weighting			
OBA Max Spectrum	Bin Max			
Overload	122.7 dB			
	A	**C**	**Z**	
Under Range Peak	79.0	76.0	**81.0**	dB
Under Range Limit	**28.0**	26.4	34.0	dB
Noise Floor	17.3	17.3	23.7	dB

Results

LA_{eq}	**55.1 dB**	
LAE	82.9 dB	
EA	21.669 µPa²h	
$LZ_{peak\ (max)}$	2019-06-18 12:13:59	94.2 dB
LAF_{max}	2019-06-18 12:13:58	73.5 dB
LAF_{min}	2019-06-18 12:13:04	40.1 dB
SEA	-99.9 dB	

LAF > 85.0 dB (Exceedance Counts / Duration)	0	0.0 s
LAF > 115.0 dB (Exceedance Counts / Duration)	0	0.0 s
LZ_{peak} > 135.0 dB (Exceedance Counts / Duration)	0	0.0 s
LZ_{peak} > 137.0 dB (Exceedance Counts / Duration)	0	0.0 s
LZ_{peak} > 140.0 dB (Exceedance Counts / Duration)	0	0.0 s

Community Noise	**Ldn**	**LDay 07:00-22:00**	**LNight 22:00-07:00**	**Lden**	**LDay 07:00-19:00**	**LEvening 19:00-22:00**
	55.1	55.1	-99.9	55.1	55.1	-99.9

LC_{eq}	65.2 dB
LA_{eq}	55.1 dB
LC_{eq} - LA_{eq}	10.1 dB
LAI_{eq}	56.4 dB
LA_{eq}	55.1 dB
LAI_{eq} - LA_{eq}	1.3 dB

	A		**C**		**Z**	
	dB	**Time Stamp**	**dB**	**Time Stamp**	**dB**	**Time Stamp**
L_{eq}	55.1		65.2			
$L_{F(max)}$	73.5	2019/06/18 12:13:58				
$L_{F(min)}$	40.1	2019/06/18 12:13:04				
$L_{Peak(max)}$					94.2	2019/06/18 12:13:59

# Overloads	0
Overload Duration	0.0 s
# OBA Overloads	0
OBA Overload Duration	0.0 s

Statistics	
LAF5.00	61.2 dB
LAF10.00	58.8 dB
LAF33.30	50.5 dB
LAF50.00	47.6 dB
LAF66.60	45.3 dB
LAF90.00	42.9 dB

Site Number: 3			
Recorded By: Jerry Aguirre			
Job Number: 2019-110			
Date: 6/18/209			
Time: 12:30 p.m.			
Location: Gate at the end of the cul-de sac on East Pennsylvania Avenue.			
Source of Peak Noise: Vehicles on adjacent roadways, airport and birds.			
Noise Data			
Leq (dB)	**Lmin (dB)**	**Lmax (dB)**	**Peak (dB)**
58.8	36.4	77.9	99.8

Equipment						
Category	**Type**	**Vendor**	**Model**	**Serial No.**	**Cert. Date**	**Note**
Sound	Sound Level Meter	**Larson Davis**	**LxT SE**	**0005120**	**8/05/2019**	
	Microphone	**Larson Davis**	**377B02**	**174464**	**8/05/2019**	
	Preamp	**Larson Davis**	**PRMLxT1L**	**042852**	**8/05/2019**	
	Calibrator	**Larson Davis**	**CAL200**	**14105**	**8/02/2019**	

Weather Data			
Est.	**Duration:** 10 minutes		**Sky:** Clear
	Note: dBA Offset = 0.01		**Sensor Height (ft):** 4 feet
	Wind Ave Speed (mph)	**Temperature (degrees Fahrenheit)**	**Barometer Pressure (hPa)**
	7-10	79	29.89

Photo of Measurement Location

Summary

File Name on Meter	LxT_Data.131
File Name on PC	SLM_0005120_LxT_Data_131.00.ldbin
Serial Number	0005120
Model	SoundExpert® LxT
Firmware Version	2.302
User	Jerry Aguirre
Location	Redlands, CA
Job Description	2019-110 Holy Name of Jesus Church
Note	

Measurement

Description	
Start	2019-06-18 12:29:47
Stop	2019-06-18 12:39:47
Duration	00:10:00.0
Run Time	00:10:00.0
Pause	00:00:00.0
Pre Calibration	2019-06-18 11:34:17
Post Calibration	None
Calibration Deviation	---

Overall Settings

RMS Weight	A Weighting		
Peak Weight	Z Weighting		
Detector	Fast		
Preamp	PRMLxT1L		
Microphone Correction	Off		
Integration Method	Linear		
OBA Range	Normal		
OBA Bandwidth	1/1 and 1/3		
OBA Freq. Weighting	Z Weighting		
OBA Max Spectrum	Bin Max		
Overload	122.7 dB		
	A	**C**	**Z**
Under Range Peak	79.0	76.0	**81.0** dB
Under Range Limit	**28.0**	26.4	34.0 dB
Noise Floor	17.3	17.3	23.7 dB

Results

LA_{eq}	**58.8 dB**	
LAE	86.6 dB	
EA	50.470 µPa²h	
$LZ_{peak\ (max)}$	2019-06-18 12:34:05	99.8 dB
LAF_{max}	2019-06-18 12:33:55	77.9 dB
LAF_{min}	2019-06-18 12:30:09	36.4 dB
SEA	-99.9 dB	

LAF > 85.0 dB (Exceedance Counts / Duration)	0	0.0 s
LAF > 115.0 dB (Exceedance Counts / Duration)	0	0.0 s
LZ_{peak} > 135.0 dB (Exceedance Counts / Duration)	0	0.0 s
LZ_{peak} > 137.0 dB (Exceedance Counts / Duration)	0	0.0 s
LZ_{peak} > 140.0 dB (Exceedance Counts / Duration)	0	0.0 s

Community Noise	**Ldn**	**LDay 07:00-22:00**	**LNight 22:00-07:00**	**Lden**	**LDay 07:00-19:00**	**LEvening 19:00-22:00**
	58.8	58.8	-99.9	58.8	58.8	-99.9

LC_{eq}	68.2 dB
LA_{eq}	58.8 dB
LC_{eq} - LA_{eq}	9.4 dB
LAI_{eq}	62.1 dB
LA_{eq}	58.8 dB
LAI_{eq} - LA_{eq}	3.3 dB

	A		**C**		**Z**	
	dB	**Time Stamp**	**dB**	**Time Stamp**	**dB**	**Time Stamp**
L_{eq}	58.8		68.2			
$L_{F(max)}$	77.9	2019/06/18 12:33:55				
$L_{F(min)}$	36.4	2019/06/18 12:30:09				
$L_{Peak(max)}$					99.8	2019/06/18 12:34:05

# Overloads	0
Overload Duration	0.0 s
# OBA Overloads	0
OBA Overload Duration	0.0 s

Statistics	
LAF5.00	66.3 dB
LAF10.00	61.5 dB
LAF33.30	48.3 dB
LAF50.00	45.3 dB
LAF66.60	42.8 dB
LAF90.00	39.2 dB

ATTACHMENT B

Federal Highway Administration Highway Noise Prediction Model (FHWA-RD-77-108) Outputs – Project Traffic Noise

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 12/9/2021

Case Description: ***Holy Name of Jesus*** *Construction*

Description	**Land Use**
Construction Equipment	Residential

Description	**Impact Device**	**Usage(%)**	**Equipment Spec Lmax (dBA)**	**Actual Lmax (dBA)**	**Receptor Distance (feet)**
Crane	No	16		80.6	335
Dozer	No	40		81.7	335
Excavator	No	40		80.7	335
Generator	No	50		80.6	335
Grader	No	40	85		335
Paver	No	50		77.2	335
Roller	No	20		80	335
Tractor	No	40	84		335
Dump Truck	No	40		76.5	335
Concrete Pump Truck	No	20		81.4	335
Welder / Torch	No	40		74	335

	Calculated (dBA)	
Equipment	***Lmax**	**Leq**
Crane	64	56.1
Dozer	65.1	61.2
Excavator	64.2	60.2
Generator	64.1	61.1
Grader	68.5	64.5
Paver	60.7	57.7
Roller	63.5	56.5
Tractor	67.5	63.5
Dump Truck	59.9	55.9
Concrete Pump Truck	64.9	57.9
Welder / Torch	57.5	53.5
Total	**68.5**	**70.6**

*Calculated Lmax is the Loudest value.

ATTACHMENT C

SoundPLAN Outputs – Onsite Project Noise

SoundPLAN
Output Source Information

Number	Reciever Name	Floor	Level at Receiver
1	On Darlene Court approximately 8 feet from East Lugonia Avenue.	Ground Floor	43.9 dBA
2	On the parkway between Dearborn Street.	Ground Floor	49.9 dBA
3	Gate at the end of the cul-de sac on East Pennsylvania Avenue.	Ground Floor	44.1 dBA
4	Northeast of Project site at residence located behind wall across Dearborn Street.	Ground Floor	45.3 dBA
5	East of Project site at residence located behind wall Dearborn Street.	Ground Floor	46.8 dBA
6	East of Project site at residence south of Sundown Court.	Ground Floor	40.0 dBA
7	West of Project site adjacent to proposed soccer field.	Ground Floor	44.3 dBA
8	West of Project site adjacent to proposed student gathering area.	Ground Floor	38.0 dBA
9	West of Project site adjacent to proposed parking lot.	Ground Floor	43.1 dBA

Number	Noise Source Information	Citation	Level at Source
1	Parking Lot Activities	ECORP Refrence Noise Measurement	53.8 dBA
2	Crowd Noise	M.J. Hayne, et al, Prediction of Crowd Noise, Acoustics, November 2006. Assumes 60 dBA with +5 for impulsiveness and -3 for random orientation	62.0 dBA
3	Playground & Sports Field	ECORP Refrence Noise Measurement	54.8 dBA
4	Amplified Stage Noise	ECORP Refrence Noise Measurement	98.6 dBA