9-Lot Subdivision Project
Tentative Tract No. 18012

Noise Study

prepared for

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February 2020

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1 Introduction and Project Description

1.1 Introduction

This study is an analysis of the potential noise impacts of a proposed nine-lot subdivision development (proposed project) located at 12774 Banyan Street in the City of Rancho Cucamonga. This report has been prepared by Rincon Consultants, Inc. under contract to Chao di Su, the project developer, in support of the environmental documentation being prepared pursuant to the California Environmental Quality Act (CEQA). The purpose of this study is to analyze the proposed project's temporary noise impacts associated with construction activity and long-term noise impacts associated with project operation, including the project's potential exposure to roadway noise.

1.2 Project Location

The project site is located at 12774 Banyan Street (Accessor Parcel Number 0225-111-07) in the City of Rancho Cucamonga. The project site encompasses approximately 6.3 acres and consists of an undeveloped lot covered in low lying vegetation, trees, and fallen branches. The project site is bordered by Amber Lane and single-family residences to the north, Frost Early Education Center to the east, Banyan Street and single-family residences to the south, and an undeveloped lot to the west. The project site vicinity and existing site conditions are shown in Figure 1.

1.3 Project Description

The proposed project would involve development of a nine-lot subdivision development on an approximately 6.3-acre, or 274,996 square-foot, lot. The proposed project would consist of nine single-family residences and a common access street. The nine residential lots would encompass 5.57 acres, while the access street would encompass 0.73 acres of the project site. The access street would traverse the project site from the southern boundary at Banyan Street through to the northern boundary of the site. Figure 2 shows the project site plan and configuration of the nine residential lots and the access street (denoted as "A" Street).

Figure 1 Project Site Boundary

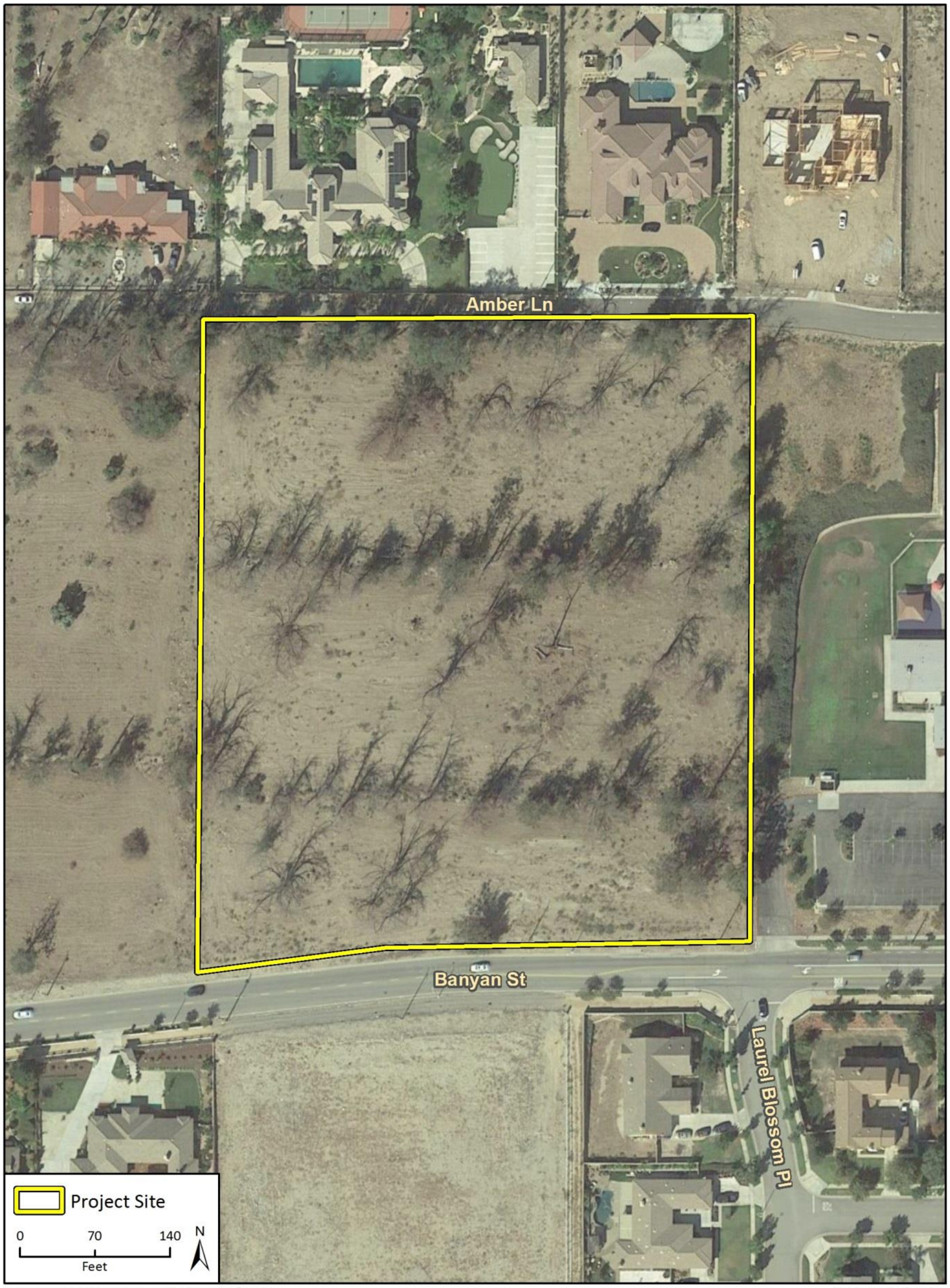

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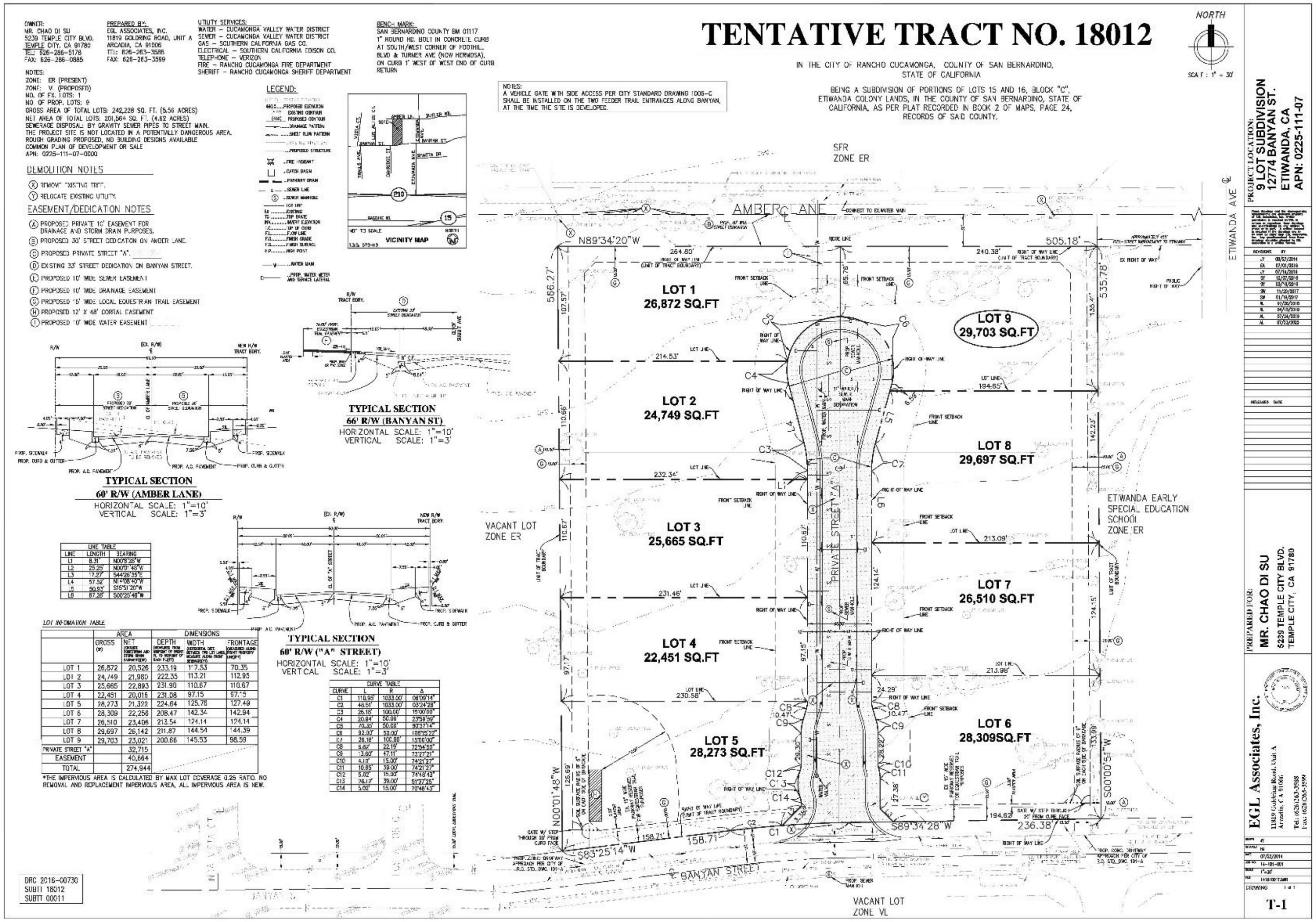
Figure 2 Project Site Plan



2 Background and Setting

2.1 Fundamentals of Noise and Vibration

Noise

Noise level (or volume) is generally measured in decibels (dB) using the A-weighted sound pressure level (dBA). The A-weighting scale is an adjustment to the actual sound pressure levels to be consistent with that of human hearing response, which is most sensitive to frequencies around 4,000 Hertz (about the highest note on a piano) and less sensitive to low frequencies (below 100 Hertz).

Sound pressure level is measured on a logarithmic scale with the 0 dBA level based on the lowest detectable sound pressure level that people can perceive (an audible sound that is not zero sound pressure level). Based on the logarithmic scale, a doubling of sound energy is equivalent to an increase of 3 dBA, and a sound that is 10 dBA less than the ambient sound level has no effect on ambient noise. Because of the nature of the human ear, a sound must be about 10 dBA greater than the ambient noise level to be judged as twice as loud. In general, a 3 dBA change in the ambient noise level is noticeable, while 1-2 dBA changes generally are not perceived. Quiet suburban areas typically have noise levels in the range of 40-50 dBA, while areas adjacent to arterial streets are typically in the 50-60+ dBA range. Normal conversational levels are usually in the 60-65 dBA range, and ambient noise levels greater than 65 dBA can interrupt conversations.

Noise levels from point sources, such as those from individual pieces of machinery, typically attenuate (or drop off) at a rate of 6 dBA per doubling of distance from the noise source. Noise levels from lightly traveled roads typically attenuate at a rate of about 4.5 dBA per doubling of distance. Noise levels from heavily traveled roads typically attenuate at about 3 dBA per doubling of distance. Noise levels may also be reduced by intervening structures; generally, a single row of buildings between the receiver and the noise source reduces noise levels by about 5 dBA, while a solid wall or berm reduces noise levels by 5 to 10 dBA (Federal Transit Administration [FTA] 2018). The manner in which residences in California are constructed generally provides a reduction of exterior-to-interior noise levels of approximately 20 to 25 dBA with closed windows.

In addition to the instantaneous measurement of sound levels, the duration of sound is important because sounds that occur over a long period of time are more likely to be an annoyance or cause direct physical damage or environmental stress. One of the most frequently used noise metrics that considers both duration and sound power level is the equivalent noise level (Leq). The Leq is defined as the single steady A-weighted level that is equivalent to the same amount of energy as that contained in the actual fluctuating levels over a period of time (essentially, the average noise level). Typically, Leq is summed over a one-hour period. Lmax is the highest RMS (root mean squared) sound pressure level within the measurement period, and Lmin is the lowest RMS sound pressure level within the measurement period.

The time period in which noise occurs is also important since nighttime noise tends to disturb people more than daytime noise. Community noise is usually measured using Day-Night Average Level (Ldn), which is the 24-hour average noise level with a 10-dBA penalty for noise occurring during nighttime (10:00 PM to 7:00 AM) hours, or Community Noise Equivalent Level (CNEL), which is the 24-hour average noise level with a 5 dBA penalty for noise occurring from 7 PM to 10 PM and a 10 dBA penalty for noise occurring from 10:00 PM to 7:00 AM. Noise levels described by Ldn and CNEL typically do not differ by more than 1 dBA. In practice, CNEL and Ldn are often used interchangeably.

The relationship between peak hourly Leq values and associated Ldn/CNEL values depends on the distribution of traffic over the entire day. There is no precise way to convert a peak hour Leq to Ldn or CNEL. However, in urban areas near heavy traffic, the peak hour Leq is typically 2-4 dBA lower than the daily Ldn/CNEL. In less heavily developed areas, such as suburban areas, the peak hour Leq is often roughly equal to the daily Ldn/CNEL. For rural areas with little nighttime traffic, the peak hour Leq will often be 3-4 dBA greater than the daily Ldn/CNEL value (California State Water Resources Control Board [SWRCB] 1999). The project site is located in a suburban area; therefore, the Ldn/CNEL in the area would be roughly equal to the peak hour Leq.

Vibration

Vibration is a unique form of noise because its energy is carried through buildings, structures, and the ground, whereas sound is simply carried through the air. Thus, vibration is generally felt rather than heard. Some vibration effects can be caused by noise (e.g., the rattling of windows from passing trucks). This phenomenon is caused by the coupling of the acoustic energy at frequencies that are close to the resonant frequency of the material being vibrated. Typically, ground-borne vibration generated by manmade activities attenuates rapidly as distance from the source of the vibration increases. The ground motion caused by vibration is measured as particle velocity in inches per second and is measured in vibration decibels (VdB).

The vibration velocity level threshold of perception for humans is approximately 65 VdB. A vibration velocity of 75 VdB is the approximate dividing line between barely perceptible and distinctly perceptible levels for many people. Most perceptible indoor vibration is caused by sources inside buildings such as the operation of mechanical equipment, movement of people, or the slamming of doors. Typical outdoor sources of perceptible ground-borne vibration are construction equipment, steel-wheeled trains, and traffic on rough roads.

2.2 Sensitive Receivers

Noise exposure goals for various types of land uses reflect the varying noise sensitivities associated with each of these uses. Noise-sensitive uses generally consist of users and activities that could be easily disturbed or annoyed by noise levels beyond acceptable standards. According to the City of Rancho Cucamonga General Public Health and Safety Element (2010), noise-sensitive uses in the City consist of residential buildings, schools, or hospitals.

The predominant noise-sensitive land uses in the project vicinity are single-family residences. The nearest single-family residences to the project site are located approximately 30 feet north of the project site boundary across Amber Lane, and approximately 65 feet south of the project site boundary across Banyan Street. In addition, the Frost Early Education Center is located approximately 30 feet east of the project site boundary. Additional single-family residences west of the project site are located at a distance of approximately 675 feet. Furthermore, single-family residences on the project site associated with the proposed project would be new noise-sensitive receivers. Figure 3 shows the existing noise-sensitive uses closest to the project site.

Figure 3 Noise-Sensitive Receiver and Sound Level Measurement Locations

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2.3 Existing Project Area Noise Levels

The most common and primary existing sources of noise in the project vicinity are motor vehicles (i.e. automobiles and buses,) along Banyan Street. Motor vehicle noise is of concern because it is characterized by a high number of individual events, which often create a sustained noise level, typically in proximity to noise-sensitive uses. Ambient noise levels would be expected to be highest during the daytime and rush hour unless congestion slows speeds substantially. Additional sources of noise in the project site vicinity include activities associated with the existing residential community and school (Frost Early Education Center), including general conversations, pedestrians, joggers, and children at play. There are no existing sources of noise on the project site, which is currently undeveloped.

In order to determine existing noise levels in the project vicinity, three peak hour weekday morning 15-minute noise measurements (Leq[15] dBA) were taken on and near the project site using an ANSI Type II integrating sound level meter on April 18, 2017. These noise measurements provide existing ambient sound levels, which are primarily due to roadway noise from Banyan Street. Measurement 1 was taken along Banyan Street south of the project site. Measurement 2 was taken within the project site along the eastern boundary to measure ambient on-site noise adjacent to the Frost Early Education Center to the east. Measurement 3 was taken within the project site along the northern boundary to measure ambient on-site noise adjacent to the northern single-family residences across Amber Lane. Figure 3 shows the noise measurements locations. Noise measurement results are summarized in Table 1. As shown in Table 1, ambient noise levels in the project area ranges from 45.6 dBA Leq to 70.0 dBA Leq.

Table 1 Sound Level Measurement Results

Measurement	Location	Sample Times	Approximate Distance to Centerline of Roadway	Leq[15] (dBA)[1]
1	Banyan Street, south of the project site	8:05 AM – 8:20 AM	25 feet[2]	70.0
2	Eastern boundary of the project site	8:28 AM – 8:42 AM	300 feet[3]	46.6
3	Northern boundary of the project site	8:45 AM – 9:00 AM	15 feet[4]	45.6

See Appendix A for noise monitoring data; see Figure 3 for noise measurement locations in the project vicinity.

[1] The equivalent noise level (Leq) is defined as the single steady A-weighted level that is equivalent to the same amount of energy as that contained in the actual fluctuating levels over a period of time (essentially, the average noise level). For this measurement, the Leq was over a 15-minute period (Leq[15]).

[2]Distance to centerline of Banyan Street.

[3]Distance to the centerline of Banyan Street.

[4]Distance to centerline of Amber Lane.

Source: Rincon Consultants, field measurements on April 18, 2018 using ANSI Type II Integrating sound level meter.

The differences among measured noise levels shown in Table 1 are generally due to the attenuating effects of distance and structural sound barriers as noise propagates from the source, combined with the additive properties of noise converging from multiple sources. For example, Measurement

Location 3 has the lowest ambient noise level because it is located the farthest north from Banyan Street, which is the primary noise source in the project area from vehicle traffic. By contrast, Measurement Location 1 has the highest ambient noise level because it has direct exposure to traffic noise from Banyan Street.

2.4 Regulatory Setting

City of Rancho Cucamonga General Plan

The City's General Plan Public Health and Safety Element (2010) addresses noise sources in the City and contains policies to incorporate noise considerations into land use planning decisions. Table 2 shows the City's noise compatibility guidelines for various land uses. As shown in Table 2, a normally acceptable exterior noise exposure for single-family residences would be less than 60 CNEL.

Table 2 Noise Compatibility Matrix

	Community Noise Equivalent Levels (CNEL)			
Land Use Categories	Normally Acceptable[1]	Conditionally Acceptable[2]	Normally Unacceptable[3]	Clearly Unacceptable[4]
Residential – Low Density Single Unit, Duplex, Mobile Homes	<60	60-65	65-75	>75
Residential – Multiple Unit, Mixed Use	<65	65-70	70-75	>75
Lodging – Hotels	<65	65-70	70-80	>80
Schools, Libraries, Community Centers, Religious Institutions, Hospitals, Nursing Homes	<70	N/A	70-80	>80
Auditoriums, Concert Halls, Amphitheaters	N/A	<70	>70	N/A
Sports Arenas, Outdoor Spectator Sports	N/A	<75	>75	N/A
Playgrounds, Neighborhood Parks	<70	N/A	70-75	>75
Outdoor Recreation (Commercial and Public)	<75	N/A	75-80	>80
Office, Retail and Commercial	<70	70-77	N/A	>77
Industrial, Manufacturing, Utilities, Agriculture	<75	75-80	N/A	>80

[1]Normally Acceptable: Specified land uses is satisfactory based on the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.

[2]Conditionally Acceptable: New construction or development should be undertaken only after a detailed analysis of the noise 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.

[3]Normally Unacceptable: New construction or development should generally be discouraged. If it does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.

[4]Clearly Unacceptable: New construction or development should generally not be undertaken.

Source: Rancho Cucamonga 2010

City of Rancho Cucamonga Municipal Code

Section 17.66.050, *Noise Standards*, of the Rancho Cucamonga Municipal Code (RCMC) sets forth the City's standards, guidelines, and procedures concerning noise regulation. Section 17.66.050.C of the RCMC prohibits the creation of any noise on any property which causes the noise level when measured on the property line of any other property to exceed the basic noise level as adjusted below:

- Basic noise level for a cumulative period of not more than 15 minutes in any one hour; or
- Basic noise level plus five dBA for a cumulative period of not more than ten minutes in any one hour; or
- Basic noise level plus 14 dBA for a cumulative period of not more than five minutes in any one hour; or
- Basic noise level plus 15 dBA at any time.

If the measured location is a boundary between two different noise zones, the lower noise level standard shall apply. According to Sections 17.66.050.D.4 and 17.66.050.D.6, the following activities are exempted from the City's noise standards:

4. Noise sources associated with, or vibration created by, construction, repair, remodeling, or grading of any real property or during authorized seismic surveys, provided said activities:
   a. When adjacent to a residential land use, school, church or similar type of use, the noise generating activity does not take place between the hours of 8:00 PM and 7:00 AM on weekdays, including Saturday, or at any time on Sunday or a national holiday, and provided noise levels created do not exceed the noise standard of 65 dBA when measured at the adjacent property line.
6. Noise sources associated with the maintenance of real property, provided said activities take place between 7:00 AM and 8:00 PM on any day.

Section 17.66.050.E of the RCMC prohibits the creation of any noise which causes the ambient noise level at any school, hospital, church, or library to exceed the noise standards specified in the RCMC for the assigned zone in which the school, hospital, church, or library is located.

Section 17.66.050.F.1 of the RCMC includes the maximum noise limits specific to residential zones, shown in Table 3. These are the noise limits when measured at the adjacent residential property line (exterior) or within a neighboring home (interior).

Table 3 Residential Noise Limits

	Maximum Allowable Noise (dBA Leq)	
Location	10:00 PM to 7:00 AM	7:00 AM to 10:00 PM
Exterior	60	65
Interior	45	50

Note: It shall be unlawful for any person at any location within the city to create any noise or to allow the creation of any noise which causes the noise level when measured within any other fully enclosed (windows and doors shut) residential dwelling unit to exceed the interior noise standard in the manner described herein.

Source: City of Rancho Cucamonga Municipal Code, Table 17.66.050-1

According to Section 17.66.050.F.2 of the RCMC, the City also prohibits the operation of any radio, television set, musical instruction, or device that reproduces, produces, or amplifies sounds in a manner that creates a disturbance between the hours of 10:00 PM and 7:00 AM in a residential zone.

California Noise Insulation Standards

California Code of Regulations (CCR) Title 24 requires that the interior noise level attributable to exterior noise sources not exceed a CNEL of 45 dBA in any habitable room with windows closed.

3 Impact Analysis

3.1 Methodology and Significance Thresholds

The analysis of noise impacts considers the effects of both temporary construction-related noise and long-term noise associated with on-site operation of the project.

Construction Noise and Groundborne Vibration

Temporary construction activity would expose nearby noise-sensitive receivers to construction noise generated by operation of on-site construction equipment. Construction noise was estimated using the Federal Highway Administration (FHWA) Roadway Construction Noise Model (RCNM). The RCNM uses baseline noise levels, distances to receivers, shielding information, and construction equipment utilized to calculate the level of construction noise from each piece of construction equipment and overall construction noise at each receiver. To calculate noise generated by each piece of equipment, the model uses equipment noise levels from a study done by the Environmental Protection Agency (EPA) and acoustical usage factors for equipment (i.e., the fraction of time each equipment is operating at full power) from the Empire State Electric Energy Research Corp. Guide (FHWA 2006).

For construction noise assessment, construction equipment can be considered to operate in two modes: stationary and mobile. As a rule, stationary equipment operates in a single location for one or more days at a time, with either fixed-power operation or variable-power operation, such as pumps, generators, and compressors. Mobile equipment moves around the construction site with power applied in cyclic fashion, such as bulldozers, graders, and loaders (FTA 2018). Noise impacts from stationary equipment are assessed from the center of the equipment, while noise impacts from mobile construction equipment are assessed from the center of the equipment activity area (e.g., construction site).

Variation in power imposes additional complexity in characterizing the noise source level from construction equipment. Power variation is accounted for by describing the noise at a reference distance from the equipment operating at full power and adjusting it based on the duty cycle, or percent of an hour the engine is under full power, of the activity to determine the L_{eq} of the operation (FTA 2018). The duty cycles in RCNM are based on surveys conducted by the US EPA and the FHWA.

Each phase of construction has a specific equipment mix, depending on the work to be accomplished during that phase. Each phase also has its own noise characteristics; some would have higher continuous noise levels than others, and some may have high short-term noise levels. The maximum hourly L_{eq} of each phase is determined by combining the L_{eq} contributions from each piece of equipment used in that phase (FTA 2018). In typical construction projects, grading activities generate the highest noise levels because grading involves the largest equipment and covers the greatest area.

Project construction noise levels were estimated using RCNM at nearby noise-sensitive receivers, including Frost Early Education Center approximately 30 feet east and single-family residences approximately 30 feet north, 65 feet south, and 675 feet west of the project site boundary. The project site is approximately 630 feet by 500 feet. This results in a modeling distance from construction activity of 280, 315, and 925 feet to the Early Education Center and single-family residences respectively.

The modeled construction equipment for each construction phase was based on the California Emissions Estimator Model (CalEEMod) Version 2016.3.2 equipment defaults for construction of nine single-family residences. CalEEMod uses project characteristics, such as land use, building sizes, and lot acreage, to estimate a project's emissions and uses default equipment lists in its modeling based on empirical data. The RCNM results and equipment list from CalEEMod are included in Appendix B. As discussed in Section 2.4, *Regulatory Setting*, Section 17.66.050.D.4 of the RCMC states that construction noise should not exceed 65 dBA Leq when measured at the property line of an adjacent residential or school land use. Therefore, construction noise would be significant if construction activities generate an average hourly noise level above 65 dBA Leq when measured at the property line of adjacent noise-sensitive receivers.

Construction activities also have the potential to generate ground-borne vibration near sensitive receivers, especially from grading and excavation of the project site. It is assumed pile driving would not be required for construction of the proposed project. The primary vibratory source during construction within the project vicinity would likely be bulldozers, rollers, and loaded trucks. Construction vibration estimates are based upon vibration levels reported by the FTA in the *Transit Noise and Vibration Impact Assessment Manual* (2018). Vibration significance ranges from approximately 50 VdB (the typical background vibration-velocity level) to 100 VdB, the general threshold where minor damage can occur in fragile buildings (FTA 2018). The general human response to different levels of groundborne vibration velocity levels is described in Table 4.

Table 4 Human Response to Different Levels of Groundborne Vibration

Vibration Velocity Level	Human Reaction
65 VdB	Approximate threshold of perception for many people.
75 VdB	Approximate dividing line between barely perceptible and distinctly perceptible. Many people find that transportation-related vibration at this level is unacceptable.
85 VdB	Vibration acceptable only if there are an infrequent number of events per day.

Source: FTA 2018

This analysis uses FTA criteria to determine the significance of construction vibration as it relates to the structural integrity of off-site buildings. Based on the vibration criteria in the FTA *Transit Noise and Vibration Assessment Manual* (2018), construction vibration impacts would be significant if vibration levels exceed 100 VdB, which could cause structural damage to typical buildings. To determine structural impacts from ground-borne vibration, construction vibration was modeled from the project site to the nearest sensitive structures rather than at the property line. Therefore, construction vibration levels were modeled at a distance of 125 feet for the Frost Early Education Center to the east, and at distances of 50 feet, 80 feet, and 675 feet for single-family residences to the north, south, and west, respectively.

Operational Noise

The proposed project would be exposed to significant noise impacts if noise levels on the project site exceed the standards established in the City's noise and land use compatibility matrix (see Table 2) for single-family residences. As shown in Table 2, an exterior noise level exposure at or above 60 CNEL would exceed the normally acceptable noise conditions for the proposed project. In addition, per CCR Title 24, sufficient insulation must be provided to reduce exterior ambient noise levels to 45 CNEL within interior spaces.

Noise sources associated with operation of the proposed single-family residences would consist of vehicular noise, landscaping equipment (e.g., lawnmower), general conversations, and heating, ventilation and air conditioning (HVAC) equipment. On-site operational noise would be significant if noise levels exceed the City's standards for noise at nearby noise-sensitive receivers. Per Section 17.66.050.F.1 of the RCMC, existing single-family residences north, south, and west of the project site would be impacted if exterior noise at these residences exceeds standards in Table 3. In addition, per Section 17.66.050.E of the RCMC, project operational noise would be significant at Frost Early Education Center if it causes the ambient noise level to exceed the noise standards specified in the RCMC for the assigned zone in which the school is located. However, based on the City's zoning map, the project site is zoned SP-E, or Etiwanda Specific Plan (Rancho Cucamonga 2012). According to the Etiwanda Specific Plan, the project site is designated Very Low Density Residential District (Rancho Cucamonga 2000). Because the RCMC does not specify standards for schools, RCMC standards for residential zones included in Section 17.66.050.F.1 were applied for operational noise impacts to Frost Early Education Center.

The proposed project would generate vehicle trips, thereby increasing traffic on area roadways. Roadway noise was modeled using the U.S. Department of Housing and Urban Development (HUD) Exchange Day/Night Noise Level (DNL) Calculator (HUD 2018). The model uses average daily traffic (ADT) volumes, speed limits, distance to the centerline of the roadways, and other parameters to estimate traffic noise. As discussed in Section 1.3, *Project Description*, access to the project site would be provided by one ingress/egress driveway along Banyan Street (see Figure 2). Therefore, it was assumed that all project traffic would use Banyan Street. Traffic on Banyan Street was modeled under existing and existing plus project conditions to assess direct roadway noise increases caused by the project. According to the City's General Plan Environmental Impact Report, Banyan Street is a tertiary travel corridor that supports and provides access to the primary and secondary corridors in the City and typically carries 10,000 to 15,000 vehicles per day (Rancho Cucamonga 2010). For a conservative estimate of existing traffic noise at the project site, the segment of Banyan Street (between Bluegrass Avenue and Etiwanda Avenue) nearest to the project site is assumed to carry 15,000 vehicles per day. New vehicle trips generated by the proposed project were estimated using the *Institute of Transportation Engineers (ITE) 9th Edition Tip Generation Manual* rates for single-family residences. According to the ITE, single-family residences have a trip generation rate of 9.52 per dwelling unit. Therefore, the proposed project would generate approximately 86 daily trips. In addition, HUD DNL model calculations assume that the average speed limit along Banyan Street is 40 miles per hour and that daily traffic along Banyan Street consists of 99 percent light-duty and one percent medium-duty vehicles[1]. The HUD DNL model calculations for existing and existing plus project conditions are included as Appendix C.

[1] Commercial vehicles over three tons are prohibited along Banyan Street between Day Creek Boulevard and Etiwanda Avenue.

The City has not adopted thresholds for mobile noise sources. Therefore, this analysis uses thresholds contained in the FTA *Transit Noise and Vibration Impact Assessment Manual* (2006) as guidance to determine whether or not a change in traffic would result in a significant permanent increase in roadway noise. Using the FTA criteria, the significance threshold is based on the existing ambient noise level. Roadways with lower ambient noise levels have a higher noise level increase threshold, while roadways with a higher ambient noise level have a lower noise level increase threshold. Traffic-related noise increases would result in a significant impact if roadway noise would increase by more than the levels indicated in Table 5.

Table 5 Significance of Changes in Operational Roadway Noise Exposure

Existing Noise Exposure (Ldn or Leq in dBA)	Significant Noise Exposure Increase (Ldn or Leq in dBA)
45-50	7
50-55	5
55-60	3
60-65	2
65-75	1
75+	0

Source: FTA 2018

3.2 Impact Analysis

Construction Noise

Construction of the proposed project would generate temporary noise that would exceed existing ambient noise levels on and around the project site, but would cease upon completion of construction. Table 6 shows the average expected noise levels (Leq) at the nearest sensitive receivers based on the combined construction equipment anticipated to be used concurrently during each phase of construction as modeled in RCNM.

Table 6 Construction Noise Levels by Phase

Construction Phase	Construction Equipment	Construction Noise Level (dBA, Leq) at Noise-Sensitive Receivers		
		280 Feet [1]	315 Feet[2]	925 Feet[3]
Site Preparation	Loader, Backhoe, Dozer	67	65	55
Grading	Excavator, Dozer, Grader	68	67	58
Building Construction	Compactor, Generator Set, Backhoe	65	64	55
Paving	Paver Machine, Rollers (2), Off Highway Truck	64	63	54
Architectural Coating	Air Compressor	59	58	48

See Appendix B for RCNM results and CalEEMod equipment list.

[1] Modeled distance for Frost Early Education Center and single-family residences located 30 feet east and north of the project site.

[2] Modeled distance for single-family residences located 65 feet south of the project site across Banyan Street.

[3] Modeled distance for single-family residences located 675 feet west of the project site.

Source: FHWA 2006

As shown in Table 6, operation of equipment during site preparation and grading could generate noise levels in excess of 65 dBA L_{eq} at the nearest single-family residences 30 feet north of the project site boundary and Frost Early Education Center 30 feet east of the project site boundary. Additionally grading could generate noise levels up to 67 dBA L_{eq} at single-family residences 115 feet south of the project site boundary across Banyan Street. At 675 feet from of the project site boundary. Construction noise level estimates do not account for the presence of intervening structures or topography, which could reduce noise levels at receiver locations. Therefore, the noise levels presented herein represent a reasonable worst-case estimate of actual construction noise.

According to Section 17.66.050.D.4 of the RCMC, construction noise should not exceed 65 dBA Leq when measured at the property line of an adjacent residential or school land use. As shown in Table 6, daytime site preparation and grading activities could exceed the City noise limits at the project site, i.e., 65 dBA L_{eq} (see Table 1). Any exceedance in the ambient noise level would be temporary and would only last during the construction period. Nonetheless, Section 4, *Recommendations and Conclusions*, includes recommendations to reduce construction noise levels at the project site.

Groundborne Vibration

Operation of the proposed single-family residences would not generate significant groundborne vibration since residential uses do not generate high vibration levels. Therefore, this analysis only considers vibration impacts from project construction. Construction activity associated with the project would create groundborne vibration from operation of heavy mechanical equipment, such as dozers, loaded trucks, and rollers. To determine structural impacts from ground-borne vibration, construction vibration was modeled from the project site to the nearest sensitive structures rather than at the property line of these uses. Therefore, Table 7 shows groundborne vibration levels from a loaded truck, dozer, and a roller at 50 feet, 80 feet, 125 feet, and 675 feet from the source. Single-family residences to the north, south, and west are 50 feet, 80 feet, and 675 feet, respectively. The Frost Early Education Center is located 125 feet to the east.

Table 7 Vibration Levels for Construction Equipment

	Vibration Level (VdB) at Noise-Sensitive Receivers			
Construction Equipment	50 Feet[1]	80 Feet[2]	125 Feet[3]	675 Feet[4]
Loaded Truck	77	70	65	43
Dozer	78	72	66	44
Roller	85	79	73	51

See Appendix B for vibration analysis.

[1] Modeled distance for single-family residences located 30 feet north of the project site.

[2] Modeled distance for single-family residences located 65 feet south of the project site across Banyan Street.

[3] Modeled distance for Frost Early Education Center located 30 feet east of the project site.

[4] Modeled distance for single-family residences located 675 feet west of the project site.

Source: FTA 2018

As shown in Table 7, operation of a loaded truck, dozer, and roller would generate peak vibration levels up to 85 VdB at the nearest noise-sensitive receivers. Although vibration would exceed 75 VdB (the threshold between barely perceptible and distinctly perceptible) such events would be intermittent and relatively short in duration. As recommended in Section 4, *Conclusions and Recommendations*, compliance with the City's permitted hours of construction would ensure that adjacent noise-sensitive residential receivers are not disturbed by construction vibration during nighttime sleep hours between 7:00 AM and 8:00 PM. Nonetheless, ground-borne vibration would not reach levels that could cause damage (100 VdB) to sensitive structures in the project site vicinity. Therefore, impacts from vibration would be less than significant.

Operational Noise

The proposed project would include development of single-family residences on the project site, which would be new noise-sensitive receivers. In addition, existing sensitive uses near the project site may be subject to noise associated with operation of the proposed project.

Project Site Compatibility

The dominant source of noise on the project site is traffic along area roadways, specifically Banyan Street. The proposed single-family residences would be new noise-sensitive receivers on the project site. Existing ambient sound levels were measured during a site visit on April 18, 2018 (see Table 1 for measurement results). These measurements represent the average noise level (Leq) over a 15-minute time period during the AM peak traffic hour at the project site and at nearby sensitive receivers (see Figure 3 for sound measurement locations). As shown in Table 1, measured noise levels in the vicinity of the project site range from approximately 46 dBA Leq to 70 dBA Leq. The project site is located in a suburban area; therefore, the peak hourly Leq at the project site would be roughly equal to the daily CNEL value. Therefore, the current CNEL in the project site vicinity ranges from about 46 dBA to 70 dBA.

According to the City's adopted exterior noise standards shown in Table 2, an exterior noise exposure below 60 CNEL is normally acceptable for single-family residences. Conservatively assuming that the project site would be exposed to traffic noise levels up to 70 CNEL from Banyan Street, proposed on-site noise-sensitive receivers could be exposed to normally unacceptable noise levels. Using an attenuation rate of 4.5 dBA per doubling of distance, single-family residences associated with the proposed project would require a setback of at least 116 feet from the centerline of Banyan Street to meet the City's normally acceptable level of below 60 CNEL. Based on the project site plan shown in Figure 2, current plans for the project include a setback of approximately 50 feet from the centerline of Banyan Street to the southern residential lots. At this distance, the traffic noise levels from Banyan Street would attenuate to 65.5 CNEL based on an attenuation rate of 4.5 dBA per doubling of distance. Therefore, Section 4, *Recommendations and Conclusions*, includes recommendations to further reduce exterior noise levels from Banyan Street on proposed single-family residences.

The manner in which buildings in California are constructed typically provides a reduction of exterior-to-interior noise levels of up to 25 dBA with closed windows (FTA 2018). Therefore, based on an exterior noise level up to 70 CNEL, interior noise at would be approximately 45 CNEL and compliant with the CCR Title 24 interior noise standard of 45 CNEL. As such, the proposed project's interior noise would be compatible with the existing noise environment.

On-Site Noise Sources

The proposed project would introduce new single-family residences on the project site. Existing residences near the project site may periodically be subjected to noise associated with on-site vehicle traffic, use of landscaping equipment, as well as general conversations. However, Section 17.66.050.D.6 exempts noise sources associated with the maintenance of any property (e.g., lawnmowers) between 7:00 AM and 8:00 PM every day. In addition, Section 17.66.050.F.2 of the RCMC, prohibits the operation of any radio, television set, musical instruction, or device that reproduces, produces, or amplifies sounds in a manner that creates a disturbance between the hours of 10:00 PM and 7:00 AM in a residential zone. Operation of the proposed project would not generate sources of noise that would be new to the existing community. Compliance with the RCMC would ensure that the proposed single-family residences would not generate a substantial noise increase.

Stationary equipment such as rooftop HVAC systems may be used by the proposed residences. Noise levels from commercial HVAC equipment can reach 90 dBA Leq at a distance of three feet (USEPA 1971). Typically, the shielding and location of HVAC units reduces noise levels to no greater than 55 dBA Leq at 50 feet from the source (USEPA 1971). Assuming that noise from this point source attenuates at 6 dBA per doubling of distance, estimated noise levels from HVAC equipment would not exceed 59 dBA Leq at a distance of 30 feet, 53 dBA Leq at 65 feet, and 32 dBA Leq at 675 feet. Per Section 17.66.050.F.1 of the RCMC, existing single-family residences north, south, and west of the project site and Frost Early Education Center east of the project site would be impacted if exterior noise at these uses exceeds 60 dBA Leq from 10:00 PM to 7:00 AM or 65 dBA Leq from 7:00 AM to 10:00 PM and interior noise exceeds 45 dBA Leq from 10:00 PM to 7:00 AM or 50 dBA Leq from 7:00 AM to 10:00 PM. Therefore, operation of potential on-site HVAC equipment would not generate noise in excess of the City's exterior noise standards at adjacent noise-sensitive receivers.

Off-Site Traffic Noise

The proposed project would generate new vehicle trips and increase traffic on area roadways. According to the ITE trip generation rate for single-family residences, the proposed project would generate approximately 86 daily trips to Banyan Street. To assess direct roadway noise increases caused by the project, Banyan Street was modeled under existing and existing plus project conditions. As shown in Table 8, model calculations indicate an existing noise level of 72.1 CNEL along Banyan Street. As shown in Table 1, field measurements indicate a noise level of 70.0 dBA Leq along Banyan Street. As discussed in Section 2.1, *Fundamentals of Noise and Vibration*, the peak hour Leq is often roughly equal to the daily Ldn/CNEL in suburban areas (SWRCB 1999). Therefore, the measured 70.0 dBA Leq in the area would be roughly equal to a CNEL of 70 dBA. The California Department of Transportation (Caltrans) indicates that modeled noise is generally reflective of measured vehicle noise if modeled noise is within 3 dBA of the peak-hour measurement (Caltrans 2013). Since modeled results are within 3 dBA of measured noise levels, the HUD DNL Calculator appropriately reflects existing traffic noise. Table 8 compares existing and existing plus project-generated traffic noise. As shown in Table 9, project traffic would not generate an increase of traffic noise in excess of the applicable threshold. Therefore, the project's impact on traffic noise would be less than significant.

Table 8 Comparison of Existing and Existing Plus Project Traffic Noise

	Noise Level (CNEL)				
Roadway Segment	Existing [1]	Existing Plus Project [2]	Change in Noise Level [2] – [1]	Significance Threshold (CNEL)	Significant
Banyan Street between Bluegrass Avenue and Etiwanda Avenue	72.1	72.1	0.0	1	No

See Appendix C for HUD DNL Calculator results. Results are rounded to the nearest decimal.

3.3 Recommendations and Conclusions

As concluded in Section 3.2, *Impact Analysis*, construction vibration would exceed 75 VdB (the threshold between barely perceptible and distinctly perceptible); however, such events would be intermittent and relatively short in duration. Nonetheless, ground-borne vibration would not reach levels that could cause damage (100 VdB) to sensitive structures in the project site vicinity. Therefore, impacts from vibration would be less than significant. Furthermore, long-term operational impacts associated with on-site stationary noise sources and off-site mobile sources (i.e., project-generated traffic) would also be less than significant.

According to Section 17.66.050.D.4 of the RCMC, construction noise should not exceed 65 dBA Leq when measured at the property line of an adjacent residential or school land use. As concluded in Section 3.2, *Impact Analysis*, operation of equipment during various phases of construction could generate noise levels up to 85 dBA Leq at the nearest single-family residences 30 feet north of the project site boundary and Frost Early Education Center 30 feet east of the project site boundary, and 81 dBA Leq at single-family residences 65 feet south of the project site boundary across Banyan Street. Therefore, the following construction noise attenuating measures and practices are recommended:

- **Construction Hours.** Consistent with the hours described in Section 17.66.050.D.4 of the RCMC, limit construction to between the hours of 7:00 AM and 8:00 PM on weekdays and Saturdays and prohibit all construction activity on Sunday and national holidays.
- **Construction Scheduling.** Schedule construction activities to avoid operating several pieces of equipment simultaneously, to the extent feasible.

- **Equipment Staging Areas.** Contractor must provide staging areas on site to minimize off-site transportation of heavy construction equipment. These areas must be located to maximize the distance between activity and sensitive receptors. This would reduce noise levels associated with most types of idling construction equipment.
- **Equipment Idling.** Construction vehicles shall not park, queue and/or idle at the project site or along the adjoining public rights-of-way prior to the construction hours.
- **Electrically-Powered Tools and Facilities.** Electrical power must be used to run air compressors and similar power tools and to power any temporary structures, such as construction trailers.
- **Mufflers or Engine Shrouds.** Use power construction equipment with properly operating state-of-the-art noise shielding and industrial muffling devices, consistent with manufacturers' standards, which would reduce noise levels by at least 15 dBA at 50 feet from the source[2].
- **Noise Monitoring.** The contractor should implement noise measurements survey program to be conducted at the nearest residence(s) and the Early Education Center. The noise measurements should be conducted for a minimum of 8-hours at the beginning of site preparation and grading activities and should include 1-minute intervals. To document the noise survey a letter report will be prepared summarizing the measurements and identifying and potential noise exceedances. The letter report shall include all measurement and calculation data. If the survey determines the project would exceed 65 dBA L_{eq} at any residence or the Early Education Center, a temporary noise barrier would be erected as follows:

  > A temporary noise barriers with a minimum height of 10 feet, would be placed along the northern, eastern, and southern boundaries . To be effective the barriers must break the line-of-sight between on-site construction activities and off-site receivers to the north, east, and south throughout the duration of site preparation and grading activities. The noise barrier should be constructed of material with a minimum weight of 2 pounds per square foot with no gaps or perforations. Noise barriers may be constructed of, but are not limited to, 5/8 inch plywood, 5/8 inch oriented strand board, or hay bales. A barrier of this design is estimated to achieve a 5-dBA reduction. .

Implementation of the recommendations listed above would reduce construction-related noise. Restricting construction activity to the hours between 7:00 AM and 8:00 PM would provide consistency with Section 17.66.050.D.4 of the RCMC and ensure that adjacent noise-sensitive residential receivers are not disturbed during sensitive nighttime sleep hours. However, as shown in Table 6, operation of equipment during site preparation and grading activities could exceed 65 dBA L_{eq} Implementation of above recommendations for construction scheduling, equipment staging areas, equipment idling, electrically-powered tools and facilities, and mufflers/engine shrouds, may reduce noise levels associated with construction activities by an estimated 5-8 dBA L_{eq}. Furthermore, a temporary noise barrier of at least 10 feet in height placed along the full lengths of the northern, eastern, and southern boundaries of the project site would reduce construction noise levels by 5 dBA. See Appendix E for the barrier performance calculations.

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[2] See Appendix D for example manufacturer specifications for industrial grade mufflers.

Conservatively assuming a maximum reduction of 5 dBA from predicted noise levels with applied construction recommendations, the project would not exceed 65 dBA Leq at any residential land use, school, church or similar type of use. While implementation of recommendations would reduce construction noise, there may be short peaks in construction noise levels that exceed the City's 65 dBA . However, these short peaks would last only seconds and would not affect the maximum hourly noise level. Therefore, upon implementation of the listed construction recommendations, such temporary construction noise impacts would be less than significant.

According to the City's adopted exterior noise standards shown in Table 2, an exterior noise exposure below 60 CNEL is normally acceptable for single-family residences. As concluded in Section 3.2, *Impact Analysis*, proposed single-family residences would be exposed to traffic noise levels up to 65.5 CNEL from Banyan Street, which would exceed the City's normally acceptable noise level by 4.5 CNEL. Therefore, the following noise-reducing feature is recommended.

- **Permanent Noise Attenuation Barrier.** Implement a permanent solid wall with a height of a least six feet, or sufficient to break the line of site, along the southern project site boundary capable of reducing traffic noise from Banyan Street by at least 4.5 dBA[3].

Implementation of a permanent solid wall barrier would further reduce the estimated 65.5 CNEL noise exposure at the proposed single-family residences by an estimated 4.5 dBA (see Appendix E for the HUD Barrier Performance Module results), which would be consistent with the City's maximum normally acceptable noise exposure level of 60 CNEL for single-family residences.

[3] See Appendix E for the HUD Barrier Performance Module results.

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Appendix A

Sound Level Measurement Data

- Freq Weight : A
- Time Weight : FAST
- Level Range : 40-100
- Max dB : 83.6 - 2018/04/18 08:20:14
- Level Range : 40-100
- SEL : 99.5
- Leq : 70.0
-

No.s	Date Time	(dB)
1	2018/04/18 08:05:48	53.4
2	2018/04/18 08:05:51	68.9
3	2018/04/18 08:05:54	61.3
4	2018/04/18 08:05:57	65.4
5	2018/04/18 08:06:00	60.5
6	2018/04/18 08:06:03	53.0
7	2018/04/18 08:06:06	63.7
8	2018/04/18 08:06:09	69.4
9	2018/04/18 08:06:12	62.6
10	2018/04/18 08:06:15	68.3
11	2018/04/18 08:06:18	67.4
12	2018/04/18 08:06:21	59.6
13	2018/04/18 08:06:24	49.1
14	2018/04/18 08:06:27	53.9
15	2018/04/18 08:06:30	75.6
16	2018/04/18 08:06:33	57.5
17	2018/04/18 08:06:36	55.3
18	2018/04/18 08:06:39	50.5
19	2018/04/18 08:06:42	44.2
20	2018/04/18 08:06:45	48.6
21	2018/04/18 08:06:48	52.4
22	2018/04/18 08:06:51	65.3
23	2018/04/18 08:06:54	70.1
24	2018/04/18 08:06:57	68.9
25	2018/04/18 08:07:00	74.2
26	2018/04/18 08:07:03	68.7
27	2018/04/18 08:07:06	75.1
28	2018/04/18 08:07:09	73.4
29	2018/04/18 08:07:12	58.8
30	2018/04/18 08:07:15	60.0
31	2018/04/18 08:07:18	69.3
32	2018/04/18 08:07:21	68.2
33	2018/04/18 08:07:24	71.8
34	2018/04/18 08:07:27	67.3
35	2018/04/18 08:07:30	72.1
36	2018/04/18 08:07:33	62.3
37	2018/04/18 08:07:36	66.5
38	2018/04/18 08:07:39	65.2
39	2018/04/18 08:07:42	62.5
40	2018/04/18 08:07:45	54.3
41	2018/04/18 08:07:48	69.1
42	2018/04/18 08:07:51	62.1
43	2018/04/18 08:07:54	56.3
44	2018/04/18 08:07:57	53.9
45	2018/04/18 08:08:00	47.6
46	2018/04/18 08:08:03	50.0
47	2018/04/18 08:08:06	53.3
48	2018/04/18 08:08:09	64.4
49	2018/04/18 08:08:12	70.1
50	2018/04/18 08:08:15	69.4
51	2018/04/18 08:08:18	63.2
52	2018/04/18 08:08:21	59.5
53	2018/04/18 08:08:24	70.0
54	2018/04/18 08:08:27	70.3
55	2018/04/18 08:08:30	64.8
56	2018/04/18 08:08:33	71.1
57	2018/04/18 08:08:36	62.0
58	2018/04/18 08:08:39	56.3
59	2018/04/18 08:08:42	69.1
60	2018/04/18 08:08:45	67.7
61	2018/04/18 08:08:48	68.3
62	2018/04/18 08:08:51	60.2
63	2018/04/18 08:08:54	53.2
64	2018/04/18 08:08:57	51.3
65	2018/04/18 08:09:00	55.7
66	2018/04/18 08:09:03	75.5
67	2018/04/18 08:09:06	58.8
68	2018/04/18 08:09:09	54.3
69	2018/04/18 08:09:12	51.7
70	2018/04/18 08:09:15	54.7
71	2018/04/18 08:09:18	63.4
72	2018/04/18 08:09:21	73.1
73	2018/04/18 08:09:24	71.2
74	2018/04/18 08:09:27	61.8
75	2018/04/18 08:09:30	58.2
76	2018/04/18 08:09:33	62.6
77	2018/04/18 08:09:36	74.0
78	2018/04/18 08:09:39	66.6
79	2018/04/18 08:09:42	57.3
80	2018/04/18 08:09:45	54.3
81	2018/04/18 08:09:48	70.1
82	2018/04/18 08:09:51	61.8
83	2018/04/18 08:09:54	74.4
84	2018/04/18 08:09:57	62.3
85	2018/04/18 08:10:00	58.4

86	2018/04/18 08:10:03	75.5
87	2018/04/18 08:10:06	70.3
88	2018/04/18 08:10:09	71.3
89	2018/04/18 08:10:12	68.2
90	2018/04/18 08:10:15	64.9
91	2018/04/18 08:10:18	56.8
92	2018/04/18 08:10:21	51.3
93	2018/04/18 08:10:24	55.3
94	2018/04/18 08:10:27	74.2
95	2018/04/18 08:10:30	57.1
96	2018/04/18 08:10:33	56.5
97	2018/04/18 08:10:36	76.0
98	2018/04/18 08:10:39	66.0
99	2018/04/18 08:10:42	69.6
100	2018/04/18 08:10:45	61.7
101	2018/04/18 08:10:48	63.2
102	2018/04/18 08:10:51	71.0
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104	2018/04/18 08:10:57	68.4
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106	2018/04/18 08:11:03	69.5
107	2018/04/18 08:11:06	61.5
108	2018/04/18 08:11:09	66.0
109	2018/04/18 08:11:12	78.6
110	2018/04/18 08:11:15	67.9
111	2018/04/18 08:11:18	73.7
112	2018/04/18 08:11:21	77.8
113	2018/04/18 08:11:24	64.2
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119	2018/04/18 08:11:42	67.9
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121	2018/04/18 08:11:48	72.6
122	2018/04/18 08:11:51	57.7
123	2018/04/18 08:11:54	51.9
124	2018/04/18 08:11:57	45.1
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144	2018/04/18 08:12:57	69.8
145	2018/04/18 08:13:00	61.5
146	2018/04/18 08:13:03	74.0
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247	2018/04/18 08:18:06	69.5
248	2018/04/18 08:18:09	74.5
249	2018/04/18 08:18:12	70.9
250	2018/04/18 08:18:15	63.9
251	2018/04/18 08:18:18	69.7
252	2018/04/18 08:18:21	74.2
253	2018/04/18 08:18:24	74.7
254	2018/04/18 08:18:27	60.9
255	2018/04/18 08:18:30	56.7
256	2018/04/18 08:18:33	53.6
257	2018/04/18 08:18:36	49.8
258	2018/04/18 08:18:39	41.0
259	2018/04/18 08:18:42	50.0
260	2018/04/18 08:18:45	49.2
261	2018/04/18 08:18:48	62.0
262	2018/04/18 08:18:51	70.6
263	2018/04/18 08:18:54	56.7
264	2018/04/18 08:18:57	55.5
265	2018/04/18 08:19:00	72.6
266	2018/04/18 08:19:03	62.7
267	2018/04/18 08:19:06	70.1
268	2018/04/18 08:19:09	56.6
269	2018/04/18 08:19:12	51.2
270	2018/04/18 08:19:15	47.4
271	2018/04/18 08:19:18	45.0
272	2018/04/18 08:19:21	45.1
273	2018/04/18 08:19:24	42.2
274	2018/04/18 08:19:27	42.6
275	2018/04/18 08:19:30	46.1
276	2018/04/18 08:19:33	47.4
277	2018/04/18 08:19:36	48.0
278	2018/04/18 08:19:39	52.8
279	2018/04/18 08:19:42	60.3
280	2018/04/18 08:19:45	79.0
281	2018/04/18 08:19:48	61.7
282	2018/04/18 08:19:51	73.3
283	2018/04/18 08:19:54	72.8

284	2018/04/18	08:19:57	71.9
285	2018/04/18	08:20:00	72.0
286	2018/04/18	08:20:03	76.1
287	2018/04/18	08:20:06	71.1
288	2018/04/18	08:20:09	72.9
289	2018/04/18	08:20:12	83.4
290	2018/04/18	08:20:15	72.9
291	2018/04/18	08:20:18	71.2
292	2018/04/18	08:20:21	73.5
293	2018/04/18	08:20:24	72.8
294	2018/04/18	08:20:27	64.4
295	2018/04/18	08:20:30	57.7
296	2018/04/18	08:20:33	67.4
297	2018/04/18	08:20:36	63.3
298	2018/04/18	08:20:39	59.9
299	2018/04/18	08:20:42	70.7
300	2018/04/18	08:20:45	60.5

- Freq Weight : A
- Time Weight : FAST
- Level Range : 40-100
- Max dB : 69.9 - 2018/04/18 08:43:35
- Level Range : 40-100
- SEL : 76.1
- Leq : 46.6
-

No.s	Date Time	(dB)
1	2018/04/18 08:28:36	51.4
2	2018/04/18 08:28:39	43.4
3	2018/04/18 08:28:42	52.0
4	2018/04/18 08:28:45	50.2
5	2018/04/18 08:28:48	49.3
6	2018/04/18 08:28:51	45.4
7	2018/04/18 08:28:54	45.9
8	2018/04/18 08:28:57	41.9
9	2018/04/18 08:29:00	42.1
10	2018/04/18 08:29:03	44.3
11	2018/04/18 08:29:06	40.3
12	2018/04/18 08:29:09	40.9
13	2018/04/18 08:29:12	41.9
14	2018/04/18 08:29:15	45.7
15	2018/04/18 08:29:18	48.9
16	2018/04/18 08:29:21	45.0
17	2018/04/18 08:29:24	44.2
18	2018/04/18 08:29:27	50.0
19	2018/04/18 08:29:30	46.4
20	2018/04/18 08:29:33	48.1
21	2018/04/18 08:29:36	47.4
22	2018/04/18 08:29:39	49.8
23	2018/04/18 08:29:42	46.9
24	2018/04/18 08:29:45	47.9
25	2018/04/18 08:29:48	51.0
26	2018/04/18 08:29:51	53.8
27	2018/04/18 08:29:54	55.1
28	2018/04/18 08:29:57	54.2
29	2018/04/18 08:30:00	52.5
30	2018/04/18 08:30:03	52.2
31	2018/04/18 08:30:06	51.5
32	2018/04/18 08:30:09	48.7
33	2018/04/18 08:30:12	46.6
34	2018/04/18 08:30:15	47.5
35	2018/04/18 08:30:18	44.5
36	2018/04/18 08:30:21	51.4
37	2018/04/18 08:30:24	47.6
38	2018/04/18 08:30:27	46.5
39	2018/04/18 08:30:30	41.3
40	2018/04/18 08:30:33	41.4
41	2018/04/18 08:30:36	43.8
42	2018/04/18 08:30:39	46.1
43	2018/04/18 08:30:42	45.7
44	2018/04/18 08:30:45	44.8
45	2018/04/18 08:30:48	42.9
46	2018/04/18 08:30:51	45.5
47	2018/04/18 08:30:54	42.9
48	2018/04/18 08:30:57	41.8
49	2018/04/18 08:31:00	44.4
50	2018/04/18 08:31:03	39.0
51	2018/04/18 08:31:06	45.8
52	2018/04/18 08:31:09	40.0
53	2018/04/18 08:31:12	43.8
54	2018/04/18 08:31:15	44.9
55	2018/04/18 08:31:18	43.0
56	2018/04/18 08:31:21	43.8
57	2018/04/18 08:31:24	42.8
58	2018/04/18 08:31:27	43.5
59	2018/04/18 08:31:30	39.5
60	2018/04/18 08:31:33	42.3
61	2018/04/18 08:31:36	43.0
62	2018/04/18 08:31:39	42.4
63	2018/04/18 08:31:42	42.8
64	2018/04/18 08:31:45	43.3
65	2018/04/18 08:31:48	52.9
66	2018/04/18 08:31:51	52.2
67	2018/04/18 08:31:54	44.3
68	2018/04/18 08:31:57	42.8
69	2018/04/18 08:32:00	44.3
70	2018/04/18 08:32:03	45.2
71	2018/04/18 08:32:06	41.8
72	2018/04/18 08:32:09	44.9
73	2018/04/18 08:32:12	44.0
74	2018/04/18 08:32:15	44.0
75	2018/04/18 08:32:18	46.4
76	2018/04/18 08:32:21	48.2
77	2018/04/18 08:32:24	46.3
78	2018/04/18 08:32:27	41.5
79	2018/04/18 08:32:30	43.6
80	2018/04/18 08:32:33	43.7
81	2018/04/18 08:32:36	43.2
82	2018/04/18 08:32:39	45.6
83	2018/04/18 08:32:42	42.6
84	2018/04/18 08:32:45	40.8
85	2018/04/18 08:32:48	45.5

86	2018/04/18	08:32:51	50.4
87	2018/04/18	08:32:54	44.5
88	2018/04/18	08:32:57	47.2
89	2018/04/18	08:33:00	46.6
90	2018/04/18	08:33:03	41.7
91	2018/04/18	08:33:06	44.7
92	2018/04/18	08:33:09	43.0
93	2018/04/18	08:33:12	41.6
94	2018/04/18	08:33:15	40.4
95	2018/04/18	08:33:18	42.4
96	2018/04/18	08:33:21	40.3
97	2018/04/18	08:33:24	43.3
98	2018/04/18	08:33:27	44.5
99	2018/04/18	08:33:30	49.0
100	2018/04/18	08:33:33	44.4
101	2018/04/18	08:33:36	41.4
102	2018/04/18	08:33:39	41.3
103	2018/04/18	08:33:42	40.9
104	2018/04/18	08:33:45	42.5
105	2018/04/18	08:33:48	44.7
106	2018/04/18	08:33:51	47.9
107	2018/04/18	08:33:54	47.3
108	2018/04/18	08:33:57	44.6
109	2018/04/18	08:34:00	45.0
110	2018/04/18	08:34:03	46.6
111	2018/04/18	08:34:06	43.6
112	2018/04/18	08:34:09	42.5
113	2018/04/18	08:34:12	42.7
114	2018/04/18	08:34:15	44.4
115	2018/04/18	08:34:18	44.5
116	2018/04/18	08:34:21	43.2
117	2018/04/18	08:34:24	42.4
118	2018/04/18	08:34:27	43.3
119	2018/04/18	08:34:30	48.0
120	2018/04/18	08:34:33	42.1
121	2018/04/18	08:34:36	44.5
122	2018/04/18	08:34:39	46.1
123	2018/04/18	08:34:42	44.9
124	2018/04/18	08:34:45	41.6
125	2018/04/18	08:34:48	43.9
126	2018/04/18	08:34:51	43.2
127	2018/04/18	08:34:54	44.0
128	2018/04/18	08:34:57	43.8
129	2018/04/18	08:35:00	44.5
130	2018/04/18	08:35:03	45.2
131	2018/04/18	08:35:06	46.4
132	2018/04/18	08:35:09	46.2
133	2018/04/18	08:35:12	48.0
134	2018/04/18	08:35:15	47.1
135	2018/04/18	08:35:18	47.0
136	2018/04/18	08:35:21	45.2
137	2018/04/18	08:35:24	41.8
138	2018/04/18	08:35:27	44.0
139	2018/04/18	08:35:30	47.2
140	2018/04/18	08:35:33	46.8
141	2018/04/18	08:35:36	46.1
142	2018/04/18	08:35:39	45.4
143	2018/04/18	08:35:42	45.1
144	2018/04/18	08:35:45	45.1
145	2018/04/18	08:35:48	51.5
146	2018/04/18	08:35:51	43.3
147	2018/04/18	08:35:54	44.1
148	2018/04/18	08:35:57	43.5
149	2018/04/18	08:36:00	42.2
150	2018/04/18	08:36:03	43.4
151	2018/04/18	08:36:06	42.8
152	2018/04/18	08:36:09	40.9
153	2018/04/18	08:36:12	41.2
154	2018/04/18	08:36:15	42.5
155	2018/04/18	08:36:18	42.4
156	2018/04/18	08:36:21	46.2
157	2018/04/18	08:36:24	42.1
158	2018/04/18	08:36:27	43.0
159	2018/04/18	08:36:30	44.9
160	2018/04/18	08:36:33	46.9
161	2018/04/18	08:36:36	49.5
162	2018/04/18	08:36:39	50.3
163	2018/04/18	08:36:42	44.5
164	2018/04/18	08:36:45	44.2
165	2018/04/18	08:36:48	48.9
166	2018/04/18	08:36:51	47.2
167	2018/04/18	08:36:54	47.9
168	2018/04/18	08:36:57	48.5
169	2018/04/18	08:37:00	49.0
170	2018/04/18	08:37:03	46.4
171	2018/04/18	08:37:06	44.6
172	2018/04/18	08:37:09	43.7
173	2018/04/18	08:37:12	43.3
174	2018/04/18	08:37:15	43.8
175	2018/04/18	08:37:18	43.7
176	2018/04/18	08:37:21	47.2
177	2018/04/18	08:37:24	47.1
178	2018/04/18	08:37:27	45.8
179	2018/04/18	08:37:30	50.8
180	2018/04/18	08:37:33	51.1
181	2018/04/18	08:37:36	51.8
182	2018/04/18	08:37:39	50.6
183	2018/04/18	08:37:42	51.0
184	2018/04/18	08:37:45	44.4

185	2018/04/18 08:37:48	46.4
186	2018/04/18 08:37:51	42.3
187	2018/04/18 08:37:54	43.0
188	2018/04/18 08:37:57	41.8
189	2018/04/18 08:38:00	41.4
190	2018/04/18 08:38:03	43.0
191	2018/04/18 08:38:06	44.1
192	2018/04/18 08:38:09	42.8
193	2018/04/18 08:38:12	44.3
194	2018/04/18 08:38:15	41.1
195	2018/04/18 08:38:18	40.6
196	2018/04/18 08:38:21	41.1
197	2018/04/18 08:38:24	41.9
198	2018/04/18 08:38:27	45.4
199	2018/04/18 08:38:30	47.3
200	2018/04/18 08:38:33	41.9
201	2018/04/18 08:38:36	43.8
202	2018/04/18 08:38:39	48.0
203	2018/04/18 08:38:42	46.4
204	2018/04/18 08:38:45	50.8
205	2018/04/18 08:38:48	49.3
206	2018/04/18 08:38:51	46.7
207	2018/04/18 08:38:54	43.5
208	2018/04/18 08:38:57	44.9
209	2018/04/18 08:39:00	44.6
210	2018/04/18 08:39:03	44.9
211	2018/04/18 08:39:06	46.3
212	2018/04/18 08:39:09	48.1
213	2018/04/18 08:39:12	45.0
214	2018/04/18 08:39:15	45.7
215	2018/04/18 08:39:18	45.0
216	2018/04/18 08:39:21	43.7
217	2018/04/18 08:39:24	44.2
218	2018/04/18 08:39:27	47.4
219	2018/04/18 08:39:30	44.9
220	2018/04/18 08:39:33	47.4
221	2018/04/18 08:39:36	47.4
222	2018/04/18 08:39:39	48.6
223	2018/04/18 08:39:42	45.4
224	2018/04/18 08:39:45	43.5
225	2018/04/18 08:39:48	44.0
226	2018/04/18 08:39:51	43.5
227	2018/04/18 08:39:54	43.6
228	2018/04/18 08:39:57	44.8
229	2018/04/18 08:40:00	44.8
230	2018/04/18 08:40:03	46.1
231	2018/04/18 08:40:06	48.4
232	2018/04/18 08:40:09	47.3
233	2018/04/18 08:40:12	48.6
234	2018/04/18 08:40:15	46.2
235	2018/04/18 08:40:18	45.8
236	2018/04/18 08:40:21	44.3
237	2018/04/18 08:40:24	42.7
238	2018/04/18 08:40:27	45.5
239	2018/04/18 08:40:30	43.0
240	2018/04/18 08:40:33	44.3
241	2018/04/18 08:40:36	48.7
242	2018/04/18 08:40:39	43.8
243	2018/04/18 08:40:42	50.1
244	2018/04/18 08:40:45	48.6
245	2018/04/18 08:40:48	46.5
246	2018/04/18 08:40:51	42.1
247	2018/04/18 08:40:54	41.7
248	2018/04/18 08:40:57	39.8
249	2018/04/18 08:41:00	38.7
250	2018/04/18 08:41:03	38.7
251	2018/04/18 08:41:06	38.5
252	2018/04/18 08:41:09	40.6
253	2018/04/18 08:41:12	43.5
254	2018/04/18 08:41:15	42.3
255	2018/04/18 08:41:18	46.7
256	2018/04/18 08:41:21	47.8
257	2018/04/18 08:41:24	41.9
258	2018/04/18 08:41:27	44.5
259	2018/04/18 08:41:30	45.4
260	2018/04/18 08:41:33	42.2
261	2018/04/18 08:41:36	42.6
262	2018/04/18 08:41:39	43.5
263	2018/04/18 08:41:42	42.3
264	2018/04/18 08:41:45	45.3
265	2018/04/18 08:41:48	44.8
266	2018/04/18 08:41:51	43.5
267	2018/04/18 08:41:54	42.2
268	2018/04/18 08:41:57	42.9
269	2018/04/18 08:42:00	49.0
270	2018/04/18 08:42:03	56.4
271	2018/04/18 08:42:06	53.3
272	2018/04/18 08:42:09	44.5
273	2018/04/18 08:42:12	44.8
274	2018/04/18 08:42:15	44.7
275	2018/04/18 08:42:18	47.6
276	2018/04/18 08:42:21	44.8
277	2018/04/18 08:42:24	51.2
278	2018/04/18 08:42:27	40.2
279	2018/04/18 08:42:30	38.9
280	2018/04/18 08:42:33	39.3
281	2018/04/18 08:42:36	40.9
282	2018/04/18 08:42:39	43.2
283	2018/04/18 08:42:42	42.2

284	2018/04/18	08:42:45	39.5
285	2018/04/18	08:42:48	47.6
286	2018/04/18	08:42:51	39.8
287	2018/04/18	08:42:54	38.8
288	2018/04/18	08:42:57	37.1
289	2018/04/18	08:43:00	41.8
290	2018/04/18	08:43:03	42.0
291	2018/04/18	08:43:06	49.6
292	2018/04/18	08:43:09	44.8
293	2018/04/18	08:43:12	44.0
294	2018/04/18	08:43:15	41.1
295	2018/04/18	08:43:18	41.1
296	2018/04/18	08:43:21	41.8
297	2018/04/18	08:43:24	44.0
298	2018/04/18	08:43:27	45.2
299	2018/04/18	08:43:30	45.3
300	2018/04/18	08:43:33	66.2

- Freq Weight : A
- Time Weight : FAST
- Level Range : 40-100
- Max dB : 64.9 - 2018/04/18 08:51:26
- Level Range : 40-100
- SEL : 75.1
- Leq : 45.6
-

No.s	Date Time	(dB)
1	2018/04/18 08:45:41	44.5
2	2018/04/18 08:45:44	46.5
3	2018/04/18 08:45:47	44.2
4	2018/04/18 08:45:50	47.0
5	2018/04/18 08:45:53	44.2
6	2018/04/18 08:45:56	47.0
7	2018/04/18 08:45:59	43.1
8	2018/04/18 08:46:02	43.0
9	2018/04/18 08:46:05	41.4
10	2018/04/18 08:46:08	46.5
11	2018/04/18 08:46:11	40.9
12	2018/04/18 08:46:14	44.6
13	2018/04/18 08:46:17	46.0
14	2018/04/18 08:46:20	38.8
15	2018/04/18 08:46:23	39.6
16	2018/04/18 08:46:26	43.8
17	2018/04/18 08:46:29	39.1
18	2018/04/18 08:46:32	44.4
19	2018/04/18 08:46:35	40.0
20	2018/04/18 08:46:38	38.4
21	2018/04/18 08:46:41	38.3
22	2018/04/18 08:46:44	40.9
23	2018/04/18 08:46:47	42.4
24	2018/04/18 08:46:50	44.3
25	2018/04/18 08:46:53	40.1
26	2018/04/18 08:46:56	38.6
27	2018/04/18 08:46:59	46.8
28	2018/04/18 08:47:02	36.8
29	2018/04/18 08:47:05	39.2
30	2018/04/18 08:47:08	40.5
31	2018/04/18 08:47:11	43.6
32	2018/04/18 08:47:14	38.1
33	2018/04/18 08:47:17	37.5
34	2018/04/18 08:47:20	38.2
35	2018/04/18 08:47:23	38.5
36	2018/04/18 08:47:26	38.6
37	2018/04/18 08:47:29	40.6
38	2018/04/18 08:47:32	43.7
39	2018/04/18 08:47:35	40.5
40	2018/04/18 08:47:38	40.3
41	2018/04/18 08:47:41	49.0
42	2018/04/18 08:47:44	42.0
43	2018/04/18 08:47:47	44.8
44	2018/04/18 08:47:50	44.5
45	2018/04/18 08:47:53	42.6
46	2018/04/18 08:47:56	44.1
47	2018/04/18 08:47:59	42.4
48	2018/04/18 08:48:02	46.0
49	2018/04/18 08:48:05	46.5
50	2018/04/18 08:48:08	44.3
51	2018/04/18 08:48:11	49.7
52	2018/04/18 08:48:14	45.5
53	2018/04/18 08:48:17	43.3
54	2018/04/18 08:48:20	43.5
55	2018/04/18 08:48:23	40.5
56	2018/04/18 08:48:26	41.8
57	2018/04/18 08:48:29	40.7
58	2018/04/18 08:48:32	40.9
59	2018/04/18 08:48:35	41.1
60	2018/04/18 08:48:38	40.5
61	2018/04/18 08:48:41	43.1
62	2018/04/18 08:48:44	39.2
63	2018/04/18 08:48:47	40.5
64	2018/04/18 08:48:50	39.8
65	2018/04/18 08:48:53	43.0
66	2018/04/18 08:48:56	46.3
67	2018/04/18 08:48:59	41.4
68	2018/04/18 08:49:02	47.5
69	2018/04/18 08:49:05	40.0
70	2018/04/18 08:49:08	41.1
71	2018/04/18 08:49:11	52.3
72	2018/04/18 08:49:14	42.2
73	2018/04/18 08:49:17	42.4
74	2018/04/18 08:49:20	54.7
75	2018/04/18 08:49:23	43.9
76	2018/04/18 08:49:26	48.8
77	2018/04/18 08:49:29	41.7
78	2018/04/18 08:49:32	58.7
79	2018/04/18 08:49:35	44.0
80	2018/04/18 08:49:38	41.9
81	2018/04/18 08:49:41	42.4
82	2018/04/18 08:49:44	43.2
83	2018/04/18 08:49:47	47.0
84	2018/04/18 08:49:50	42.0
85	2018/04/18 08:49:53	43.4

86	2018/04/18	08:49:56	50.0
87	2018/04/18	08:49:59	41.7
88	2018/04/18	08:50:02	40.1
89	2018/04/18	08:50:05	54.7
90	2018/04/18	08:50:08	40.8
91	2018/04/18	08:50:11	48.5
92	2018/04/18	08:50:14	39.9
93	2018/04/18	08:50:17	42.1
94	2018/04/18	08:50:20	39.0
95	2018/04/18	08:50:23	42.9
96	2018/04/18	08:50:26	39.7
97	2018/04/18	08:50:29	40.0
98	2018/04/18	08:50:32	39.5
99	2018/04/18	08:50:35	39.1
100	2018/04/18	08:50:38	39.6
101	2018/04/18	08:50:41	40.9
102	2018/04/18	08:50:44	42.7
103	2018/04/18	08:50:47	40.5
104	2018/04/18	08:50:50	41.9
105	2018/04/18	08:50:53	39.8
106	2018/04/18	08:50:56	39.9
107	2018/04/18	08:50:59	42.0
108	2018/04/18	08:51:02	40.8
109	2018/04/18	08:51:05	42.5
110	2018/04/18	08:51:08	44.7
111	2018/04/18	08:51:11	41.6
112	2018/04/18	08:51:14	43.6
113	2018/04/18	08:51:17	46.3
114	2018/04/18	08:51:20	47.4
115	2018/04/18	08:51:23	58.0
116	2018/04/18	08:51:26	55.8
117	2018/04/18	08:51:29	47.8
118	2018/04/18	08:51:32	50.5
119	2018/04/18	08:51:35	49.3
120	2018/04/18	08:51:38	50.5
121	2018/04/18	08:51:41	49.5
122	2018/04/18	08:51:44	51.5
123	2018/04/18	08:51:47	48.6
124	2018/04/18	08:51:50	51.2
125	2018/04/18	08:51:53	52.9
126	2018/04/18	08:51:56	50.7
127	2018/04/18	08:51:59	49.5
128	2018/04/18	08:52:02	45.7
129	2018/04/18	08:52:05	45.3
130	2018/04/18	08:52:08	50.1
131	2018/04/18	08:52:11	50.3
132	2018/04/18	08:52:14	48.3
133	2018/04/18	08:52:17	44.6
134	2018/04/18	08:52:20	40.9
135	2018/04/18	08:52:23	42.2
136	2018/04/18	08:52:26	40.2
137	2018/04/18	08:52:29	41.4
138	2018/04/18	08:52:32	42.9
139	2018/04/18	08:52:35	41.1
140	2018/04/18	08:52:38	42.8
141	2018/04/18	08:52:41	46.2
142	2018/04/18	08:52:44	43.4
143	2018/04/18	08:52:47	42.7
144	2018/04/18	08:52:50	40.4
145	2018/04/18	08:52:53	40.3
146	2018/04/18	08:52:56	43.5
147	2018/04/18	08:52:59	40.4
148	2018/04/18	08:53:02	41.7
149	2018/04/18	08:53:05	40.8
150	2018/04/18	08:53:08	40.8
151	2018/04/18	08:53:11	39.1
152	2018/04/18	08:53:14	39.7
153	2018/04/18	08:53:17	41.2
154	2018/04/18	08:53:20	40.9
155	2018/04/18	08:53:23	41.5
156	2018/04/18	08:53:26	41.3
157	2018/04/18	08:53:29	39.4
158	2018/04/18	08:53:32	40.6
159	2018/04/18	08:53:35	40.8
160	2018/04/18	08:53:38	43.9
161	2018/04/18	08:53:41	40.8
162	2018/04/18	08:53:44	43.1
163	2018/04/18	08:53:47	41.6
164	2018/04/18	08:53:50	42.9
165	2018/04/18	08:53:53	41.2
166	2018/04/18	08:53:56	43.2
167	2018/04/18	08:53:59	43.5
168	2018/04/18	08:54:02	46.8
169	2018/04/18	08:54:05	45.6
170	2018/04/18	08:54:08	40.6
171	2018/04/18	08:54:11	39.9
172	2018/04/18	08:54:14	43.7
173	2018/04/18	08:54:17	40.7
174	2018/04/18	08:54:20	42.0
175	2018/04/18	08:54:23	44.8
176	2018/04/18	08:54:26	45.8
177	2018/04/18	08:54:29	46.1
178	2018/04/18	08:54:32	46.0
179	2018/04/18	08:54:35	43.4
180	2018/04/18	08:54:38	40.0
181	2018/04/18	08:54:41	39.9
182	2018/04/18	08:54:44	50.7
183	2018/04/18	08:54:47	39.1
184	2018/04/18	08:54:50	41.0

185	2018/04/18 08:54:53	39.9
186	2018/04/18 08:54:56	41.5
187	2018/04/18 08:54:59	46.9
188	2018/04/18 08:55:02	45.2
189	2018/04/18 08:55:05	50.9
190	2018/04/18 08:55:08	44.4
191	2018/04/18 08:55:11	42.3
192	2018/04/18 08:55:14	44.2
193	2018/04/18 08:55:17	43.9
194	2018/04/18 08:55:20	43.1
195	2018/04/18 08:55:23	43.2
196	2018/04/18 08:55:26	46.1
197	2018/04/18 08:55:29	44.2
198	2018/04/18 08:55:32	45.5
199	2018/04/18 08:55:35	46.0
200	2018/04/18 08:55:38	48.6
201	2018/04/18 08:55:41	44.5
202	2018/04/18 08:55:44	42.5
203	2018/04/18 08:55:47	40.6
204	2018/04/18 08:55:50	43.5
205	2018/04/18 08:55:53	41.5
206	2018/04/18 08:55:56	44.5
207	2018/04/18 08:55:59	42.0
208	2018/04/18 08:56:02	44.4
209	2018/04/18 08:56:05	41.1
210	2018/04/18 08:56:08	46.2
211	2018/04/18 08:56:11	48.0
212	2018/04/18 08:56:14	46.1
213	2018/04/18 08:56:17	45.3
214	2018/04/18 08:56:20	43.8
215	2018/04/18 08:56:23	45.4
216	2018/04/18 08:56:26	44.6
217	2018/04/18 08:56:29	42.0
218	2018/04/18 08:56:32	43.2
219	2018/04/18 08:56:35	42.4
220	2018/04/18 08:56:38	43.6
221	2018/04/18 08:56:41	42.6
222	2018/04/18 08:56:44	41.4
223	2018/04/18 08:56:47	41.1
224	2018/04/18 08:56:50	42.6
225	2018/04/18 08:56:53	40.8
226	2018/04/18 08:56:56	40.7
227	2018/04/18 08:56:59	48.4
228	2018/04/18 08:57:02	47.1
229	2018/04/18 08:57:05	46.5
230	2018/04/18 08:57:08	45.9
231	2018/04/18 08:57:11	40.3
232	2018/04/18 08:57:14	51.0
233	2018/04/18 08:57:17	43.0
234	2018/04/18 08:57:20	41.3
235	2018/04/18 08:57:23	45.1
236	2018/04/18 08:57:26	45.5
237	2018/04/18 08:57:29	43.1
238	2018/04/18 08:57:32	42.0
239	2018/04/18 08:57:35	50.2
240	2018/04/18 08:57:38	50.0
241	2018/04/18 08:57:41	42.5
242	2018/04/18 08:57:44	42.4
243	2018/04/18 08:57:47	43.7
244	2018/04/18 08:57:50	48.9
245	2018/04/18 08:57:53	42.8
246	2018/04/18 08:57:56	40.3
247	2018/04/18 08:57:59	42.3
248	2018/04/18 08:58:02	44.4
249	2018/04/18 08:58:05	43.0
250	2018/04/18 08:58:08	43.2
251	2018/04/18 08:58:11	42.5
252	2018/04/18 08:58:14	40.5
253	2018/04/18 08:58:17	47.1
254	2018/04/18 08:58:20	41.2
255	2018/04/18 08:58:23	39.3
256	2018/04/18 08:58:26	40.4
257	2018/04/18 08:58:29	39.4
258	2018/04/18 08:58:32	41.1
259	2018/04/18 08:58:35	39.8
260	2018/04/18 08:58:38	38.7
261	2018/04/18 08:58:41	41.1
262	2018/04/18 08:58:44	39.6
263	2018/04/18 08:58:47	40.7
264	2018/04/18 08:58:50	41.5
265	2018/04/18 08:58:53	38.7
266	2018/04/18 08:58:56	39.1
267	2018/04/18 08:58:59	38.8
268	2018/04/18 08:59:02	38.3
269	2018/04/18 08:59:05	37.4
270	2018/04/18 08:59:08	39.6
271	2018/04/18 08:59:11	38.2
272	2018/04/18 08:59:14	40.7
273	2018/04/18 08:59:17	43.3
274	2018/04/18 08:59:20	38.4
275	2018/04/18 08:59:23	44.3
276	2018/04/18 08:59:26	43.2
277	2018/04/18 08:59:29	38.9
278	2018/04/18 08:59:32	38.9
279	2018/04/18 08:59:35	39.7
280	2018/04/18 08:59:38	41.0
281	2018/04/18 08:59:41	39.8
282	2018/04/18 08:59:44	40.3
283	2018/04/18 08:59:47	39.9

284	2018/04/18 08:59:50	41.8
285	2018/04/18 08:59:53	44.8
286	2018/04/18 08:59:56	39.7
287	2018/04/18 08:59:59	39.4
288	2018/04/18 09:00:02	40.6
289	2018/04/18 09:00:05	43.6
290	2018/04/18 09:00:08	42.5
291	2018/04/18 09:00:11	45.8
292	2018/04/18 09:00:14	46.6
293	2018/04/18 09:00:17	41.5
294	2018/04/18 09:00:20	44.6
295	2018/04/18 09:00:23	45.2
296	2018/04/18 09:00:26	42.3
297	2018/04/18 09:00:29	46.9
298	2018/04/18 09:00:32	41.1
299	2018/04/18 09:00:35	42.3
300	2018/04/18 09:00:38	41.5

Appendix B

Construction Noise and Vibration Assessment

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 2/19/2020
Case Description: Grading 925

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Receiver	Residential	60	55	40

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Excavator	No	40		80.7	315	0
Scraper	No	40		83.6	315	0
Dozer	No	40		81.7	315	0

Results

Equipment		Calculated (dBA) *Lmax	Leq
Excavator		64.7	60.7
Scraper		67.6	63.6
Dozer		65.7	61.7
	Total	67.6	67

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 2/19/2020
Case Description Grading 315

---- Receptor #1 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
Receiver	Residential	60	55	40

			Equipment			
			Spec	Actual	Receptor	Estimated
	Impact		Lmax	Lmax	Distance	Shielding
Description	Device	Usage(%)	(dBA)	(dBA)	(feet)	(dBA)
Excavator	No	40		80.7	280	0
Scraper	No	40		83.6	280	0
Dozer	No	40		81.7	280	0

			Results	
		Calculated (dBA)		
				Day
Equipment		*Lmax	Leq	Lmax
Excavator		65.7	61.8	85
Scraper		68.6	64.6	85
Dozer		66.7	62.7	85
	Total	68.6	68	85

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 2/19/2020
Case Description: Building 315

---- Receptor #1 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
Receiver	Residential	60	55	40

			Equipment			
			Spec	Actual	Receptor	Estimated
	Impact		Lmax	Lmax	Distance	Shielding
Description	Device	Usage(%)	(dBA)	(dBA)	(feet)	(dBA)
Front End Loader	No	40		79.1	315	0
Compactor (ground)	No	20		83.2	315	0
Backhoe	No	40		77.6	315	0

				Results
		Calculated (dBA)		
				Day
Equipment		*Lmax	Leq	Lmax
Front End Loader		63.1	59.1	85
Compactor (ground)		67.2	60.3	85
Backhoe		61.6	57.6	85
	Total	67.2	63.9	85

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 2/19/2020
Case Description: Building 315

---- Receptor #1 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
Receiver	Residential	60	55	40

			Equipment			
			Spec	Actual	Receptor	Estimated
	Impact		Lmax	Lmax	Distance	Shielding
Description	Device	Usage(%)	(dBA)	(dBA)	(feet)	(dBA)
Front End Loader	No	40		79.1	280	0
Compactor (ground)	No	20		83.2	280	0
Backhoe	No	40		77.6	280	0

Results

		Calculated (dBA)		
				Day
Equipment		*Lmax	Leq	Lmax
Front End Loader		64.1	60.2	85
Compactor (ground)		68.3	61.3	85
Backhoe		62.6	58.6	85
	Total	68.3	64.9	85

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 2/19/2020
Case Description: Architectural Coating 280

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Receiver	Residential	60	55	40

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Compressor (air)	No	40		77.7	315	0

Results

Calculated (dBA)

Equipment		*Lmax	Leq
Compressor (air)		61.7	57.7
	Total	61.7	57.7

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 2/19/2020
Case Description: Architectural Coating 280

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Receiver	Residential	60	55	40

Equipment

Description	Impact Device	Usage(%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Compressor (air)	No	40		77.7	280	0

Results

Equipment		Calculated (dBA) *Lmax	Leq
Compressor (air)		62.7	58.7
	Total	62.7	58.7

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 2/19/2020
Case Description: Site Prep 280

---- Receptor #1 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
Receiver	Residential	60	55	40

			Equipment			
			Spec	Actual	Receptor	Estimated
	Impact		Lmax	Lmax	Distance	Shielding
Description	Device	Usage(%)	(dBA)	(dBA)	(feet)	(dBA)
Front End Loader	No	40		79.1	315	0
Backhoe	No	40		77.6	315	0
Dozer	No	40		81.7	315	0

				Results
		Calculated (dBA)		
				Day
Equipment		*Lmax	Leq	Lmax
Front End Loader		63.1	59.1	85
Backhoe		61.6	57.6	85
Dozer		65.7	61.7	85
	Total	65.7	64.6	85

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 2/19/2020
Case Description: Site Prep 280

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Receiver	Residential	60	55	40

Equipment

Description	Impact Device	Usage(%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Front End Loader	No	40		79.1	280	0
Backhoe	No	40		77.6	280	0
Dozer	No	40		81.7	280	0

Results

Equipment		Calculated (dBA) *Lmax	Leq
Front End Loader		64.1	60.2
Backhoe		62.6	58.6
Dozer		66.7	62.7
	Total	66.7	65.6

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 2/19/2020
Case Description: Paving 315

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Receiver	Residential	60	55	40

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Roller	No	20		80	280	0
Roller	No	20		80	280	0
Dump Truck	No	40		76.5	280	0
Paver	No	50		77.2	280	0

Results

Equipment		Calculated (dBA) *Lmax	Leq
Roller		65	58
Roller		65	58
Dump Truck		61.5	57.5
Paver		62.3	59.2
	Total	65	64.3

*Calculated Lmax is the Loudest value.

Vibration Analysis - Banyan Street Subdivision Project

PPV (in/sec) = PPV {ref} * (25/D)^1.5
Where PPV = Peak Particle Velocity
{ref} = PPV at the reference distance of 25 feet
D = distance to the receptor

Equipment =	**Loaded Trucks**	
PPV{ref} =	0.076	in/sec
D =	50	feet
PPV at receptor =	***0.027***	***in/sec***
PPV is 1.7x to 6x larger than RMS velocity		
Assume typical conversion factor of	4	PPV:RMS
Therefore estimated RMS velocity =	***0.007***	***in/sec***
Receptor Lv =	***77***	***VdB***

Equipment =	**Loaded Trucks**	
PPV{ref} =	0.076	in/sec
D =	80	feet
PPV at receptor =	***0.013***	***in/sec***
PPV is 1.7x to 6x larger than RMS velocity		
Assume typical conversion factor of	4	PPV:RMS
Therefore estimated RMS velocity =	***0.003***	***in/sec***
Receptor Lv =	***70***	***VdB***

Equipment =	**Loaded Trucks**	
PPV{ref} =	0.076	in/sec
D =	125	feet
PPV at receptor =	***0.007***	***in/sec***
PPV is 1.7x to 6x larger than RMS velocity		
Assume typical conversion factor of	4	PPV:RMS
Therefore estimated RMS velocity =	***0.002***	***in/sec***
Receptor Lv =	***65***	***VdB***

Equipment =	**Loaded Trucks**	
PPV{ref} =	0.076	in/sec
D =	675	feet
PPV at receptor =	***0.001***	***in/sec***
PPV is 1.7x to 6x larger than RMS velocity		
Assume typical conversion factor of	4	PPV:RMS
Therefore estimated RMS velocity =	***0.000***	***in/sec***
Receptor Lv =	***43***	***VdB***

Source: Section 5 Transit Vibration
Section 6 Vibration Impact Analysis
Section 7 Noise and Vibration during Construction
Transit Noise and Vibration Assessment, September 2018
John A. Volpe National Transportation Systems Center
Prepared For: USDOT Federal Transit Administration

* RMS Velocity in decibels VdB with Vref of 1E-6 in/sec and PPV:RMS of ~4

Criterion

Building Damage	
Type	VdB
Extremely susceptible to vibration damage	90
Non-engineered timber and masonry buildings	94
Engineered concrete and masonry buildings	98
Typical buildings	100
Reinforced concrete, steel, or timber buildings	102

Canmet, Bauer, and Calder, 1977		
Equipment	PPV Threshold, in/sec	Type of Damage
Rigid Mercury Switches	0.5	Trip Out
House	2	Cracked Plaster
Concrete Block	8	Crack in Block
Cased Drill Holes	15	Horizontol Offset
Pumps, Compressors	40	Shaft Misalignment

Human Response Criteria

Level, Lv in VdB	Equivalent Noise Level, dBA		Human Response
	Low Freq (30 Hz)	Mid Freq (60 Hz	
65	25	40	Approximate threshold of perception, low-freq inaudible, but mid-freq excessive for sleeping
75	35	50	Approx. dividing line between barely perceptible and distinctly perceptible. Annoying vibration for most people. Low-freq acceptable for sleeping areas. Mid-freq excessive in most quiet occupied space.
85	45	60	Vibration tolerable only if infrequent number of events/day. Low-freq excessive for sleeping areas; mid-freq excessive even for infrequent events for some activities.

Impact Criteria

Land Use	Lv in VdB		
	Frequent Events (70+/day)	Occasional Events (30-70/day)	Infrequent (<30 events/day)
Category 1: Vibration Sensitive	65	65	65
Concert Halls	65	65	65
TV Studios	65	65	65
Recording Studios	65	65	65
Category 2: Residences, hotels, sleeping areas	72	75	80
Auditoriums	72	80	80
Theaters	72	80	80
Category 3: Institutional with primarily daytime use only (i.e. schools and churches)	75	78	83

Vibration Source Levels For Construction Equipment

Equipment	PPV at 25 ft (in/sec)	Approximate Lv at 25 feet *
Impact Pile Driver - Upper Range	1.518	112
Impact Pile Driver - Typical	0.644	104
Sonic Pile Driver - Upper Range	0.734	105
Sonic Pile Driver - Typical	0.17	93
Clam Shovel Drop (slurry wall construction)	0.202	94
Hydromill (slurry wall construction) - in Soil	0.008	66
Hydromill (slurry wall construction) - in Rock	0.017	75
Vibratory Roller	0.21	94
Hoe Ram	0.089	87
Bulldozer - Large	0.089	87
Bulldozer - Small	0.003	58
Caisson Drilling	0.089	87
Loaded Trucks	0.076	86
Jackhammer	0.035	79

Vibration Analysis - Banyan Street Subdivision Project

PPV (in/sec) = PPV {ref} * (25/D)^1.5
Where PPV = Peak Particle Velocity
{ref} = PPV at the reference distance of 25 feet
D = distance to the receptor

Equipment =	**Bulldozer - Large**		
PPV{ref} =	0.089	in/sec	
D =	50	feet	
PPV at receptor =	***0.031***	***in/sec***	
PPV is 1.7x to 6x larger than RMS velocity			
Assume typical conversion factor of		4	PPV:RMS
Therefore estimated RMS velocity =		***0.008***	***in/sec***
Receptor Lv =		***78***	***VdB***

Equipment =	**Bulldozer - Large**		
PPV{ref} =	0.089	in/sec	
D =	80	feet	
PPV at receptor =	***0.016***	***in/sec***	
PPV is 1.7x to 6x larger than RMS velocity			
Assume typical conversion factor of		4	PPV:RMS
Therefore estimated RMS velocity =		***0.004***	***in/sec***
Receptor Lv =		***72***	***VdB***

Equipment =	**Bulldozer - Large**		
PPV{ref} =	0.089	in/sec	
D =	125	feet	
PPV at receptor =	***0.008***	***in/sec***	
PPV is 1.7x to 6x larger than RMS velocity			
Assume typical conversion factor of		4	PPV:RMS
Therefore estimated RMS velocity =		***0.002***	***in/sec***
Receptor Lv =		***66***	***VdB***

Equipment =	**Bulldozer - Large**		
PPV{ref} =	0.089	in/sec	
D =	675	feet	
PPV at receptor =	***0.001***	***in/sec***	
PPV is 1.7x to 6x larger than RMS velocity			
Assume typical conversion factor of		4	PPV:RMS
Therefore estimated RMS velocity =		***0.000***	***in/sec***
Receptor Lv =		***44***	***VdB***

Source: Section 5 Transit Vibration
Section 6 Vibration Impact Analysis
Section 7 Noise and Vibration during Construction
Transit Noise and Vibration Assessment, September 2018
John A. Volpe National Transportation Systems Center
Prepared For: USDOT Federal Transit Administration

* RMS Velocity in decibels VdB with Vref of 1E-6 in/sec and PPV:RMS of ~4

Criterion

Building Damage	
Type	VdB
Extremely susceptible to vibration damage	90
Non-engineered timber and masonry buildings	94
Engineered concrete and masonry buildings	98
Typical buildings	100
Reinforced concrete, steel, or timber buildings	102

Canmet, Bauer, and Calder, 1977		
Equipment	PPV Threshold, in/sec	Type of Damage
Rigid Mercury Switches	0.5	Trip Out
House	2	Cracked Plaster
Concrete Block	8	Crack in Block
Cased Drill Holes	15	Horizontol Offset
Pumps, Compressors	40	Shaft Misalignment

Human Response Criteria

Level, Lv in VdB	Equivalent Noise Level, dBA: Low Freq (30 Hz)	Equivalent Noise Level, dBA: Mid Freq (60 Hz	Human Response
65	25	40	Approximate threshold of perception, low-freq inaudible, but mid-freq excessive for sleeping
75	35	50	Approx. dividing line between barely perceptible and distinctly perceptible. Annoying vibration for most people. Low-freq acceptable for sleeping areas. Mid-freq excessive in most quiet occupied space.
85	45	60	Vibration tolerable only if infrequent number of events/day. Low-freq excessive for sleeping areas; mid-freq excessive even for infrequent events for some activities.

Impact Criteria

Land Use	Lv in VdB: Frequent Events (70+/day)	Occasional Events (30-70/day)	Infrequent (<30 events/day)
Category 1: Vibration Sensitive	65	65	65
Concert Halls	65	65	65
TV Studios	65	65	65
Recording Studios	65	65	65
Category 2: Residences, hotels, sleeping areas	72	75	80
Auditoriums	72	80	80
Theaters	72	80	80
Category 3: Institutional with primarily daytime use only (i.e. schools and churches)	75	78	83

Vibration Source Levels For Construction Equipment

Equipment	PPV at 25 ft (in/sec)	Approximate Lv at 25 feet *
Impact Pile Driver - Upper Range	1.518	112
Impact Pile Driver - Typical	0.644	104
Sonic Pile Driver - Upper Range	0.734	105
Sonic Pile Driver - Typical	0.17	93
Clam Shovel Drop (slurry wall construction)	0.202	94
Hydromill (slurry wall construction) - in Soil	0.008	66
Hydromill (slurry wall construction) - in Rock	0.017	75
Vibratory Roller	0.21	94
Hoe Ram	0.089	87
Bulldozer - Large	0.089	87
Bulldozer - Small	0.003	58
Caisson Drilling	0.089	87
Loaded Trucks	0.076	86
Jackhammer	0.035	79

Vibration Analysis - Banyan Street Subdivision Project

PPV (in/sec) = PPV {ref} * (25/D)^1.5
Where PPV = Peak Particle Velocity
{ref} = PPV at the reference distance of 25 feet
D = distance to the receptor

Equipment =	**Vibratory Roller**		
PPV{ref} =	0.21	in/sec	
D =	50	feet	
PPV at receptor =	***0.074***	***in/sec***	
PPV is 1.7x to 6x larger than RMS velocity			
Assume typical conversion factor of		4	PPV:RMS
Therefore estimated RMS velocity =		***0.019***	***in/sec***
Receptor Lv =		***85***	***VdB***

Equipment =	**Vibratory Roller**		
PPV{ref} =	0.21	in/sec	
D =	80	feet	
PPV at receptor =	***0.037***	***in/sec***	
PPV is 1.7x to 6x larger than RMS velocity			
Assume typical conversion factor of		4	PPV:RMS
Therefore estimated RMS velocity =		***0.009***	***in/sec***
Receptor Lv =		***79***	***VdB***

Equipment =	**Vibratory Roller**		
PPV{ref} =	0.21	in/sec	
D =	125	feet	
PPV at receptor =	***0.019***	***in/sec***	
PPV is 1.7x to 6x larger than RMS velocity			
Assume typical conversion factor of		4	PPV:RMS
Therefore estimated RMS velocity =		***0.005***	***in/sec***
Receptor Lv =		***73***	***VdB***

Equipment =	**Vibratory Roller**		
PPV{ref} =	0.21	in/sec	
D =	675	feet	
PPV at receptor =	***0.001***	***in/sec***	
PPV is 1.7x to 6x larger than RMS velocity			
Assume typical conversion factor of		4	PPV:RMS
Therefore estimated RMS velocity =		***0.000***	***in/sec***
Receptor Lv =		***51***	***VdB***

Source: Section 5 Transit Vibration
Section 6 Vibration Impact Analysis
Section 7 Noise and Vibration during Construction
Transit Noise and Vibration Assessment, September 2018
John A. Volpe National Transportation Systems Center
Prepared For: USDOT Federal Transit Administration

* RMS Velocity in decibels VdB with Vref of 1E-6 in/sec and PPV:RMS of ~4

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Equipment	PPV Threshold, in/sec	Type of Damage
Rigid Mercury Switches	0.5	Trip Out
House	2	Cracked Plaster
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Cased Drill Holes	15	Horizontol Offset
Pumps, Compressors	40	Shaft Misalignment

Human Response Criteria

	Equivalent Noise Level, dBA		
Level, Lv in VdB	Low Freq (30 Hz)	Mid Freq (60 Hz	Human Response
65	25	40	Approximate threshold of perception, low-freq inaudible, but mid-freq excessive for sleeping
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85	45	60	Vibration tolerable only if infrequent number of events/day. Low-freq excessive for sleeping areas; mid-freq excessive even for infrequent events for some activities.

Impact Criteria

	Lv in VdB		
Land Use	Frequent Events (70+/day)	Occasional Events (30-70/day)	Infrequent (<30 events/day)
Category 1: Vibration Sensitive	65	65	65
Concert Halls	65	65	65
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Recording Studios	65	65	65
Category 2: Residences, hotels, sleeping areas	72	75	80
Auditoriums	72	80	80
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Vibration Source Levels For Construction Equipment

Equipment	PPV at 25 ft (in/sec)	Approximate Lv at 25 feet *
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Sonic Pile Driver - Typical	0.17	93
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Hydromill (slurry wall construction) - in Soil	0.008	66
Hydromill (slurry wall construction) - in Rock	0.017	75
Vibratory Roller	0.21	94
Hoe Ram	0.089	87
Bulldozer - Large	0.089	87
Bulldozer - Small	0.003	58
Caisson Drilling	0.089	87
Loaded Trucks	0.076	86
Jackhammer	0.035	79

Appendix C

HUD DNL Calculator Results

Home (/) > **Programs (/programs/)** > **Environmental Review (/programs/environmental-review/)** > DNL Calculator

DNL Calculator

The Day/Night Noise Level Calculator is an electronic assessment tool that calculates the Day/Night Noise Level (DNL) from roadway and railway traffic. For more information on using the DNL calculator, view the **Day/Night Noise Level Calculator Electronic Assessment Tool Overview (/programs/environmental-review/daynight-noise-level-electronic-assessment-tool/)**.

Note: HUD updated the Calculator December 12, 2017. If you used the Calculator prior to December 12, you may need to clear your cache to perform an accurate calculation. **View instructions to clear your cache (https://support.google.com/accounts/answer/32050)**.

Guidelines

- To display the Road and/or Rail DNL calculator(s), click on the "Add Road Source" and/or "Add Rail Source" button(s) below.
- All Road and Rail input values must be positive non-decimal numbers.
- All Road and/or Rail DNL value(s) must be calculated separately before calculating the Site DNL.
- All checkboxes that apply must be checked for vehicles and trains in the tables' headers.
- **Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
- **Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID	12774 Banyan Street (Rancho Cucamonga)
Record Date	04/30/2018
User's Name	Rincon Consultants, Inc.

Road # 1 Name:	**Banyan Street b/w Bluegrass Avenue and Etiwanda Avenue - Existing**

Road #1

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☐
Effective Distance	25	25	

Effective Distance	25	25	
Distance to Stop Sign			
Average Speed	40	40	
Average Daily Trips (ADT)	14850	150	
Night Fraction of ADT	15	15	
Road Gradient (%)			
Vehicle DNL	71.7	61.7437	
Calculate Road #1 DNL	72.1044	Reset	

Road # 2 Name: **Banyan Street b/w Bluegrass Avenue and Etiwanda Avenue - Plus Proje**

Road #2

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☐
Effective Distance	25	25	
Distance to Stop Sign			
Average Speed	40	40	
Average Daily Trips (ADT)	14936	150	
Night Fraction of ADT	15	15	
Road Gradient (%)			
Vehicle DNL	71.7251	61.7437	
Calculate Road #2 DNL	72.127	Reset	

Add Road Source | Add Rail Source

Airport Noise Level

Loud Impulse Sounds?	◯Yes ◯No
Combined DNL for all Road and Rail sources	0
Combined DNL including Airport	
Site DNL with Loud Impulse Sound	

Calculate

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
  - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
  - Incorporate natural or man-made barriers. See ***The Noise Guidebook (/resource/313/hud-noise-guidebook/)***
  - Construct noise barrier. See the **Barrier Performance Module (/programs/environmental-review/bpm-calculator/)**

Tools and Guidance

Day/Night Noise Level Assessment Tool User Guide (/resource/3822/day-night-noise-level-assessment-tool-user-guide/)

Day/Night Noise Level Assessment Tool Flowcharts (/resource/3823/day-night-noise-level-assessment-tool-flowcharts/)

Appendix D

Manufacturer Specifications

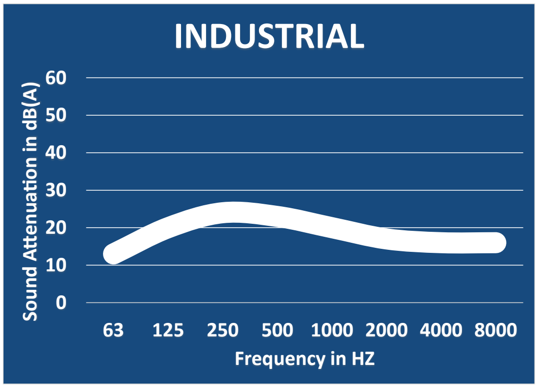
NETT TECHNOLOGIES INC.

www.nettinc.com sales@nettinc.com +1 (905) 672-5453

Industrial Grade Silencers

Model NTIN-C (Cylindrical), 15-20 dBA

TYPICAL ATTENUATION CURVE



Nett Technologies' Industrial Grade Silencers are designed to achieve maximum performance with the least amount of backpressure.
The silencers are Reactive Silencers and are typically used for reciprocating or positive displacement engines where noise level regulations are low.

FEATURES & BENEFITS

- Over 25 years of excellence in manufacturing noise and emission control solutions
- Compact modular designs providing ease of installations, less weight and less foot-print
- Responsive lead time for both standard and custom designs to meet your needs
- Customized engineered systems solutions to meet challenging integration and engine requirements

Contact Nett Technologies with your projects design requirements and specifications for optimized noise control solutions.

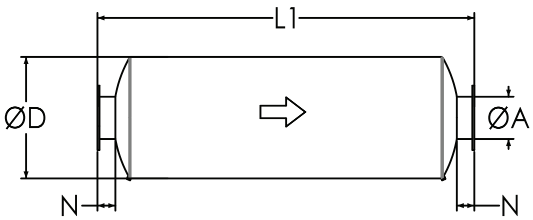
OPTIONS

- Versatile connections including ANSI pattern flanges, NPT, slip-on, engine flange, schedule 40 and others
- Aluminized Steel, Stainless Steel 304 or 316 construction
- Horizontal or vertical mounting brackets and lifting lugs

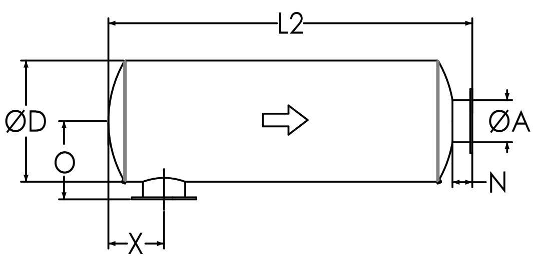
ACCESSORIES

- Hardware Kits
- Flexible connectors and expansion joints
- Elbows
- Thimbles
- Raincaps
- Thermal insulation: integrated or with thermal insulation blankets
- Please see our accessories catalog for a complete listing

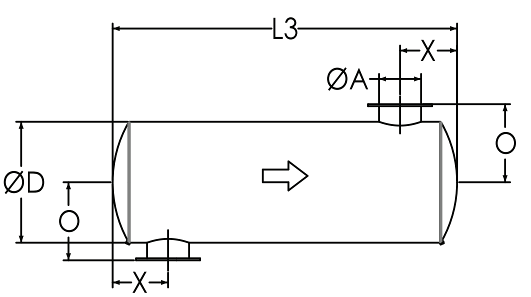
TYPICAL CONFIGURATIONS



END IN END OUT (EI-EO)



SIDE IN END OUT (SI-EO)



SIDE IN SIDE OUT (SI-SO)

PRODUCT DIMENSIONS (in)

Model*	A	D	L1	L2	L3	X**	X	N	O
	Outlet	Dia	EI-EO	SI-EO	SI-SO	Min	Max	Nipple	O
NTIN-C1	1	4	20	18	16	3	7	2	4
NTIN-C1.5	1.5	6	22	20	18	3	8	2	5
NTIN-C2	2	6	22	19	16	3	8	3	6
NTIN-C2.5	2.5	6	24	21	18	4	9	3	6
NTIN-C3	3	8	26	23	20	5	10	3	7
NTIN-C3.5	3.5	9	28	25	22	5	11	3	8
NTIN-C4	4	10	32	29	26	5	12	3	8
NTIN-C5	5	12	36	33	30	6	14	3	9
NTIN-C6	6	14	40	36	32	7	16	4	11
NTIN-C8	8	16	50	46	42	8	21	4	12
NTIN-C10	10	20	52	48	44	11	21	4	14
NTIN-C12	12	24	62	58	54	12	26	4	16
NTIN-C14	14	30	74	69	64	15	31	5	20
NTIN-C16	16	36	82	77	72	18	35	5	23
NTIN-C18	18	40	94	89	84	18	42	5	25
NTIN-C20	20	40	110	105	100	19	52	5	25
NTIN-C22	22	48	118	113	108	22	56	5	29
NTIN-C24	24	48	130	125	120	24	62	5	29

* Other models and custom designs are available upon request. Dimensions subject to change without notice. All silencers are equipped with drain ports on inlet side. The silencer is all welded construction and coated with high heat black paint for maximum durability.

** Standard inlet/outlet position.

Appendix E

HUD Barrier Performance Module Results

Site Prep Barrier Calculations

Input Variables	
Reference Noise Level (dBA)	66
Reference Distance (ft)	280
Site Conditions *(Choice: Hard or Soft)*	Hard

Output Calculations

Distance from Barrier to Source (ft)	Distance from Barrier to Receiver (ft)	Distance from Source to Receiver (ft)	Height of Source (ft)	Height of Wall (ft)	Height of Receiver (ft)	Noise Level Reduction (dBA)	Unabated Noise Level (dBA)	Resultant Noise Level (dBA)
250	30	280	10	10	5	9.2	66.0	57
250	65	315	10	10	5	7.1	65.0	58
250	675	925	10	10	5	5.1	55.6	51

Grading Barrier Calculations

Input Variables	
Reference Noise Level (dBA)	68
Reference Distance (ft)	280
Site Conditions *(Choice: Hard or Soft)*	Hard

Output Calculations

Distance from Barrier to Source (ft)	Distance from Barrier to Receiver (ft)	Distance from Source to Receiver (ft)	Height of Source (ft)	Height of Wall (ft)	Height of Receiver (ft)	Noise Level Reduction (dBA)	Unabated Noise Level (dBA)	Resultant Noise Level (dBA)
250	30	280	10	10	5	9.2	66.0	57
250	65	315	10	10	5	7.1	65.0	58
250	675	925	10	10	5	5.1	55.6	51

Barrier Performance Module

This module provides to the user a measure on the barrier's effectiveness on noise reduction. A list of the input/output variables and their definitions, as well as illustrations of different scenarios are provided.

Calculator

View Day/Night Noise Level Calculator (/programs/environmental-review/dnl-calculator/)

View Descriptions of the Input/Output variables.

Note: Tool tips, containing field specific information, have been added in this tool and may be accessed by hovering over the Input and Output variables with the mouse.

WARNING: If there is direct line-of-sight between the Source and the Observer, the module will report erroneous attenuation. “Direct line-of-sight” means if the 5’ tall Observer can see the noise Source (cars, trucks, trains, etc.) over the Barrier (wall, hill/excavation, building, etc.), the current version of Barrier Performance Module will not accurately calculate the attenuation provided. In this instance, there is unlikely to be any appreciable attenuation.

Road/Rail Site DNL:

Note: Barrier height must block the line of sight

Input Data

H	6	**R1**	30
S	5	**D1**	20
O	5	**α**	140

Calculate Output

Output Data

h	1	**R**	30
D	20	**FS**	4.5736

New Site DNL:

-4.5736

Refresh

Note: If you have separate Road and Rail DNL values, please enter the values below to calculate the new site DNL:

Road DNL:

Rail DNL:

Calculate

Combined New Site DNL:

Input/Output Variables

Input Variables

The following variables and definitions from the barrier being assessed are the input required for the web-based barrier performance module:

- H = Barrier Height
- S = Noise Source Height
- O = Observer Height (known as the receiver)
- R^1 = Distance from Noise Source to Barrier
- D^1 = Distance from the Observer to the Barrier
- α = Line of sight angle between the Observer and the Noise Source, subtended by the barrier at observer's location

Output Variables

Definitions of the output variables from the mitigation module of the Day/Night Noise Level Assessment Tools as part of the Assessment Tools for Environmental Compliance:

- h = The shortest distance from the barrier top to the line of sight from the Noise source to the Observer.
- R = Slant distance along the line of sight from the Barrier to the Noise Source
- D = Slant distance along the line of sight from the Barrier to the Observer

The "actual barrier performance for barriers of finite length" is noted on the worksheets(in the Guidebook) as **FS**.