Bloomington Commercial Center Project

Noise and Vibration Study

prepared for

County of San Bernardino
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San Bernardino, CA 92415

prepared by

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1 Project Description and Impact Summary

1.1 Introduction

This study analyzes the potential noise and vibration impacts of the proposed Bloomington Commercial Center Project (project) in the community of Bloomington, San Bernardino County, California. Rincon Consultants, Inc. (Rincon) prepared this 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 project's noise and vibration impacts related to both temporary construction activity and long-term operation of the project. Table 1 provides a summary of project impacts.

Table 1 Summary of Impacts

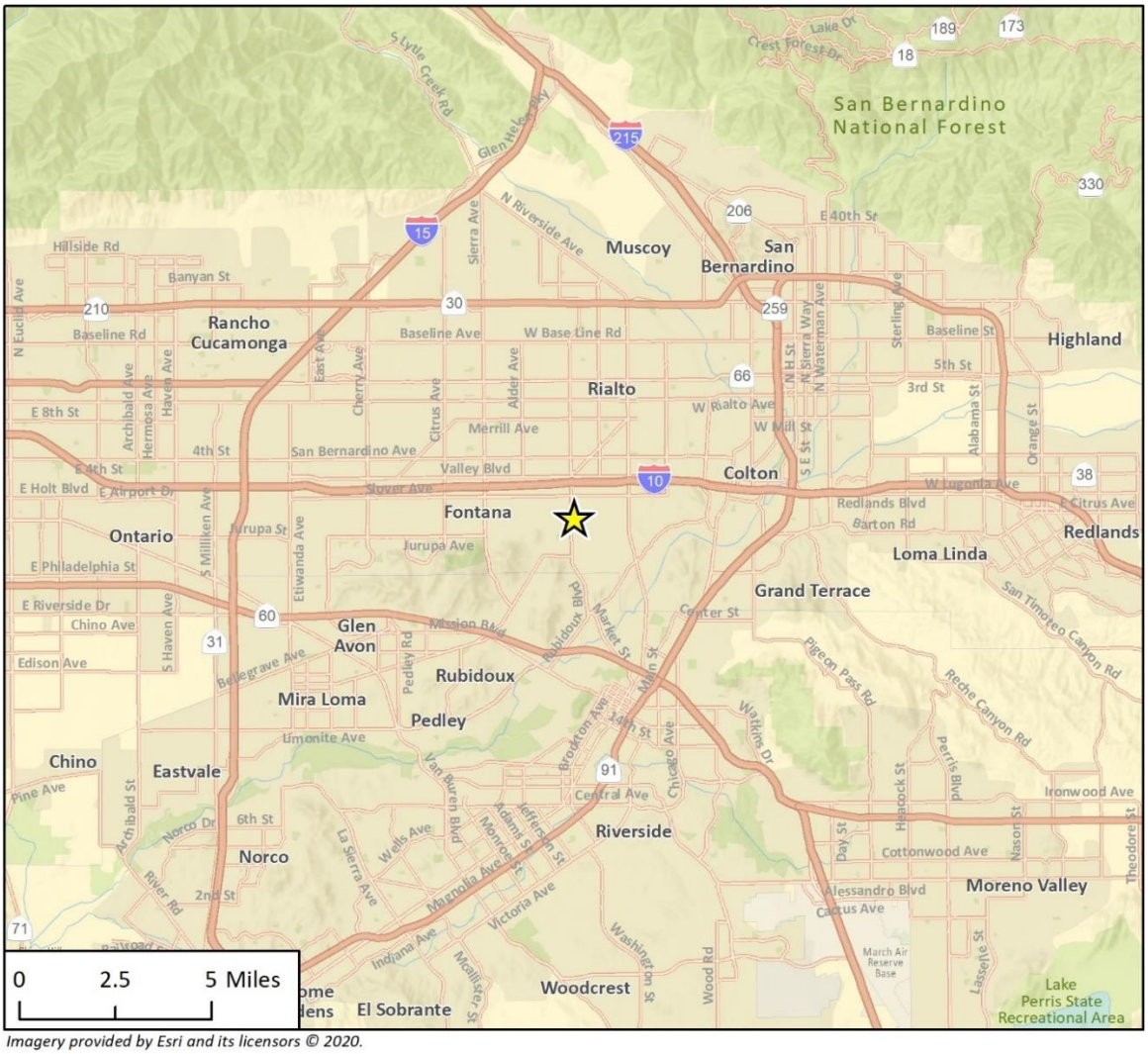
Impact Statement	Level of Significance	Applicable Recommendations
Would the project result in generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	Less than significant impact (Construction) Less than significant impact (Operation)	None
Would the project result in the exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	Less than significant impact (Construction) Less than significant impact (Operation)	None
For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	No Impact	None

1.2 Project Summary

Project Location

The project site is located on the southeast corner of Santa Ana Avenue and Cedar Avenue in the unincorporated community of Bloomington within the County of San Bernardino (County). The project site is located within the City of Rialto Sphere of Influence and is zoned Bloomington/Single Residential one-acre minimum/Additional Agriculture (BL/RS-1-AA) per the County of San Bernardino Development Code. The approximately 8.9-acre project site is currently vacant and is bounded by Santa Ana Avenue and a mobile home park to the north, vacant land to the east and south, and Cedar Avenue and commercial uses to the west. The project local study area is shown in Figure 1.

Figure 1 Regional Location



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Project Location

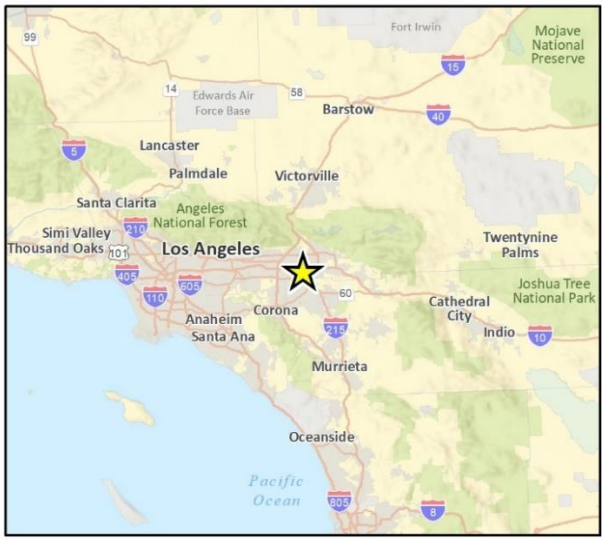

Figure 2 Project Location

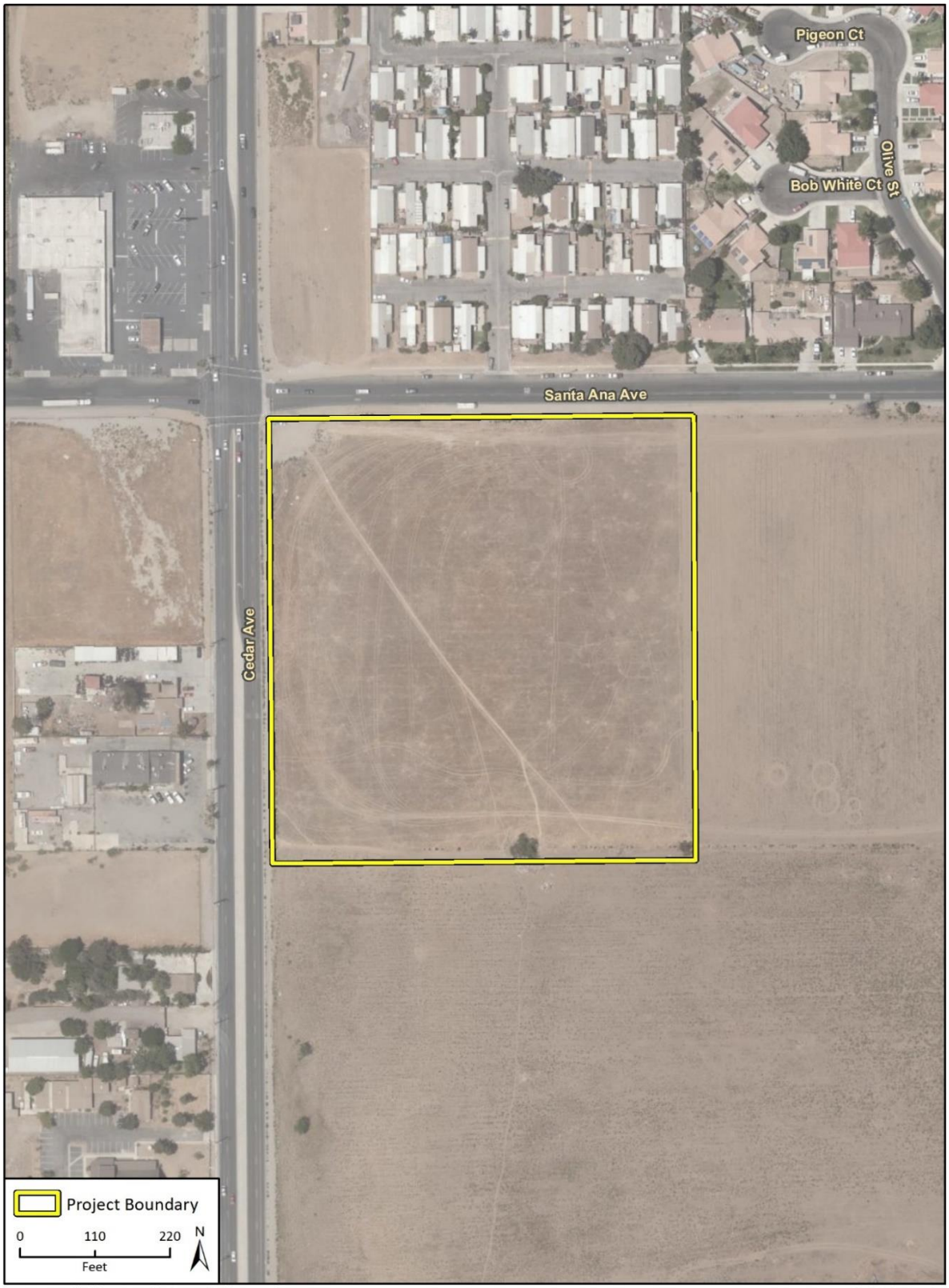

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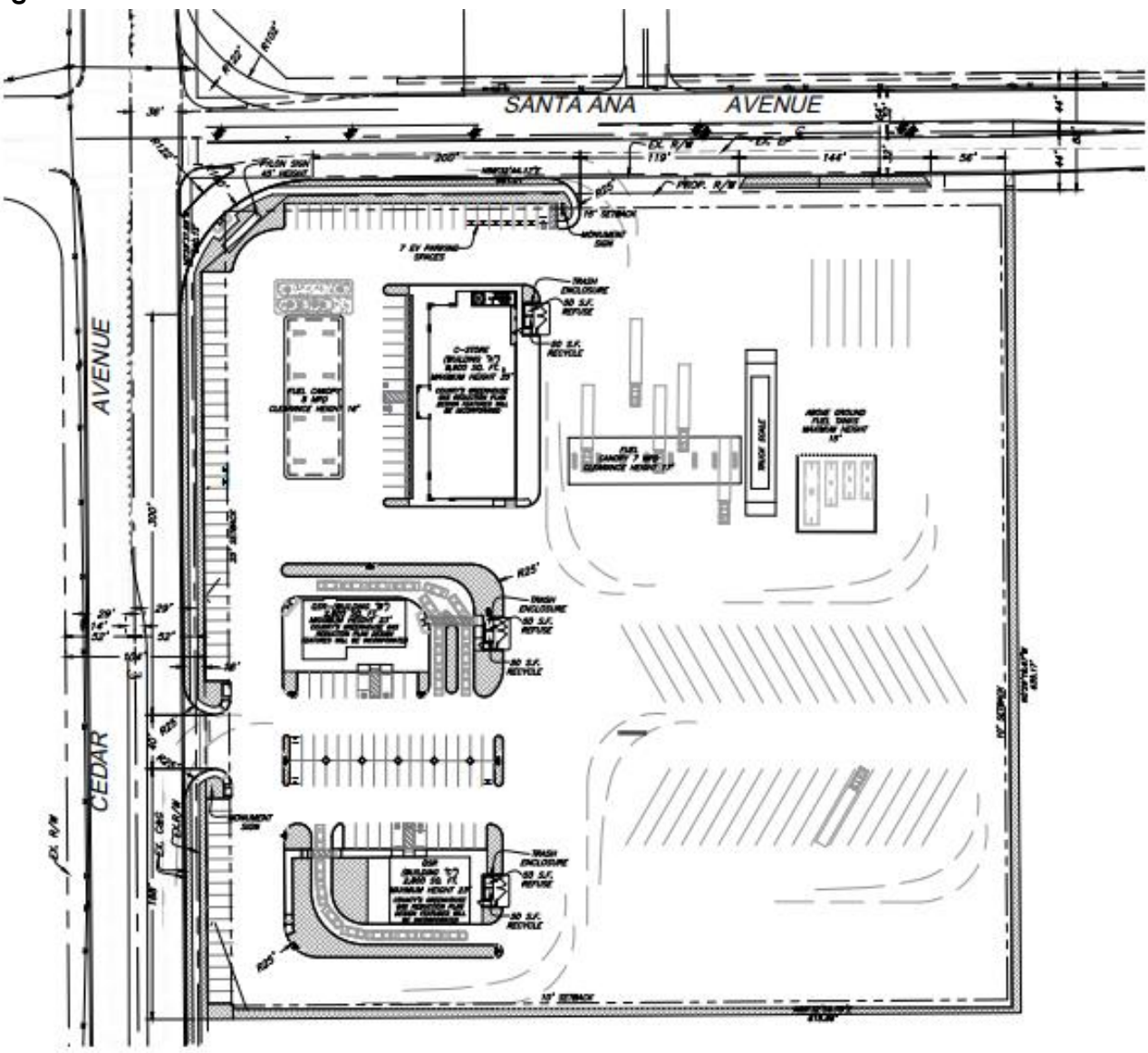
Figure 3 Site Plan



Project Description

The proposed project consist of a gas station with two fuel canopies that includes a 8 Multiple Product Dispensers (MPD) automobile fuel station under one canopy and a 7 MPD truck fuel station under the second canopy with a truck scale, in addition to an approximate 11,400 square foot (SF) convenience store; one (1) 3,000 SF quick service restaurant with a drive thru; and one (1) 2,800 SF quick service restaurant with a drive thru. In addition, a total of 149 parking spaces would be provided onsite that includes 10 ADA parking spaces and 40 truck parking spaces. The proposed site plan is shown in Figure 3.

2 Background

2.1 Overview of Sound Measurement

Sound is a vibratory disturbance created by a moving or vibrating source, which is capable of being detected by the hearing organs. Noise is defined as sound that is loud, unpleasant, unexpected, or undesired and may therefore be classified as a more specific group of sounds. The effects of noise on people can include general annoyance, interference with speech communication, sleep disturbance, and, in the extreme, hearing impairment (Caltrans 2013a).

Noise levels are commonly 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 so that they are consistent with the human hearing response, which is most sensitive to frequencies around 4,000 Hertz and less sensitive to frequencies around and below 100 Hertz (Kinsler, et. al. 1999). Decibels are measured on a logarithmic scale that quantifies sound intensity in a manner similar to the Richter scale used to measure earthquake magnitudes. A doubling of the energy of a noise source, such as doubling of traffic volume, would increase the noise level by 3 dB; dividing the energy in half would result in a 3 dB decrease (Crocker 2007).

Human perception of noise has no simple correlation with sound energy: the perception of sound is not linear in terms of dBA or in terms of sound energy. Two sources do not "sound twice as loud" as one source. It is widely accepted that the average healthy ear can barely perceive changes of 3 dBA, increase or decrease (i.e., twice the sound energy); that a change of 5 dBA is readily perceptible (8 times the sound energy); and that an increase (or decrease) of 10 dBA sounds twice (half) as loud ([10.5x the sound energy] Crocker 2007).

Sound changes in both level and frequency spectrum as it travels from the source to the receiver. The most obvious change is the decrease in level as the distance from the source increases. The manner by which noise reduces with distance depends on factors such as the type of sources (e.g., point or line, the path the sound will travel, site conditions, and obstructions). Noise levels from a point source typically attenuate, or drop off, at a rate of 6 dBA per doubling of distance (e.g., construction, industrial machinery, ventilation units). Noise from a line source (e.g., roadway, pipeline, railroad) typically attenuates at about 3 dBA per doubling of distance (Caltrans 2013a). The propagation of noise is also affected by the intervening ground, known as ground absorption. A hard site, such as a parking lot or smooth body of water, receives no additional ground attenuation and the changes in noise levels with distance (drop-off rate) result from simply the geometric spreading of the source. An additional ground attenuation value of 1.5 dBA per doubling of distance applies to a soft site (e.g., soft dirt, grass, or scattered bushes and trees) (Caltrans 2013a). Noise levels may also be reduced by intervening structures; the amount of attenuation provided by this "shielding" depends on the size of the object and the frequencies of the noise levels. Natural terrain features such as hills and dense woods, and man-made features such as buildings and walls, can significantly alter noise levels. Generally, any large structure blocking the line of sight will provide at least a 5-dBA reduction in source noise levels at the receiver (Federal Highway Administration [FHWA] 2011). Structures can substantially reduce exposure to noise as well. The FHWA's guidelines indicate that

modern building construction generally provides an exterior-to-interior noise level reduction of 20 to 35 dBA with closed windows.

The impact of noise is not a function of loudness alone. The time of day when noise occurs and the duration of the noise are also important factors of project noise impact. Most noise that lasts for more than a few seconds is variable in its intensity. Consequently, a variety of noise descriptors have been developed. One of the most frequently used noise metrics is the equivalent noise level (L_{eq}); it considers both duration and sound power level. L_{eq} is defined as the single steady A-weighted level equivalent to the same amount of energy as that contained in the actual fluctuating levels over time. Typically, L_{eq} is summed over a one-hour period. L_{max} is the highest root mean squared (RMS) sound pressure level within the sampling period, and L_{min} is the lowest RMS sound pressure level within the measuring period (Crocker 2007).

Noise that occurs at night tends to be more disturbing than that occurring during the day. Community noise is usually measured using Day-Night Average Level (L_{dn}), which is the 24-hour average noise level with a +10 dBA penalty for noise occurring during nighttime (10:00 p.m. to 7:00 a.m.) hours. It is also measured using CNEL, which is the 24-hour average noise level with a +5 dBA penalty for noise occurring from 7:00 p.m. to 10:00 p.m. and a +10 dBA penalty for noise occurring from 10:00 p.m. to 7:00 a.m. (Caltrans 2013a). Noise levels described by L_{dn} and CNEL usually differ by about 1 dBA. The relationship between the peak-hour L_{eq} value and the L_{dn}/CNEL depends on the distribution of traffic during the day, evening, and night. Quiet suburban areas typically have CNEL noise levels in the range of 40 to 50 dBA, while areas near arterial streets are in the 50 to 60-plus CNEL range. Normal conversational levels are in the 60 to 65-dBA L_{eq} range; ambient noise levels greater than 65 dBA L_{eq} can interrupt conversations (FTA 2018).

According to Caltrans, for traffic noise L_{dn} is approximately equal to the peak hour traffic L_{eq} (Caltrans 2013a). Caltrans' general rule is that L_{dn} is within 2 dBA of the peak hour traffic L_{eq} (Caltrans 2013a).

2.2 Vibration

Groundborne vibration of concern in environmental analysis consists of the oscillatory waves that move from a source through the ground to adjacent structures. The number of cycles per second of oscillation makes up the vibration frequency, described in terms of Hz. The frequency of a vibrating object describes how rapidly it oscillates. The normal frequency range of most groundborne vibration that can be felt by the human body starts from a low frequency of less than 1 Hz and goes to a high of about 200 Hz (Crocker 2007).

While people have varying sensitivities to vibrations at different frequencies, in general they are most sensitive to low-frequency vibration. Vibration in buildings, such as from nearby construction activities, may cause windows, items on shelves, and pictures on walls to rattle. Vibration of building components can also take the form of an audible low-frequency rumbling noise, referred to as groundborne noise. Groundborne noise is usually only a problem when the originating vibration spectrum is dominated by frequencies in the upper end of the range (60 to 200 Hz), or when foundations or utilities, such as sewer and water pipes, physically connect the structure and the vibration source (Federal Transit Administration [FTA] 2018). Although groundborne vibration is sometimes noticeable in outdoor environments, it is almost never annoying to people who are outdoors. The primary concern from vibration is that it can be intrusive and annoying to building occupants and vibration-sensitive land uses.

Vibration energy spreads out as it travels through the ground, causing the vibration level to diminish with distance away from the source. High-frequency vibrations diminish much more rapidly than low frequencies, so low frequencies tend to dominate the spectrum at large distances from the source. Discontinuities in the soil strata can also cause diffractions or channeling effects that affect the propagation of vibration over long distances (Caltrans 2013b). When a building is impacted by vibration, a ground-to-foundation coupling loss will usually reduce the overall vibration level. However, under rare circumstances, the ground-to-foundation coupling may actually amplify the vibration level due to structural resonances of the floors and walls.

Vibration amplitudes are usually expressed in peak particle velocity (PPV) or root mean squared (RMS) vibration velocity. The PPV and RMS velocity are normally described in inches per second (in/sec). PPV is defined as the maximum instantaneous positive or negative peak of a vibration signal. PPV is often used in monitoring of blasting vibration because it is related to the stresses that are experienced by buildings (Caltrans 2013b).

2.3 Sensitive Receivers

Noise exposure goals for various types of land uses reflect the varying noise sensitivities associated with those uses. Noise sensitive land uses typically include: residences, schools, libraries, churches, hospitals, and other medical facilities Uses less sensitive to excessive noise disturbance include commercial and light industrial uses, conventional hotels and motels, children's play areas, playgrounds, neighborhood ballparks, and other outdoor spectator sport arenas. Sensitive receivers nearest to the project site include single-family residences and mobile homes to the north across Santa Ana Drive.

2.4 Project Noise Setting

To determine the existing noise levels, noise measurements were taken in the vicinity of the project site on Tuesday, May 19, 2020 and Wednesday, May 20, 2020. The locations were selected in order to obtain noise levels at the nearest residential uses. The noise measurements were taken using three Larson Davis Model LXT1Type1 sound level meters programmed in "slow" mode to record the sound pressure level at 1-secondintervalsfor24 hours in "A" weighted form. The sound level meters and microphones were mounted on fences in the vicinity of nearby homes to the project site, were placed between four and six feet above the ground. The noise meters were calibrated before and after the monitoring using a Larson Davis Cal 200 calibrator.

The field survey noted that noise within the proposed project area is generally characterized by vehicle traffic on Cedar Avenue, which is located adjacent to the west side of the project site and Santa Ana Avenue, which is located adjacent to the north side of the project site. The noise monitoring locations were selected in order to obtain noise levels at the nearest residential uses to the project site. Descriptions and results of the noise monitoring sites are provided below in Table 2.

Table 2 Existing (Ambient) Noise Level Measurements

Site No.	Site Description	Average (dBA L_{eq})		1-hr Average (dBA L_{eq}/Time)		
		Daytime	Nighttime	Maximum		Average (dBA CNEL)
1	Located north of project site, near southwest corner of mobile home park, approximately 60 feet north of Santa Ana Avenue centerline.	66.2	59.3	54.6 1:31 a.m.	70.6 7:26 p.m.	68.8
2	Located northeast of project site, on west property line of home at 18824 Santa Ana Avenue, approximately 55 feet north of Santa Ana Avenue centerline.	63.3	56.5	51.2 1:17 a.m.	64.6 1:32 p.m.	65.6
3	Located southwest of the project site, north of home at 11034 Cedar Avenue, approximately 60 feet west of Cedar Avenue centerline.	72.4	66.9	63.3 12:56 a.m.	73.5 4:00 p.m.	75.5

Daytime defined as 8:00 a.m. to 10:00 p.m. (Section 83.01.080 of the Municipal Code)
Nighttime define as 10:01 p.m. to 8:01 a.m. (Section 83.01.080 of the Municipal Code)

2.5 Regulatory Setting

Federal Regulations

Although the proposed project is not under the jurisdiction of the FTA, the FTA is the only agency that provides guidance on construction noise and recommends developing construction noise criteria on a project-specific basis that utilizes local noise ordinances if possible. However, local noise ordinances usually relate to nuisance and hours of allowed activity and sometimes specify limits in terms of maximum levels but are generally not practical for assessing the noise impacts of a construction project. Project construction noise criteria should take into account the existing noise environment, the absolute noise levels during construction activities, the duration of the construction, and the adjacent land uses. The FTA standards are based on extensive studies by the FTA and other governmental agencies on the human effects and reaction to noise and a summary of the FTA findings for a detailed construction noise assessment are provided in Table 3.

Table 3 FTA Construction Noise Criteria

Land Use	Day (dBA L_{eq})	Night (dBA L_{eq})	30-day Average (dBA L_{dn})
Residential	80	70	75
Commercial	85	85	80
Industrial	90	90	85

Source: FTA 2018.

County of San Bernardino General Plan

The following applicable goals and policies to the proposed project are from the Noise Element of the General Plan.

Goal N1: The County will abate and avoid excessive noise exposures through noise mitigation measures incorporated into the design of new noise-generating and new noise-sensitive land uses, while protecting areas within the County where the present noise environment is within acceptable limits.

Policies:

N1.1: Designate areas within San Bernardino County as "Noise impacted" if exposed to existing or projected future exterior noise levels from mobile or stationary sources exceeding the standards listed in Chapter 83.01 of the Development Code.

N1.3: When industrial, commercial, or other land uses, including locally regulated noise sources, are proposed from areas containing noise-sensitive land uses, noise levels generated by the proposed use will not exceed the performance standards within outdoor activity areas. If outdoor activities areas have not yet been determined, noise levels shall not exceed the performance standards listed in Chapter 83.01 of the Development Code at the boundary of areas planned or zoned for residential or other noise-sensitive land uses.

N1.5: Limit truck traffic in residential and commercial areas to designated truck routes; limit construction, delivery, and through-truck traffic to designated routes; and distribute maps of approved truck routes to County traffic officers.

N1.6: Enforce the hourly noise-level performance standards for stationary and other locally regulated sources, such as industrial, recreational, and contraction activities as well as mechanical and electrical equipment.

N1.7: Prevent incompatible land uses, by reason or excessive noise levels, from occurring in the future.

County of San Bernardino Code of Ordinances

Section 81.010.080 establishes standards concerning acceptable noise levels for both noise-sensitive land uses and for noise-generating land uses.

(a) Noise Measurement. Noise shall be measured:

   a. At the property line of the nearest site that is occupied by, and/or zoned or designated to allow the development of noise sensitive land uses;

   b. With a sound level meter that meets the standard of the American National Standards Institute (ANSI Section S14-1979, Type 1 or Type 2);

   c. Using the "A" weighted sound pressure level scale in decibels (ref. Pressure = 20 micronewton per meter squared). The unit of measure shall be designated as dB(A).

(b) Noise Impacted Areas. Areas within the County shall be designed as "noise-impacted" if exposed to existing or projected future exterior noise levels from mobile or stationary sources exceeding the standards listed in Subdivision (d) (Noise Standards for Stationary Noise Sources) and Subdivision (e) (Noise Standards for Adjacent Mobile Noise Sources),

below. New development of residential or other noise-sensitive land uses shall not be allowed in noise-impacted areas unless effective mitigation measures are incorporated into the project design to reduce noise levels to these standards. Noise-sensitive land uses shall include residential uses, schools, hospitals, nursing homes, religious institutions, libraries, and similar uses.

(c) Noise Standards for Stationary Noise Sources

a. Noise Standards. Table 4 describes the noise standard for emanations from a stationary noise source, as it affects adjacent properties.

Table 4 Community Noise Exposure

Affected Land Uses (Receiving Noise)	7 a.m. - 10 p.m.	10 p.m. - 7 p.m.
Residential	55 dBA	45 dBA
Professional Services	55 dBA	55 dBA
Other Commercial	60 dBA	60 dBA
Industrial	70 dBA	70 dBA

Source: County of San Bernardino 2020

(d) Noise standards for adjacent Mobile Noise Sources. Noise from mobile sources shall be mitigated for any new development to a level that shall not exceed the standards described in Table 5.

Table 5 County of San Bernardino Noise Standards for Mobile Noise Sources

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

Notes: The indoor environment shall exclude bathrooms, kitchens, toilets, closets and corridors. The outdoor environment shall be limited to: hospital office building patios, hotel and motel recreation areas, mobile home parks, multi-family private patios or balconies, park picnic areas, private yard of single-family dwellings, school playgrounds. An exterior noise level of up to 65 dBA (or CNEL) shall be allowed provided exterior noise levels have been substantially mitigated through a reasonable application of the best available noise reduction technology, and interior noise exposure does not exceed 45 dBA (or CNEL) with windows and doors closed. Requiring that windows and doors remain closed to achieve an acceptable interior noise level shall necessitate the use of air condition or mechanical ventilation.

Source: County of San Bernardino, 2020.

(a) Increases in Allowable Noise Levels. If the measured ambient levels exceed any of the first four noise limit categories in Subdivision (d)(2), the allowable noise exposure standard shall be increased to reflect the ambient noise level. If the ambient noise level exceeds the fifth noise limit category in Subdivision (d)(2), the maximum allowable noise levels under this category shall be increased to reflect the maximum ambient noise level.

(b) Reductions in Allowable Noise Levels. If the alleged offense consists entirely of impact noise or simple tone noise, each of the noise levels in Table 4 shall be reduced by five dBA.

(c) Exempt Noise. The following sources of noise shall be exempt from the regulations of this section:

    a. Motor vehicles not under the control of the commercial or industrial use.

    b. Emergency equipment, vehicles, and devices.

    c. Temporary construction, maintenance, repairs, or demolition activities between 7:00 a.m. and 7:00 p.m., except Sundays and Federal Holidays.

(d) Noise Standards for other Structures. All other structures shall sound attenuate against the combined input of all present and projected exterior noise to not exceed the criteria.

Table 6 County of San Bernardino Noise Standards for Other Structures

Typical Uses	12-Hour Equivalent Sound Level (Interior) in dBA L_{dn}
Education, institutions, libraries, meeting facilities, etc.	45
General office, reception, etc.	50
Retail stores, restaurants, etc.	55
Other areas for manufacturing, assembly, testing, warehousing, etc.	65

Source: County of San Bernardino, 2020

In addition, the average of the maximum levels on the loudest intrusive sounds occurring during a 24-hour period shall not exceed an interior noise level 65 dBA.

Section 83.010.090, Vibration, of the County Code states that no ground vibration shall be allowed that can be felt without the aid of instruments at or beyond the lot line, nor shall any vibration be allowed which produces a particle velocity greater than or equal to two-tenths in/sec. measured at or beyond the lot line: Temporary construction, maintenance, repair, or demolition activities between 7:00 a.m. and 7:00 p.m., except Sundays and Federal holidays, is exempt from this limit.

3 Methodology

3.1 Construction Noise

Construction noise was estimated using the FHWA Roadway Construction Noise Model (RCNM) (FHWA 2006). RCNM predicts construction noise levels for a variety of construction operations based on empirical data and the application of acoustical propagation formulas. Using RCNM, construction noise levels were estimated at noise sensitive receivers near the project site. RCNM provides reference noise levels for standard construction equipment, with an attenuation of 6 dBA per doubling of distance for stationary equipment.

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 of the activity to determine the L_{eq} of the operation (FHWA 2018). 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 will have higher continuous noise levels than others, and some have high-impact noise levels.

Construction noise would typically be higher during the heavier periods of initial construction (i.e., site preparation and grading work) and would be lower during the later construction phases (i.e., interior building construction). Typical heavy construction equipment during project grading and site preparation would include small dozers and excavators. It is assumed that diesel engines would power all construction equipment. Construction equipment would not all operate at the same time or location. In addition, construction equipment would not be in constant use during the 8-hour operating day. A dozer and excavator were analyzed together for construction noise impacts due to their likelihood of being used in conjunction with one another and therefore a conservative scenario for the greatest noise generation during construction. Using RCNM to estimate noise associated with a dozer and excavator, noise levels are calculated to be 74 dBA L_{eq} at 100 feet.

3.2 Traffic Noise

Vehicular noise is a combination of the noise produced by the engine, exhaust and tires. The level of traffic noise depends on three primary factors: the volume of traffic, the speed of traffic, and the number of trucks in the flow of traffic. The proposed project does not propose any uses that would require a substantial number of truck trips and the proposed project would not alter the speed limit on any existing roadway so the proposed project's potential offsite noise impacts have been focused on the noise impacts associated with the change of volume of traffic that would occur with development of the proposed project.

The potential offsite traffic noise impacts created by the ongoing operations of the proposed project have been analyzed through utilization of the FHWA model. The project's potential offsite traffic noise impacts have been analyzed for the existing year, opening year 2021, and horizon year 2040 conditions. The model parameters for each roadway are in Table 7, the roadway volumes are in Table 8,and the roadway vehicles mixes are in Table 9. Roadway volumes are from the traffic report

prepared by Minagar & Associates, Inc. (2020). All vehicles analyzed at the single lane equivalent acoustic center of the roadway being analyzed. For vehicle height, autos analyzed at road grade, medium trucks at 2.3 feet above road grade, and heavy trucks at 8 feet above road grade. The elevations were determined through a noise-weighted average of the elevation of the exhaust pipe, tires, and mechanical parts in the engine, with the primary noise emitters from a vehicle.

Table 7 Traffic Roadway Volumes

Roadway	Segment	Vehicle Speed (MPH)	Distance to Nearest Receptor
Linden Avenue	North of Santa Ana Avenue	25	60
Linden Avenue	South of Santa Ana Avenue	25	45
Cedar Avenue	North of Slover Avenue	45	55
Cedar Avenue	North of Santa Ana Avenue	45	65
Cedar Avenue	South of Project Driveway 1	45	65
Cedar Avenue	South of Jurupa Avenue	45	75
Larch Avenue	North of Santa Ana Avenue	35	55
Larch Avenue	South of Santa Ana Avenue	35	70
Slover Avenue	West of Cedar Avenue	50	55
Slover Avenue	East of Cedar Avenue	50	65
Santa Ana Avenue	West of Linden Avenue	40	70
Santa Ana Avenue	West of Cedar Avenue	40	80
Santa Ana Avenue	East of Cedar Avenue	40	75
Santa Ana Avenue	East of Larch Avenue	40	70
Jurupa Avenue	West of Cedar Avenue	40	55
Jurupa Avenue	East of Cedar Avenue	40	50

Distance measured from nearest residential structure to centerline of roadway.

Source: Minagar & Associates, Inc. 2020

Table 8 Traffic Model Parameters

		Average Daily Traffic Volumes					
Roadway	Segment	Existing	Existing + Project	Year 2021 No Project	Year 2021 + Project	Year 2040 No Project	Year 2040 + Project
Linden Avenue	North of Santa Ana Avenue	4,430	4,590	7,520	7,680	10,320	10,480
Linden Avenue	South of Santa Ana Avenue	5,140	5,300	8,280	8,440	11,340	11,500
Cedar Avenue	North of Slover Avenue	10,260	12,183	23,210	25,133	35,900	37,823
Cedar Avenue	North of Santa Ana Avenue	10,200	12,764	22,910	25,474	33,310	35,874
Cedar Avenue	South of Project Driveway 1	11,030	12,633	23,170	24,773	33,120	34,723
Cedar Avenue	South of Jurupa Avenue	10,400	11,201	14,300	15,101	35,170	35,791
Larch Avenue	North of Santa Ana Avenue	3,670	3,830	3,790	3,950	5,270	5,430
Larch Avenue	South of Santa Ana Avenue	2,620	2,780	2,710	2,870	4,140	4,300
Slover Avenue	West of Cedar Avenue	4,750	5,231	6,720	7,201	21,430	21,911
Slover Avenue	East of Cedar Avenue	4,940	5,421	7,140	7,621	17,440	17,921
Santa Ana Avenue	West of Linden Avenue	2,660	3,461	2,880	3,681	6,610	7,411
Santa Ana Avenue	West of Cedar Avenue	3,920	5,042	4,160	5,282	8,640	9,762
Santa Ana Avenue	East of Cedar Avenue	2,590	6,436	3,560	7,406	10,440	14,286
Santa Ana Avenue	East of Larch Avenue	1,120	1,761	1,270	1,911	8,440	9,081
Jurupa Avenue	West of Cedar Avenue	3,070	3,551	2,800	3,281	11,590	12,071
Jurupa Avenue	East of Cedar Avenue	4,250	4,731	4,390	4,871	13,740	14,221

Source: Minagar & Associates, Inc. 2020

Table 9 Roadway Vehicle Mixes

	Traffic Flow Distributions			
Vehicle Type	Day (7 a.m. to 7 p.m.)	Evening (7 p.m. to 10 p.m.)	Night (10 p.m. to 7 a.m.)	Overall
Collector and Local Roads				
Automobiles	67.1%	12.6%	15.5%	97.0%
Medium Trucks	1.3%	0.2%	0.5%	2.0%
Heavy Trucks	0.6%	0.1%	0.3%	1.0%
Major, Primary, and Secondary Arterial Roads				
Automobiles	69.5%	12.9%	9.6%	92.0%
Medium Trucks	1.4%	0.1%	1.5%	3.0%
Heavy Trucks	2.4%	0.1%	2.5%	5.0%
Interstate 10				
Automobiles	61.6%	8.4%	23.3%	93.3%
Medium Trucks	1.1%	0.2%	0.6%	1.8%
Heavy Trucks	2.5%	0.4%	2.0%	4.9%

3.3 Significance Thresholds

The following thresholds are based on County of San Bernardino noise standards and Appendix G of the CEQA guidelines. Noise impacts would be considered significant if:

- **Issue 1:** The project would result in the generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.
  - **Temporary**
    - For purposes of analyzing impacts from this project, the City has determined that using FTA construction noise thresholds would be applicable to the project. Therefore, construction noise would be significant is it exceeds a daytime threshold of 80 dBA L_{eq} for an 8-hour period.
  - **Permanent**
    - Operational noise would be significant if the noise levels exceed Section 83.01.080(c) of the County's Code, which limits the noise created from stationary sources on the project site at the nearby homes to 55 dBA between 7:00 a.m. to 10:00 p.m. and 45 dBA between 10:00 p.m. and 7:00 a.m. Section 83.01.080(d) of the County's Municipal Code

limits the noise created from mobile noise sources, such as trucks, to 60 dBA at the exterior of the nearest homes.

- For off-site traffic-related noise, the General Plan Noise Element Goal N1 requires the avoidance of excessive noise exposure to noise sensitive land uses. However, the General Plan does not quantify what is a significant roadway noise increase. For traffic-related noise, impacts would be considered significant if project-generated traffic would result in exposure of sensitive receptors to an unacceptable increase in noise levels. For purposes of this analysis, a significant impact would occur if project related traffic increases the ambient noise environment of noise-sensitive locations by 3 dBA or more if the locations are subject to noise levels in excess of normally acceptable noise levels in Table IV-K-1 of the County General Plan Final Program Environmental Impact Report (County of San Bernardino 2007), or by 5 dBA or more if the land uses are exposed to conditionally acceptable or unacceptable noise levels.

- **Issue 2:** The project would result in the generation of excessive ground-borne vibration or ground-borne noise levels.
  - Section 83.01.090 of the County's Municipal Code restricts the creation of vibration which produces a particle velocity greater than 0.2 inch-per-second PPV.

- **Issue 3:** For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, if the project exposes people residing or working in the project area to excessive noise levels.

4 Impact Analysis

4.1 Issue 1

Issue:	Would the project result in generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?

Construction

Project construction would occur nearest to the single-family and mobile home residences to the north of the project site. Over the course of a typical construction day, construction equipment would be located as close as 100 feet to the nearest residential property line. At a distance of 100 feet, a dozer and an excavator would generate a noise level of 74.2 dBA L_{eq}. This would be well below the FTA daytime threshold of 80 dBA L_{eq} for an 8-hour period. Therefore, impacts from construction equipment would be less than significant.

Operation

Project operation may increase noise levels from rooftop mechanical equipment, parking lots, semi-trucks, gas station activities, and drive-through speakers. Section 83.01.080(c) of the County's Code limits the noise created from stationary sources on the project site at the nearby homes to 55 dBA between 7:00 a.m. to 10:00 p.m. and 45 dBA between 10:00 p.m. and 7:00 a.m. Section 83.01.080(d) of the County's Municipal Code limits the noise created from mobile noise sources, such as trucks, to 60 dBA at the exterior of the nearest homes.

The nearest sensitive receptors to the project site are residents at the mobile home park that are located as near as 85 feet north of the project site. There are also single-family homes located as near as 125 feet to the northeast, and 220 feet to the southwest of the project site.

In order to determine the noise impacts from the operation of rooftop mechanical equipment, parking lots, semi-trucks, and drive-through speakers, reference noise measurements were taken of each noise source and are shown on Table 10. The noise levels from each source were calculated through use of standard geometric spreading of noise from a point source with a drop-off rate of 6 dB for each doubling of the distance between the source and receiver.

Table 10 Onsite Operational Noise Levels at the Nearby Sensitive Receptors

Noise Source	Operational Noise Levels (dBA Leq) at: Mobile Homes to North	Single-Family Homes to Northeast	Single-Family Homes to Southwest	County Noise Standard (Day/Night)	Exceed Standard?
Rooftop Equipment	40	33	35	55/45	No/No
Parking Lot	35	33	30	60/60	No/No
Semi-Truck	59	57	49	60/60	No/No
Drive-Through Speaker	28	25	30	55/45	No/No
Gas Station	41	34	33	55/45	No/No

The noise levels were calculated through use of standard geometric spreading of noise from a point source with drop-off rate of 6 dB for each doubling of the distance between the source and receiver. Does not account for noise reduction features such as buildings and walls.

Reference noise measurements include:

- Rooftop equipment is based on a reference noise measurement of 66.6 dBA at 10 feet.
- Parking lot is based on a reference noise measurement of 63.1 dBA at 5 feet.
- Semi-Truck is based on a reference noise measurement of 61.2 dBA at 10 feet.
- Drive-through speaker is based on a reference noise measurement of 61.2 dBA at 10 feet.
- Gas station is based on a reference noise measurement of 61.7 dBA at 25 feet.

Table 10 shows that the proposed project's on-site operational noise from the anticipated noise sources would not exceed the applicable noise standards for each stationary and mobile noise source. Therefore, operational onsite noise impacts would be less than significant.

Off-site Traffic Noise

EXISTING CONDITIONS

The proposed project's potential offsite roadway noise impacts have been calculated through a comparison of the existing scenario to the existing with project scenario. Results of this comparison are shown in Table 11.

Table 11 Existing Conditions Project Traffic Noise Contributions

Roadway	Segment	dBA CNEL at Nearest Receptor: Existing	Existing Plus Project	Project Contribution	Significant Impact?
Linden Avenue	North of Santa Ana Avenue	53.7	53.9	0.2	No
Linden Avenue	South of Santa Ana Avenue	56.3	56.4	0.1	No
Cedar Avenue	North of Slover Avenue	66.0	66.7	0.7	No

Roadway	Segment	dBA CNEL at Nearest Receptor			
		Existing	Existing Plus Project	Project Contribution	Significant Impact?
Cedar Avenue	North of Santa Ana Avenue	64.7	65.6	0.9	No
Cedar Avenue	South of Project Driveway 1	65.0	65.6	0.6	No
Cedar Avenue	South of Jurupa Avenue	63.7	64.0	0.3	No
Larch Avenue	North of Santa Ana Avenue	57.7	57.9	0.2	No
Larch Avenue	South of Santa Ana Avenue	54.6	54.9	0.3	No
Slover Avenue	West of Cedar Avenue	63.9	64.3	0.4	No
Slover Avenue	East of Cedar Avenue	62.7	63.1	0.4	No
Santa Ana Avenue	West of Linden Avenue	56.9	58.0	1.1	No
Santa Ana Avenue	West of Cedar Avenue	57.6	58.7	1.1	No
Santa Ana Avenue	East of Cedar Avenue	56.2	60.2	4.0	No
Santa Ana Avenue	East of Larch Avenue	53.1	55.1	2.0	No
Jurupa Avenue	West of Cedar Avenue	59.4	60.1	0.7	No
Jurupa Avenue	East of Cedar Avenue	61.6	62.1	0.5	No

Distance to nearest residential use does not take into account existing noise barriers.

A significant impact would occur if project related traffic increases the ambient noise environment of noise-sensitive locations by 3 dBA or more if the locations are subject to noise levels in excess of normally acceptable noise levels in Table IV-K-1 of the County General Plan Final Program Environmental Impact Report (County of San Bernardino 2007), or by 5 dBA or more if the land uses are exposed to conditionally acceptable or unacceptable noise levels.

Table 11 shows that for the existing conditions, the proposed project's permanent noise increases to the nearby homes from the generation of additional vehicular traffic would not exceed noise thresholds. Therefore, the proposed project would not result in a substantial permanent increase in ambient noise levels for existing conditions. Impacts would be less than significant.

Opening Year 2021 Conditions

The proposed project's potential offsite roadway noise impacts have been calculated through a comparison of the opening year 2021 scenario to the opening year 2021 with project scenario. The results of this comparison are shown in Table 12.

Table 12 Opening Year 2021 Conditions Project Traffic Noise Contributions

		dBA CNEL at Nearest Receptor			
Roadway	Segment	Existing	Existing Plus Project	Project Contribution	Significant Impact?
Linden Avenue	North of Santa Ana Avenue	56.0	56.1	0.1	No
Linden Avenue	South of Santa Ana Avenue	58.4	58.5	0.1	No
Cedar Avenue	North of Slover Avenue	69.5	69.9	0.4	No
Cedar Avenue	North of Santa Ana Avenue	68.2	68.6	0.4	No
Cedar Avenue	South of Project Driveway 1	68.2	68.5	0.3	No
Cedar Avenue	South of Jurupa Avenue	65.1	65.3	0.2	No
Larch Avenue	North of Santa Ana Avenue	57.8	58.0	0.2	No
Larch Avenue	South of Santa Ana Avenue	54.8	55.0	0.2	No
Slover Avenue	West of Cedar Avenue	65.4	65.7	0.3	No
Slover Avenue	East of Cedar Avenue	64.3	64.6	0.3	No
Santa Ana Avenue	West of Linden Avenue	57.2	58.3	1.1	No
Santa Ana Avenue	West of Cedar Avenue	57.8	58.9	1.1	No
Santa Ana Avenue	East of Cedar Avenue	57.6	60.8	3.2	No
Santa Ana Avenue	East of Larch Avenue	53.6	55.4	1.8	No
Jurupa Avenue	West of Cedar Avenue	59.0	59.7	0.7	No
Jurupa Avenue	East of Cedar Avenue	61.8	62.2	0.4	No

Roadway	Segment	dBA CNEL at Nearest Receptor			
		Existing	Existing Plus Project	Project Contribution	Significant Impact?

Distance to nearest residential use does not take into account existing noise barriers.

A significant impact would occur if project related traffic increases the ambient noise environment of noise-sensitive locations by 3 dBA or more if the locations are subject to noise levels in excess of normally acceptable noise levels in Table IV-K-1 of the County General Plan Final Program Environmental Impact Report (County of San Bernardino 2007), or by 5 dBA or more if the land uses are exposed to conditionally acceptable or unacceptable noise levels.

Table 12 shows that for the opening year 2021 conditions, the proposed project's permanent noise increases to the nearby homes from the generation of additional vehicular traffic would not exceed noise thresholds. Therefore, the proposed project would not result in a substantial permanent increase in ambient noise levels for the opening year 2021 conditions. Impacts would be less than significant.

HORIZON YEAR 2040 CONDITIONS

The proposed project's potential offsite roadway noise impacts have been calculated through a comparison of the horizon year 2040 scenario to the horizon year 2040 with project scenario. The results of this comparison are shown in Table 13.

Table 13 Horizon Year 2040 Conditions Project Traffic Noise Contributions

Roadway	Segment	dBA CNEL at Nearest Receptor			
		Existing	Existing Plus Project	Project Contribution	Significant Impact?
Linden Avenue	North of Santa Ana Avenue	57.5	57.6	0.1	No
Linden Avenue	South of Santa Ana Avenue	59.9	59.9	0.0	No
Cedar Avenue	North of Slover Avenue	71.4	71.7	0.3	No
Cedar Avenue	North of Santa Ana Avenue	69.8	70.1	0.3	No
Cedar Avenue	South of Project Driveway 1	69.8	70.0	0.2	No
Cedar Avenue	South of Jurupa Avenue	69.0	69.1	0.1	No
Larch Avenue	North of Santa Ana Avenue	59.3	59.4	0.1	No
Larch Avenue	South of Santa Ana Avenue	56.6	56.8	0.2	No
Slover Avenue	West of Cedar Avenue	70.4	70.5	0.1	No

Roadway	Segment	dBA CNEL at Nearest Receptor			
		Existing	Existing Plus Project	Project Contribution	Significant Impact?
Slover Avenue	East of Cedar Avenue	68.2	68.3	0.1	No
Santa Ana Avenue	West of Linden Avenue	60.8	61.3	0.5	No
Santa Ana Avenue	West of Cedar Avenue	61.0	61.6	0.6	No
Santa Ana Avenue	East of Cedar Avenue	62.3	63.7	2.4	No
Santa Ana Avenue	East of Larch Avenue	61.9	62.2	0.3	No
Jurupa Avenue	West of Cedar Avenue	65.2	65.4	0.2	No
Jurupa Avenue	East of Cedar Avenue	66.7	66.9	0.2	No

Distance to nearest residential use does not take into account existing noise barriers.

A significant impact would occur if project related traffic increases the ambient noise environment of noise-sensitive locations by 3 dBA or more if the locations are subject to noise levels in excess of normally acceptable noise levels in Table IV-K-1 of the County General Plan Final Program Environmental Impact Report (County of San Bernardino 2007), or by 5 dBA or more if the land uses are exposed to conditionally acceptable or unacceptable noise levels.

Table 13 shows that for the horizon year 2040 conditions, the proposed project's permanent noise increases to the nearby homes from the generation of additional vehicular traffic would not exceed noise thresholds. Therefore, the proposed project would not result in a substantial permanent increase in ambient noise levels for the horizon year 2040 conditions. Impacts would be less than significant.

4.2 Issue 2

Issue: Would the project result in generation of excessive ground-borne vibration or ground-borne noise levels?

Construction

The construction activities for the proposed project are anticipated to include site preparation and grading of the project site, building construction and application of architectural coatings to the proposed gas station, convenience market and two restaurants with drive-throughs, and paving of the proposed parking lot and driveways. Vibration impacts from construction activities associated with the proposed project would typically be created from the operation of heavy off-road equipment. The nearest offsite sensitive receivers are residents at the mobile home park located as near as 85 feet north of the project site.

Section 83.01.090 of the County's Municipal Code restricts the creation of vibration which produces a particle velocity greater than 0.2 inch-per-second PPV. The primary source of vibration during construction would be from the operation of a dozer. A large dozer would create a vibration level of 0.089 in/sec. PPV at 25 feet. Based on typical propagation rates, the vibration level at the nearest residences at 85 feet would be 0.023 in/sec. PPV. The vibration level at the nearest homes would be well below the County's 0.2 in/sec. PPV threshold. Impacts would be less than significant.

Operation

The proposed project would consist of the development of a commercial center. The proposed project would result in the operation of trucks on the project site, which are a known source of vibration. Caltrans has done extensive research on vibration level created along freeways and State Routes; maximum vibration measurements of roads conducted by Caltrans are approximately 0.08 inches per second PPV at 15 feet from the center of the nearest lane (Caltrans 2020). Truck activities would occur onsite as near as 85 feet from the nearest residences. Based on typical propagation rates, the vibration level at the nearest homes would be 0.012 in/sec. PPV. Therefore, vibration created from operation of the proposed project would be well below the County's 0.2 in/sec. PPV threshold. Impacts would be less than significant.

4.3 Issue 3

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

The proposed project would not expose people residing or working in the project area to excessive noise levels from aircraft. The nearest airport is Flabob Airport that is located approximately 4.5 miles south of the project site. The project site is located outside of the 60 dBA CNEL noise contours of Flabob Airport (Riverside County Airport Land Use Commission 2004). No impacts would occur from aircraft noise.

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