

VISCAR TERRACE APARTMENT PROJECT

CONSTRUCTION NOISE STUDY

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VISCAR TERRACE APARTMENT PROJECT MURIETTA, CALIFORNIA Construction Noise Study

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VISCAR TERRACE APARTMENT PROJECT MURRIETA, CALIFORNIA CONSTRUCTION NOISE STUDY

This report is an analysis of the potential construction noise impacts associated with the Viscar Terrace Apartment Project proposed for construction in the City of Murrieta, Riverside County. The report has been prepared by Birdseye Planning Group, LLC, under contract to the applicant to support the entitlement process. This study analyzes the potential for temporary impacts associated with construction activity on a site located at 40475 Vista Murrieta Road and 40600 Myers Lane in Murrieta, California.

PROJECT DESCRIPTION

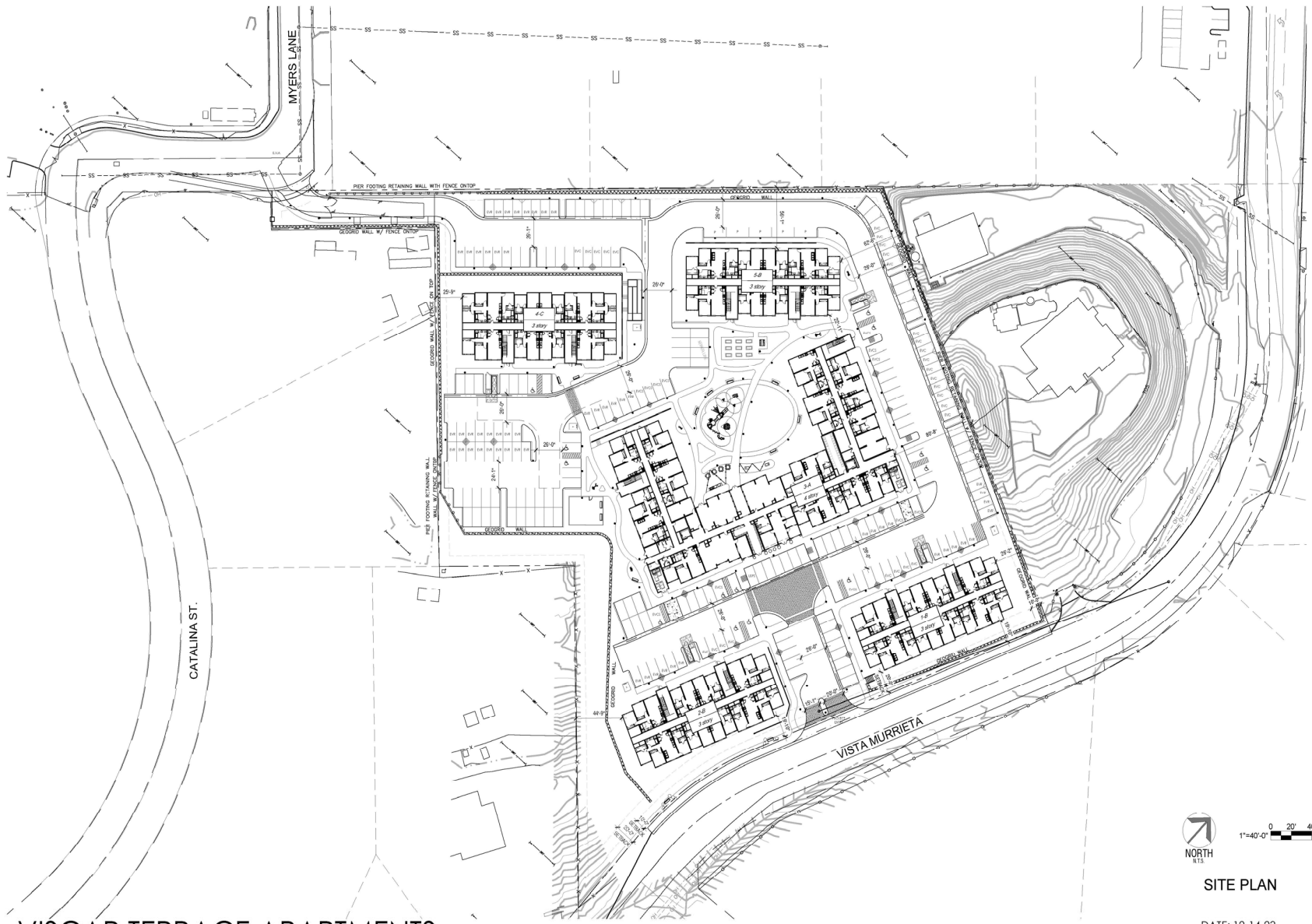
The project applicant, Viscar Terrace LP, is proposing to construct and operate the Viscar Terrace Apartments, a new 172-unit affordable housing community with related infrastructure improvements on a disturbed 5.74 gross acre (250,034 square feet) (5.61 net acre) site located at 40475 Vista Murrieta Road and 40600 Myers Lane in Murrieta, California (APN 949-180-022, -023, and -025). The site is located along the north side of Vista Murrieta Road, south of Los Alamos Road, east of Interstate 15, west of Interstate 215. The project site abuts two (2) rights-of-way: Vista Murrieta Road and Myers Lane. The site contains two single-family residences and related outbuildings and landscaping improvements. The project is zoned Office (O) and is located within a Transit Oriented Development (TOD) Overlay District. The General Plan land use designation is Office and Research Park (ORP) with a 0.6 – 2.5 Floor Area Ratio (FAR). The proposed residential project is a permitted use in the TOD Overlay District and subject to standards stipulated in Section 16.16.040 of the Murrieta Municipal Code. The minimum density is 30 units per acre or 169 units. The applicant is proposing 172 units which would equal approximately 30.56 units per acre. The proposed site plan is shown as Figure 2.

The project would provide a total of 172 apartment units and amenities in four, three-story buildings and one four-story building. The four-story building includes up to 4,241 square feet of common area with clubhouse, multipurpose room, fitness center, and resident services space as well as outdoor recreational amenities including a barbeque/picnic area and playground/dog run area. An outdoor fitness course and ½ basketball court would also be provided on-site. The project would provide 78 one-bedroom units (616-663 square feet), 48 two-bedroom units (866 square feet), 38 three-bedroom units (1,175-1,199 square feet) and 8 four-bedroom units (1,300 square feet). Up to 40% of the units (68 units) are reserved for very low-income tenants. The remaining 60% (102 units) would be reserved for low to moderate income tenants. Of the total, two units would be reserved for on-site managers. A total of 228 parking spaces would be provided. All spaces would be surface parking. The parking ratio would be 1.33 spaces per unit.



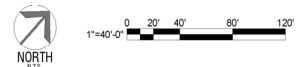
Figure 1—Vicinity Map

 - Project Site



VISCAR TERRACE APARTMENTS MURRIETA, CA

Etapes Corp. / Community Development Partners
 13681 Newport Ave., Suite 8230
 (657) 218-4856



SITE PLAN **A1.0**

DATE: 12-14-23
 JOB NO.: 2023-581

AO ARCHITECTS
 144 NORTH ORANGE ST., ORANGE, CA 92866
 (714) 639-9860



Figure 2—Site Plan

Primary access would be via a new driveway on the south side of the project via Vista Murrieta Road. A secondary emergency vehicle access (EVA) would be provided at the northwest corner of the site via Myers Lane which will also allow residents to exit the property in case of emergency.

The proposed project would install a new 12-inch water line in Vista Murrieta Road extending southwest of the site. The water line would connect to a new water line located at the intersection of Sparkman Court and Vista Murrieta Road. A second line will be installed within Vista Murrieta Road east of the site and connect to an existing water line located at the southwest corner of Vista Murrieta Road and Skypark Lane. This segment would cross under an unnamed drainage to Murrieta Creek using jack and bore. Vista Murrieta Road crosses the creek using an existing box culvert. The line would be installed under the existing box culvert within the Vista Murrieta Road corridor. This connection would complete a looped system for the project. The project would connect to an existing sewer line at the northwest corner of the site at the southern terminus of Myers Lane. All water/sewer infrastructure would be installed in trenches during grading and improvements to Vista Murrieta Road.

Electrical (Southern California Edison) and telecommunication (Frontier and Spectrum) service would initially connect to the existing overhead electrical infrastructure located along the north side of Vista Murrieta Road. All electrical lines located on-site would be undergrounded during grading. A total of four 1,600 ampere and one 3,000 ampere transformers would be installed on-site. The project would eventually underground all electrical and telecommunication service along the project frontage east of Carrigan Road and install a new electrical service line northeast of the site within the jack and bore trench required for the new water line as described above.

Construction is expected to begin in mid-2026 and be completed by mid-2027. Demolition would require removal of approximately 20,000 square feet of buildings (i.e., single-family residences, detached structures and outbuildings). The concrete driveway would be removed as would all existing underground utility lines (i.e., water, irrigation and wastewater drain lines), the septic tanks and leach fields. Grading would require 8,164 cubic yards of fill export. Construction activities are expected to occur five days per week, 8 hours per day, between 8:00 am and 5:00 pm.

Because the project is 100% affordable and within a TOD, the project design was reviewed per the City's objective standards for projects meeting these two criteria. The project applicant is processing the grading permit which is subject to discretionary review; and thus, must meet California Environmental Quality Act (CEQA) compliance requirements. Because CEQA compliance is only required for the grading permit, this Noise Study focuses only on construction noise and vibration as well as potential environmental impacts and conditions of approval that would be implemented to avoid or reduce potential impacts as requested by the City of Murrieta.

SETTING

Overview of Sound Measurement

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 dB 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 reference sound to be judged as twice as loud. In general, a 3 dBA change in community noise levels is noticeable, while 1-2 dB changes generally are not perceived. Quiet suburban areas typically have noise levels in the range of 40-50 dBA, while arterial streets are in the 50-60+ dBA range. Normal conversational levels are in the 60-65 dBA range, and ambient noise levels greater than 65 dBA can interrupt conversations. Noise levels typically attenuate (or drop off) at a rate of 6 dBA per doubling of distance from point sources (i.e., industrial machinery). Noise from lightly traveled roads typically attenuates at a rate of about 4.5 dBA per doubling of distance. Noise from heavily traveled roads typically attenuates 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 receptor and the noise source reduces the noise level by about 5 dBA, while a solid wall or berm reduces noise levels by 5 to 10 dBA. The manner in which older homes in California were constructed (approximately 30 years old or older) generally provides a reduction of exterior-to-interior noise levels of about 20 to 25 dBA with closed windows. The exterior-to-interior reduction of newer residential units and office buildings construction to California Energy Code standards is generally 30 dBA or more.

In addition to the actual instantaneous measurement of sound levels, the duration of sound is important since 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 measuring period, and Lmin is the lowest RMS sound pressure level within the measuring period.

The time period in which noise occurs is also important since noise that occurs at night tends to be more disturbing than that which occurs during the day. 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 p.m. to 7 a.m.) 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 p.m. to 10 p.m. and a 10 dBA penalty for noise occurring from 10 p.m. to 7 a.m. Noise levels described by Ldn and CNEL usually do not differ by more than 1 dB. Daytime Leq levels are louder than Ldn or CNEL levels; thus, if the Leq meets noise standards, the Ldn and CNEL are also met. Table 1 shows sound levels of typical noise sources in Leq.

Project Site Setting

The project area is primarily rural residential uses. Thus, the most common and primary sources of noise in the project site vicinity are motor vehicles (e.g., automobiles and trucks) on Vista Murrieta Road.

Table 1
Sound Levels of Typical Noise Sources and Noise Environments

Noise Source (at Given Distance)	Noise Environment	A-Weighted Sound Level (Decibels)	Human Judgment of Noise Loudness (Relative to Reference Loudness of 70 Decibels*)
Military Jet Takeoff with Afterburner (50 ft)	Carrier Flight Deck	140	128 times as loud
Civil Defense Siren (100 ft)		130	64 times as loud
Commercial Jet Take-off (200 ft)		120	32 times as loud Threshold of Pain
Pile Driver (50 ft)	Rock Music Concert Inside Subway Station (New York)	110	16 times as loud
Ambulance Siren (100 ft) Newspaper Press (5 ft) Gas Lawn Mower (3 ft)		100	8 times as loud Very Loud
Food Blender (3 ft) Propeller Plane Flyover (1,000 ft) Diesel Truck (150 ft)	Boiler Room Printing Press Plant	90	4 times as loud
Garbage Disposal (3 ft)	Noisy Urban Daytime	80	2 times as loud
Passenger Car, 65 mph (25 ft) Living Room Stereo (15 ft) Vacuum Cleaner (10 ft)	Commercial Areas	70	Reference Loudness Moderately Loud
Normal Speech (5 ft) Air Conditioning Unit (100 ft)	Data Processing Center Department Store	60	1/2 as loud

Light Traffic (100 ft)	Large Business Office Quiet Urban Daytime	50	1/4 as loud
Bird Calls (distant)	Quiet Urban Nighttime	40	1/8 as loud Quiet
Soft Whisper (5 ft)	Library and Bedroom at Night Quiet Rural Nighttime	30	1/16 as loud
	Broadcast and Recording Studio	20	1/32 as loud Just Audible
		0	1/64 as loud Threshold of Hearing

Source: Compiled by dBF Associates, Inc., 2016

Baseline conditions were measured adjacent to the project site along Vista Murrieta Road on December 20, 2023, beginning at 4:50 p.m. and concluding at 5:05 p.m. The monitoring site was selected to approximate existing ambient noise conditions at both the project site and adjacent sensitive properties. The measurements were taken using an ANSI Type II integrating sound level meter. The predominant noise source was traffic. The temperature during monitoring was 50 degrees Fahrenheit with no perceptible wind. Ambient conditions are dominated by traffic on Interstate 215 to the east and Los Alamos Road to the north. Traffic on Vista Murrieta Road is light and contributes to, but does not dominate ambient conditions. A total of four passenger vehicles passed the monitoring site during the 15-minute monitoring period. Table 2 identifies the noise measurement location and measured noise level. As shown, the measured Leq was 50.6 dBA.

**Table 2
Noise Monitoring Results**

Measurement Location	Primary Noise Source	Sample Time	Leq (dBA)
1. Near southeast corner of project site.	Traffic	Weekday evening	50.6

Source: Field visit using ANSI Type II Integrating sound level meter.

Sensitive Receptors

Noise exposure goals for various types of land uses reflect the varying noise sensitivities associated with each of these uses. Urban areas contain a variety of land use and development types that are noise sensitive including residences, schools, churches, hospitals and convalescent care facilities. The closest sensitive receptors are two single-family residences located on parcels adjacent to and approximately 70 feet west and east of the site. Residences are also located north of the site along Myers Lane and south of the site along Vista Murrieta Road. The Just 4 Kids Preschool of Murrieta is located approximately 300 feet northeast of the site.

Regulatory Setting

In 1976, the California Department of Health, State Office of Noise Control published a recommended noise/land use compatibility matrix which many jurisdictions have adopted as a standard in their general plan noise elements. The California State Office of Planning and Research 2017 updates to the General Plan Guidelines, Appendix D Noise Element Guidelines, Figure 2, shows that exterior noise levels up to 60 dBA (CNEL or Ldn) are normally compatible in rural residential areas. Noise levels up to 70 dBA (CNEL or Ldn) are conditionally compatible.

City of Murrieta Noise Ordinance

Section 16.30.130 (A) of the Murrieta Municipal Code states the following:

Construction Noise. Violations of the noise ordinance are considered to occur when one more both of the following occur:

1. Operating or causing the operation of tools or equipment used in construction, drilling, repair, alteration, or demolition work between weekday hours of 7:00 p.m. and 7:00 a.m., or at any time on Sundays or holidays;
2. Construction activities shall be conducted in a manner that the maximum noise levels at affected structures will not exceed 80-dBA at multifamily residences and 75-dBA at

single-family residences between the hours of 7:00 a.m. and 8:00 p.m. daily except Sunday's and legal holidays.

Operation Noise. Section 16.30.090 of the Murrieta Municipal Code limits exterior noise levels at residential properties to 50-dBA from 7:00 a.m. to 10:00 p.m. and 45-dBA from 10:00 p.m. to 7:00 a.m.

Per Section 16.30.100 (B) limits interior noise levels in multifamily residential properties to 45-dBA from 7:00 a.m. to 10:00 p.m. and 40-dBA from 10:00 p.m. to 7:00 a.m.

City of Murrieta General Plan Noise Element

The State of California General Plan Guidelines, published by the state Governor's Office of Planning and Research (OPR), provides guidance for the acceptability of specific land use types within areas of specific noise exposure. Table 3, *Land Use Compatibility for Community Noise Environments*, presents guidelines for determining acceptable and unacceptable community noise exposure limits for various land use categories. The guidelines also present adjustment factors that may be used to arrive at noise acceptability standards that reflect the noise control

goals of the community, the particular community's sensitivity to noise, and the community's assessment of the relative importance of noise pollution.

Table 3
Land Use Compatibility for Community Noise Environments

Land Use	Normally Acceptable ^a	Conditionally Acceptable ^b	Normally Unacceptable ^c	Clearly Unacceptable ^d
Single-Family, Duplex, Mobile Homes	50-60	55-70	70-75	Above 70
Multifamily	50-65	60-70	70-75	Above 70
Transient Lodging – Hotels, Motels	50-65	60-70	70-80	Above 80
School, Libraries, Churches, Hospitals, Nursing Homes	50-70	60-70	70-80	Above 80
Auditoriums, Concert Halls, Amphitheaters	-	50-70	-	Above 65
Sports Arena, Outdoor Spectator Sports	-	50-75	-	Above 70
Playgrounds, Neighborhood Parks	50-70	-	67-75	Above 72
Golf Courses, Riding Stables, Water Recreation, Cemeteries	50-75	-	70-80	Above 80
Office Building, Business and Professional, Commercial	50-70	67-77	Above 75	-
Industrial, Manufacturing, Utilities, Agriculture	50-75	70-80	Above 75	-

^a Normally Acceptable: Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction without any special noise insulation requirements.

^b Conditionally Acceptable: New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning would normally suffice.

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

^d Clearly Unacceptable: New construction or development should generally not be undertaken.

Note: Noise levels are provided in A-weighted decibels, CNEL.

Source: Office of Noise Control, California Department of Health

Vibration. Section 16.30.030 of the Murrieta Municipal Code provides a definition of vibration and stating that the minimum ground or structure-borne vibrational motion necessary to cause a normal person to be aware of the vibration including, but not limited to, sensation by touch or visual observations of moving objects. The perception threshold shall be presumed to be a motion velocity of 0.01 in/sec (65 VdB) within the range of one to one hundred (100) Hertz. This is provided in the Municipal Code as guidance for discussions regarding this issue.

While 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. The range of interest is from approximately 50 VdB, which is the typical background vibration velocity, to 100 VdB, which is the general threshold where minor damage can occur in fragile buildings.

With respect to potential ground-borne vibration impacts on structures, the Federal Transit Administration states that ground-borne vibration levels in excess of PPV 0.2 inches/second (100

VdB) could damage fragile buildings and levels in excess of PPV 0.12 inches/second (95 VdB) could damage extremely fragile historic buildings. No historic buildings occur on the site or are known to occur near the site. The closest receivers are not considered fragile or historic buildings; however, to conservatively estimate potential vibration impacts, a PPV of 0.2 inches per second (100 VdB) is used herein.

Construction activities such as blasting, pile driving, demolition, deep excavation and drilling have the potential to generate ground vibration levels that approximate PPV 0.12 in/sec (95 VdB) range. With the exception of removing the two existing residences, the proposed project will not require these types of construction activities. Excavation, grading and compaction of soils will be required for the building slabs and foundations. Parking lot surface grading would also be required to prepare soils to accommodate the base material and asphalt pavement. Potential impacts are identified based on the use of typical grading equipment and distance from the neighboring structures.

IMPACT ANALYSIS

Methodology and Significance Thresholds

The following significance criteria are based on Appendix G of the Guidelines for Implementation of the California Environmental Quality Act (14 CCR 15000 et seq.) and will be used to determine the significance of potential noise impacts. Impacts to noise would be significant if the proposed project would result in:

- (a) Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;
- (b) Generation of excessive groundborne vibration or groundborne noise levels; or

a. Would the project generate 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 Construction Noise

The primary source of noise during construction activities would be comprised of heavy machinery used during site preparation (i.e., clearing/grubbing), grading and clearing the site, as well as equipment used during building construction and paving. Table 4 shows the typical noise levels associated with heavy construction equipment. As shown in Table 4, average noise levels associated with the use of heavy equipment at construction sites can range from 80 to 85 dBA at 50 feet from the source, depending upon the types of equipment in operation at any given time and phase of construction (FTA 2018). Project construction would occur over the entire project site. Construction activities will vary in distance from the nearest sensitive

properties which are the single-family residences located at 25255 Vista Murrieta Road adjacent to and east of the site and 25222 Vista Murrieta Road located adjacent to and west of the site. The residences are located approximately 60 feet from both the west and east site boundaries.

**Table 4
 Typical Maximum (Lmax) Construction Equipment Noise Levels**

Equipment Onsite	Typical Maximum Level (dBA) 25 Feet from the Source	Typical Maximum Level (dBA) 50 Feet from the Source	Typical Maximum Level (dBA) 100 Feet from the Source
Air Compressor	86	80	74
Backhoe	86	80	74
Bobcat Tractor	86	80	74
Concrete Mixer	91	85	79
Loader	86	80	74
Bulldozer	91	85	79
Jack Hammer	94	88	82
Pavement Roller	91	85	79
Street Sweeper	88	82	76
Man Lift	81	75	69
Dump Truck	90	84	78
Mobile Crane	89	83	77
Excavator/Scraper	91	85	79

*Source: FTA Noise and Vibration Impact Assessment Manual (September 2018), Table 7-1.
 Noise levels are based on actual maximum measured noise levels at 50 feet (Lmax).
 Noise levels are based on a noise attenuation rate of 6 dBA per doubling of distance.*

site. Table 5 shows typical maximum construction noise levels at various distances from construction activity based on a standard noise attenuation rate of 6 dBA per doubling of distance. The noise level used to estimate the maximum noise level that could occur is based on use of a bulldozer as it is likely to be the noisiest type of equipment used over a sustained period of time in proximity to neighboring residences during site preparation and grading activities. Actual noise levels will fluctuate throughout the day but may periodically reach or exceed 88 dBA at the receivers depending on the type and location of equipment used and whether multiple pieces of equipment are operating simultaneously in the same area.

As referenced, section 16.30.130 (A) of the Murrieta Municipal Code states that a violation of the noise ordinance could occur when construction activities occur between weekday hours of 7:00 p.m. and 7:00 a.m., or at any time on Sundays or holidays and/or if construction activities exceed 75-dBA at single-family residences between the hours of 7:00 a.m. and 8:00 p.m. daily except Sunday's and legal holidays.

Table 5
Typical Maximum Construction Noise Levels
at Various Distances from Project
Construction

Distance from Construction	Maximum Noise Level at Receptor (dBA)
25 feet	88
50 feet	82
100 feet	76
250 feet	70
500 feet	64
1,000 feet	58

Construction noise would be audible and could exceed the 75-dBA threshold at the closest residential receivers. Grading activities at a distance of 100 feet or more would attenuate to below 75-dBA at the neighboring residences and the Just 4 Kids Preschool of Murrieta facility. To avoid a violation of the noise ordinance, implementation of the following conditions of approval are recommended during site preparation and grading activities requiring the use of a bulldozer or similar equipment in proximity to the adjacent residences:

NOI-1 Construction Equipment. Electrical power shall be used to run air compressors and similar power tools. Internal combustion engines should be equipped with a muffler of a type recommended by the manufacturer and in good repair. All diesel equipment should be operated with closed engine doors and should be equipped with factory-recommended mufflers. Construction equipment that continues to generate substantial noise at the project boundaries should be shielded with temporary noise barriers, such as barriers that meet a sound transmission class (STC) rating of 25, sound absorptive panels, or sound blankets on individual pieces of construction equipment. Stationary noise-generating equipment, such as generators and compressors, should be located as far as practically possible from the nearest residential property lines.

NOI-2 Limit Operations Adjacent to Receivers. Limit the number of large pieces of equipment (i.e., bulldozers or concrete mixers) operating adjacent to receivers to one at any given time.

NOI-3 Neighbor Notification. Provide notification to residential occupants adjacent to the project site at least 24 hours prior to initiation of construction activities that could result in noise levels of 75-dBA at adjacent residences. This notification should include the anticipated hours and duration of construction and a description of noise reduction measures being implemented at the project site. The notification should include a telephone number to call to submit complaints associated with construction noise.

NOI-4 Noise Control Plan. Construction contractors shall develop and implement a noise control plan that includes a noise control monitoring program to ensure sustained construction noise levels do not exceed 75 decibels at the adjacent single-family residence. The plan may include the following requirements:

- Contractor shall turn off idling equipment.
- Contractor shall perform noisier operation during the times least sensitive to receptors.
- All diesel equipment shall be operated with closed engine doors and shall be equipped with factory- recommended mufflers.
- Electrical power shall be used to run air compressors and similar power tools and to power any temporary structures, such as construction trailers or security staff facilities.
- For all noise-generating construction activities, additional noise attenuation techniques shall be employed as necessary to reduce noise levels. Such techniques shall include, but are not limited to, the use of sound blankets, noise shrouds and temporary sound barriers.

With implementation of measures NOI-1 through NOI-4, if needed, noise impacts during construction would be **less than significant**.

Temporary Construction-Related Vibration

b. Would the project result in the generation of excessive groundborne vibration or groundborne noise levels?

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. As stated, 0.2 PPV (94 VdB) is the vibration level at which damage to residential structures can occur and is considered annoying to most people exposed to the vibration energy (FTA 2018).

Heavy impact construction methods that could generate enough vibration to damage buildings proximal to the project site (i.e., pile driving, rock breaking, drilling, blasting) would not be required for the project. However, both PPV and the related VdB are used to address construction vibration and related effects to structures and people residing in adjacent residences. A vibration velocity of 75 VdB is the approximate dividing line between barely perceptible and distinctly perceptible. The PPV and accompanying VdB level associated with common construction equipment is shown in Table 6.

**Table 6
Vibration Source Levels for Construction Equipment**

	Peak Particle Velocity (inches/second) at 25 feet	Approximate Vibration Level LV (dVB) at 25 feet
Pile driver (impact)	1.518 (upper range)	112
	0.644 (typical)	104
Pile driver (sonic)	0.734 upper range	105
	0.170 typical	93
Clam shovel drop (slurry wall)	0.202	94
Hydromill (slurry wall)	0.008 in soil	66
	0.017 in rock	75
Vibratory Roller	0.21	94
Hoe Ram	0.089	87
Large bulldozer	0.089	87
Caisson drill	0.089	87
Loaded trucks	0.076	86
Jackhammer	0.035	79
Small bulldozer	0.003	58
Source: Transit Noise and Vibration Impact Assessment, Federal Transit Administration, September 2018.		

Construction activity on the project site would be temporary and vibration events would be transitory occurring only during equipment pass bys. Using vibration levels associated with a large bulldozer the piece of equipment with the highest vibration level, as a worst case scenario, typical groundborne vibration could reach 87 VdB at 25 feet, the distance between the eastern and southern property boundary and nearest receivers. This would attenuate to approximately 81 VdB at 50 feet, the approximate distance between the site boundary and the nearest receivers to the west and east. Vibration at this level can cause annoyance for brief periods of time during pass-by events. Sustained equipment operation is not expected to occur proximal to the nearest receivers nor would the PPV reach levels that may cause structural damage to the residential building.

As stated, vibration levels in excess of 75 VdB may be perceptible; thus, vibration may be perceptible at the nearest residences periodically during equipment pass by events. While there are no specific standards for use in quantifying excessive vibration levels, the PPV would not be high enough to damage buildings (i.e., 0.2 PPV) nor would construction activities generate vibration levels high enough to annoy people (i.e., 94 dBA). Thus, temporary vibration impacts would be **less than significant**.

Conclusion

The proposed would result in a temporary construction that may exceed the City of Murrieta noise ordinance. The implementation of measures NOI-1 through NOI-4, if needed and at the discretion of the City of Murrieta, would reduce temporary construction noise to less than significant.

REFERENCES

City of Murrieta Municipal Code, Section 16.30.130 (A), Section 16.30.090, Section 16.30.030.

Federal Transit Administration. *Transit Noise and Vibration Impact Assessment*. September 2018.