

NOISE IMPACT ANALYSIS
GUADALUPE MANOR (17103 MAGNOLIA) RESIDENTIAL PROJECT
FOUNTAIN VALLEY, CALIFORNIA

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Date:

May 31, 2023

Project No.: P23-025 N

BACKGROUND

The 2.1-acre project site is located west of Magnolia Street, approximately 500 feet south of Warner Avenue, at 17103 Magnolia Street, in the City of Fountain Valley, California. The site is currently developed with a three-story affordable senior housing facility containing 71 dwelling units. The proposed project involves expansion/addition of a new two-story building to provide 29 additional dwelling units, encompassing 13,498 sf. Vehicular access is proposed to remain via the existing full access driveway at Magnolia Street. There will be 68 parking spaces provided for the new building.

The project is flanked by residential, single-family homes to the south and to the west of the site with shopping centers to the north and to the east. The proposed new building is to be setback approximately 80-foot from the western property line and the setback to the southern property line is 66-feet.

The proposed project is forecast to generate approximately 94 daily trips, including six (6) trips during the AM peak hour and seven (7) trips during the PM peak hour.

NOISE SETTING

Sound is mechanical energy transmitted by pressure waves in a compressible medium such as air. Noise is generally considered to be unwanted sound. Sound is characterized by various parameters that describe the rate of oscillation of sound waves, the distance between successive troughs or crests, the speed of propagation, and the pressure level or energy content of a given sound. In particular, the sound pressure level has become the most common descriptor used to characterize the loudness of an ambient sound level.

The decibel (dB) scale is used to quantify sound pressure levels. Although decibels are most commonly associated with sound, "dB" is a generic descriptor that is equal to ten times the logarithmic ratio of any physical parameter versus some reference quantity. For sound, the reference level is the faintest sound detectable by a young person with good auditory acuity.

Since the human ear is not equally sensitive to all sound frequencies within the entire auditory spectrum, human response is factored into sound descriptions by weighting sounds within the range of maximum human sensitivity more heavily in a process called "A-weighting," written as dB(A). Any further reference in this discussion to decibels written as "dB" should be understood to be A-weighted.

Time variations in noise exposure are typically expressed in terms of a steady-state energy level equal to the energy content of the time varying period (called LEQ), or alternately, as a statistical description of the sound pressure level that is exceeded over some fraction of a given observation period. Finally, because community receptors are more sensitive to unwanted noise intrusion during the evening and at night, state law requires that, for planning purposes, an artificial dB increment be added to quiet time noise levels in a 24-hour noise descriptor called the Ldn (day-night) or the Community Noise Equivalent Level (CNEL). The CNEL metric has gradually replaced the Ldn factor, but the two descriptors are essentially identical.

CNEL-based standards are generally applied to transportation-related sources because local jurisdictions are pre-empted from exercising direct noise control over vehicles on public streets, aircraft, trains, etc. The City of Fountain Valley therefore regulates the noise exposure of the receiving property through land use controls.

For “stationary” noise sources the City has established noise performance standards designed to not adversely impact adjoining uses. These standards are articulated in the Municipal Code. These standards recognize the varying noise sensitivity of both transmitting and receiving land uses. The property line noise performance standards are normally structured according to land use and time-of-day.

CITY OF FOUNTAIN VALLEY NOISE STANDARDS

The Noise Element of the City of Fountain Valley General Plan establishes noise quality standards for land use categories based on the State of California Office of Noise Control land use compatibility recommendations. Community noise exposures are recommended as normally acceptable, conditionally acceptable, normally unacceptable, and clearly unacceptable for various classes of land use sensitivity. As shown in Table 1, the City of Fountain Valley guidelines an exterior noise exposure standard of 60 dB CNEL is the most desirable level for single-family residential uses while levels of 70 dB CNEL are acceptable for usable outdoor space (patios, decks, pools, etc.). A level of 70 dB CNEL is considered “conditionally acceptable”. In a “conditionally acceptable” noise category, new construction should be undertaken only after a noise analysis has been made and needed noise insulation features have been incorporated in the project design. These standards apply to exterior recreational noise.

An interior CNEL of 45 dB is mandated by the State of California Noise Insulation Standards (CCR, Title 24, Part 6, Section T25-28) for multiple-family dwellings and hotel and motel rooms. In 1988, the State Building Standards Commission expanded that standard to include all habitable rooms in residential use, including single-family dwelling units. For this project an exterior noise level of 70 dB CNEL in any usable outdoor recreational area and interior noise level of 45 dB in any habitable residential indoor space are considered to be the appropriate compatibility standards for residential use.

Ordinance limits generally apply to “stationary” sources such as mechanical equipment, or vehicles operating on private property as shown in Table 1. The applicable requirement is a function of the time of day and appropriate zone. As seen in Table 1, the City’s noise ordinance limits are stated in terms of a 30-minute limit with allowable deviations from this 50th percentile standard. The louder the level becomes, the shorter the time becomes that it is allowed to occur. The code allows the “not to exceed” noise limits to be adjusted upwards if the background noise level exceeds the applicable noise standard.

Construction noise is exempt from numerical noise standards from 7 a.m. to 8 p.m. Monday through Friday and 9 a.m. through 8 p.m. on Saturdays with no construction allowed on Sundays and any legal holiday.

Table 1
Fountain Valley Noise Ordinance Standards Section 6.28.050

| Noise Zone 1 | Time Period | Exterior Noise Standard |
|--|-----------------|-------------------------|
| All properties located in residential zone districts | 7 a.m.- 10 p.m. | 55 dB |
| | 10 p.m.-7 a.m. | 50 dB |

The not to exceed value for these standards is as follows:

- 1) The noise standard for a cumulative period of more than thirty (30) minutes in any hour; or
- 2) The noise standard plus five (5) dB(A) for a cumulative period of more than fifteen (15) minutes in any hour; or
- 3) The noise standard plus ten (10) dB(A) for a cumulative period of more than five (5) minutes in any hour; or
- 4) The noise standard plus fifteen (15) dB(A) for a cumulative period of more than one (1) minute in any hour; or
- 5) The noise standard plus twenty (20) dB(A) for any period of time

The Fountain Valley Municipal Code has the following caveat:

In the event the ambient noise level exceeds any of the first four noise limit categories set forth in subsection (b) of this section, the cumulative period applicable to said category shall be increased to reflect said ambient noise level. In the event the ambient noise level exceeds the fifth noise limit category, the maximum allowable noise level under said category shall be increased to reflect the maximum ambient noise level. (Ord. 806 § 2, 1976)

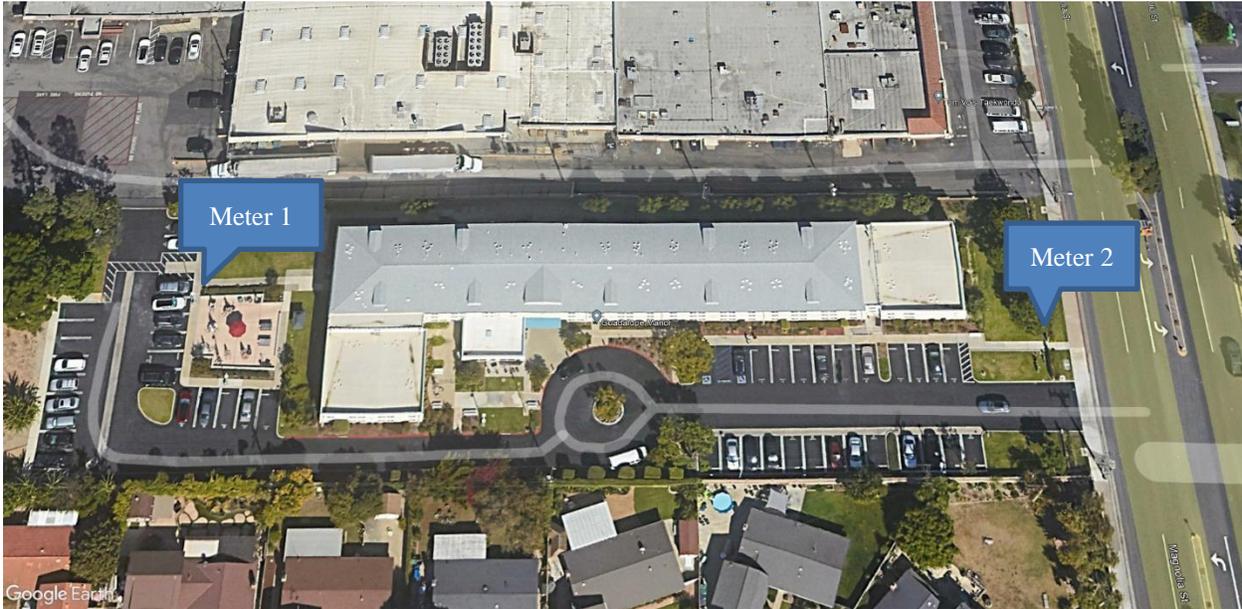
BASELINE NOISE LEVELS

Short term on-site noise measurements were made to document baseline levels in the project area as shown in Table 2. These help to serve as a basis for projecting future noise exposure from the project upon the surrounding community and noise from the community on the project. Noise measurements were conducted on Wednesday, May 3, 2023, at approximately 1:00 p.m., at the locations indicated in Figure 1.

Table 2
Measured Noise Levels (dBA)

| Location | Leq | L _{Max} | L _{Min} |
|--|------|------------------|------------------|
| On-site, approximate location of new structure | 47.2 | 56.9 | 29.0 |
| On-site, 60-feet to Magnolia centerline | 62.4 | 72.6 | 45.6 |

**Figure 1
Noise Meter Location**



The new building will be in the western portion of the site and is noise protected from Magnolia Street traffic due to setback distance and shielding from the existing structures. In this portion of the site noise is low, with an observed Leq of 47.2 dBA. Closer to the Magnolia Street frontage, in the vicinity of the existing building, noise levels were higher with a Leq of 62.4 dBA.

The City of Fountain Valley considers a noise level of up to 70 dB CNEL “conditionally acceptable” for residential uses. In a “conditionally acceptable” noise category, new construction should be undertaken only after a noise analysis has been made and needed noise insulation features have been incorporated in the project design. Existing noise levels in the vicinity of the proposed structure are well within the residential compatibility guidelines.

NOISE IMPACTS

NOISE SIGNIFICANCE CRITERIA

According to the current CEQA Appendix G guidelines, noise impacts are considered potentially significant if they result in:

1. Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of a project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?
2. Generation of excessive groundborne vibration or groundborne noise levels?
3. For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use

airport, would the project expose people residing or working in the project area to excessive noise levels?

The terms “substantial” or “excessive” are not defined in most environmental compliance guidelines. Noise analysis methodology is accurate only to the nearest whole decibel and the human ear can only clearly detect changes of around 3 dBA; changes of less than 3 dBA, while audible under controlled circumstances, are not readily discernable in an outdoor environment. Thus, a change of 3 dBA is considered as a perceptible audible change. It would require a doubling of traffic to create a +3 dBA noise increase due to the logarithmic nature of noise calculations. The project is not within the vicinity of an airport.

SOURCES OF IMPACT

Several characteristic noise sources are typically identified with general development such as the proposed residential uses. Construction activities, especially heavy equipment, will create short-term noise increases near the project site. Upon completion, vehicular traffic on streets around the proposed project area may create a higher noise exposure. In already-developed areas, the added land use intensity associated with a single project only increases traffic incrementally on existing roadways. These noise impacts are often masked by the baseline, and often preclude perception of any substantial noise level increase. The proposed residential uses represent a passive noise source, and it is not anticipated that addition of the proposed senior living units would measurably alter the existing noise environment.

SENSITIVE RECEPTORS

The closest off-site residential uses are to the west and south of the site. All adjacent residential uses are setback approximately 20 feet from the shared property line. The proposed new project structure is setback approximately 80-foot from the western property line and the setback from the new building to the southern property line is 66-feet. Therefore, the proposed structure has an approximate 100-foot setback to the closest off-site receptor to the west and 88 feet to the closest off-site receptor to the south. There is a block wall separating the off-site homes from the project site.

CONSTRUCTION NOISE IMPACTS

Temporary construction noise impacts vary markedly because the noise strength of construction equipment ranges widely as a function of the equipment used and its activity level. Short-term construction noise impacts tend to occur in discrete phases dominated by large, earth-moving equipment sources for demolition and grading. During construction and paving, equipment is generally less noisy.

In 2006, the Federal Highway Administration (FHWA) published the Roadway Construction Noise Model that includes a national database of construction equipment reference noise emissions levels. In addition, the database provides an acoustical usage factor to estimate the fraction of time

each piece of construction equipment is operating at full power during a construction phase. The usage factor is a key input variable that is used to calculate the average Leq noise levels.

Table 3 identifies highest (Lmax) noise levels associated with each type of equipment identified for use, then adjusts this noise level for distance to the closest sensitive receptor and the extent of equipment usage (usage factor), which is represented as Leq. The table is organized by construction activity and equipment associated with each activity

Quantitatively, the primary noise prediction equation is expressed as follows for the hourly average noise level (Leq) at distance D between the source and receiver (dBA):

$$Leq = L_{max} @ 50' - 20 \log (D/50') + 10 \log (U.F\%/100) - I.L.(bar)$$

Where:

Lmax @ 50' is the published reference noise level at 50 feet

U.F.% is the usage factor for full power operation per hour

I.L.(bar) is the insertion loss for intervening barriers

For the proposed project, the construction fleet would include equipment such as shown in Table 4 which describes the noise level for each individual piece of equipment at a reference 50-foot distance.

**Table 3
Construction Equipment Noise Levels**

| Phase Name and Duration | Equipment | Usage Factor¹ | Noise @ 50 feet (dB)² | Hourly Noise Level @ 50 feet (dB) |
|--------------------------------|------------------|---------------------------------|---|--|
| Demolition | Concrete Saw | 20% | 90 | 83 |
| | Dozer | 40% | 85 | 82 |
| | Loader/Backhoe | 37% | 78 | 74 |
| Grading | Grader | 40% | 85 | 81 |
| | Dozer | 40% | 85 | 82 |
| | Loader/Backhoe | 37% | 78 | 74 |
| Construction | Crane | 16% | 81 | 73 |
| | Loader/Backhoe | 37% | 78 | 74 |
| | Forklift | 20% | 75 | 69 |
| Paving | Paver | 50% | 77 | 74 |
| | Mixer | 40% | 79 | 75 |
| | Loader/Backhoe | 37% | 78 | 74 |
| | Roller | 20% | 80 | 74 |

Source: FHWA's Roadway Construction Noise Model, 2006

1. Estimates the fraction of time each piece of equipment is operating at full power during a construction operation
2. The Lmax values presented are the actual measured values summarized in the Roadway Noise Model User Guide (FHWA 2006) unless the actual is unavailable in which case the equipment specifications were used.

**Table 4
Construction Noise Equipment Levels at Off-Site Sensitive Uses (dBA Leq)**

| Phase Name and Duration | Equipment | Noise @ Western Perimeter Homes | Noise @ Southern Perimeter Homes |
|--------------------------------|------------------|--|---|
| Demolition | Concrete Saw | 72 | 73 |
| | Dozer | 71 | 72 |
| | Loader/Backhoe | 63 | 64 |
| Grading | Grader | 70 | 71 |
| | Dozer | 71 | 72 |
| | Loader/Backhoe | 63 | 64 |
| Construction | Crane | 62 | 63 |
| | Loader/Backhoe | 63 | 64 |
| | Forklift | 58 | 59 |
| Paving | Paver | 63 | 64 |
| | Mixer | 64 | 65 |
| | Loader/Backhoe | 63 | 64 |
| | Roller | 63 | 64 |

As discussed, with planned setbacks, construction activities are at a greater distance than 50 feet. Residences to the west have a 100-foot separation distance to the proposed new building and the residences to the south have an 88-foot separation distance. In addition, the block wall would assist in blocking construction noise at the adjacent uses. A -5 dBA noise credit was taken for the wall.

At the indicated setback distances, the noise levels shown in Table 4 would likely be observed.

Older homes with single pane windows can reduce noise levels by 25 dB with the windows closed. This would mean that during construction, homes to the west would experience an interior noise level of 38-47 dBA and homes to the south would be exposed to an interior noise level of 39-48 dBA. This noise reduction could be maintained only on a temporary basis, since it requires that windows always remain closed assuming the structures have air conditioning.

The potential for construction-related noise to adversely affect nearby residential receptors would depend on the location and proximity of construction activities to these receptors. Most construction equipment will be located at a much greater setback than the worst-case examples provided in Table 4.

In addition to adhering to the allowable hours of construction (7 a.m. to 8 p.m. Monday through Friday and 9 a.m. through 8 p.m. on Saturdays with no construction allowed on Sundays and any legal holiday) the following measures are recommended to ensure construction noise impacts are reduced to the lowest level possible:

- Locate stationary construction equipment away from the occupied residential residences; and
- Shut off construction equipment that is not in use; and
- Use electrical power to run air compressors and similar power tools.

These measures are included as conditions on any project construction permits and these limits will serve to minimize any adverse construction noise impact potential. Although construction equipment noise may be noticeable at times, construction noise impacts are minimized by time restrictions placed on permits which in addition to the recommended measures will minimize any adverse noise impact.

CONSTRUCTION ACTIVITY VIBRATION

Ground-borne vibration occurs when heavy equipment travels over unpaved surfaces or when it is engaged in soil movement. The effects of ground-borne vibration include discernable movement of building floors, rattling of windows, shaking of items on shelves or hanging on walls, and rumbling sounds. Vibration related problems generally occur due to resonances in the structural components of a building because structures amplify groundborne vibration. Within the “soft” sedimentary surfaces of much of Southern California, ground vibration is quickly damped out. Groundborne vibration is almost never annoying to people who are outdoors (FTA 2006).

Groundborne vibrations from construction activities rarely reach levels that can damage structures. Because vibration is typically not an issue, very few jurisdictions have adopted vibration significance thresholds. Vibration thresholds have been adopted for major public works construction projects, but these relate mostly to structural protection (cracking foundations or stucco) rather than to human annoyance.

The vibration descriptor commonly used to determine structural damage is the peak particle velocity (ppv) which is defined as the maximum instantaneous positive or negative peak of the vibration signal, usually measured in in/sec. The range of such vibration is shown in Table 5.

Table 5
Human Response to Transient Vibration

| Average Human Response | ppv (in/sec) |
|------------------------|--------------|
| Severe | 2.00 |
| Strongly perceptible | 0.90 |
| Distinctly perceptible | 0.24 |
| Barely perceptible | 0.03 |

Source: Caltrans Transportation and Construction Vibration Guidance Manual, 2013.

Over the years, numerous vibration criteria and standards have been suggested by researchers, organizations, and governmental agencies. There are no Caltrans or Federal Highway Administration standards for vibration.

According to Caltrans, the threshold for structural vibration damage for modern structures is 0.5 in/sec for intermittent sources, which include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment. The American Association of State Highway and Transportation Officials (AASHTO) (1990) identifies maximum vibration levels for preventing damage to structures from intermittent construction or maintenance activities for residential buildings in good repair with gypsum board walls to be 0.4–0.5 in/sec. The damage threshold criterion of 0.3 in/sec is appropriate for fragile buildings. For this analysis because area residences can be older, the 0.3 in/sec damage threshold for older fragile buildings is used as the evaluation criteria. Below this level there is virtually no risk of building damage. Table 6 shows the predicted vibration levels generated by construction equipment at varying distances.

**Table 6
Estimated Vibration Levels During Project Construction**

| Equipment | PPV at 10 ft (in/sec) | PPV at 15 ft (in/sec) | PPV at 25 ft (in/sec) | PPV at 40 ft (in/sec) | PPV at 50 ft (in/sec) |
|------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
| Large | 0.352 | 0.191 | 0.089 | 0.044 | 0.031 |
| Loaded trucks | 0.300 | 0.163 | 0.076 | 0.037 | 0.027 |
| Jackhammer | 0.138 | 0.075 | 0.035 | 0.017 | 0.012 |
| Small Bulldozer | 0.012 | 0.006 | 0.003 | 0.001 | <0.001 |

Source: FHWA Transit Noise and Vibration Impact Assessment

The calculation to determine PPV at a given distance is:

$$PPV_{distance} = PPV_{ref} * (25/D)^{1.5}$$

Where:

PPV_{distance} = the peak particle velocity in inches/second of the equipment adjusted for distance,

PPV_{ref} = the reference vibration level in inches/second at 25 feet, and

D = the distance from the equipment to the receiver.

As seen in Table 6, the predicted vibration levels generated by construction equipment such as a large bulldozer could be above levels that could create structural damage of older residential structures (i.e., 0.3 in/sec) if the dozer were to operate closer than 15-feet to the property line. Although the closest off-site sensitive uses have a much greater setback, because the existing on-site Our Lady of Guadalupe senior care facility residential structure is approximately 20 feet from the new building, it was assumed to be the closest sensitive use.

Large bulldozers will not likely operate directly that close to the existing Our Lady of Guadalupe structure. Nevertheless, it is recommended that any fine grading between the existing and proposed structures be accomplished with small bulldozers which are seen above to have much less vibration potential. Therefore, to ensure adequate vibration protection the following mitigation measure is recommended:

- Only small bulldozers shall be permitted to operate within 15 feet of the nearest existing Our Lady of Guadalupe senior care structure.

VEHICULAR NOISE IMPACTS

The project is expected to generate 94 daily trips according to the traffic analysis prepared for this project. According to City of Fountain Valley traffic engineering page on the City's website, on

Magnolia Street between Warner and Slater, the average daily traffic count was 31,400¹ in 2016. The addition of the project traffic to existing traffic would only represent less than a +0.01 dBA noise increase which is below the 3 dBA threshold of significance.

MECHANICAL EQUIPMENT

Project mechanical equipment will be roof mounted within a recessed well. There is sufficient distance between the proposed structure and off-site receptors to ensure noise from mechanical equipment does not create a noise nuisance.

SUMMARY

Short-term construction noise intrusion and vibration impacts will be limited by conditions on construction permits requiring compliance with the City of Fountain Valley Noise Ordinance. The allowed hours of construction are 7 a.m. to 8 p.m. Monday through Friday and 9 a.m. through 8 p.m. on Saturdays with no construction allowed on Sundays and any legal holiday. In addition, the following construction practices are recommended:

- Locate stationary construction equipment away from the occupied residential structures; and
- Shut off construction equipment that is not in use; and
- Use electrical power to run air compressors and similar power tools.

In the abundance of caution, to ensure adequate vibration protection, a dozer should only operate at least 15 feet from the closest facade of the existing Our Lady of Guadalupe residential structure. Therefore, the following mitigation measure is recommended:

- Only small bulldozers shall be permitted to operate within 15 feet of the nearest existing Our Lady of Guadalupe senior care structure.

Project traffic noise impacts on area roadways will be less-than-significant.

Project mechanical equipment will be roof mounted. There is sufficient distance between the proposed structure and off-site receptors to ensure noise from mechanical equipment does not create a noise nuisance at off-site receptors.

¹ <https://ca-fountainvalley.civicplus.com/DocumentCenter/View/13818/1-Fountain-Valley-ADT-2016>