# *TUSCANY MEADOWS*
# *ENVIRONMENTAL NOISE ASSESSMENT*
# *PITTSBURG, CALIFORNIA*

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## INTRODUCTION

This report presents the results of the environmental noise assessment completed for the Tuscany Meadows Project in Pittsburg, California. The project proposes to subdivide the approximate 170-acre property and construct up to 917 single-family dwelling units and 365 multi-family units. This report evaluates the project's potential to result in significant noise impacts with respect to applicable California Environmental Quality Act (CEQA) Guidelines. The report is divided into two sections. The Setting Section provides a brief description of the fundamentals of environmental noise, summarizes applicable regulatory criteria, and discusses the results of the ambient noise monitoring survey completed to document existing noise conditions. The Impacts and Mitigation Measures Section evaluates noise impacts resulting from the project in terms of noise and land use compatibility, temporary noise level increases resulting from project construction, and permanent noise level increases resulting from the operation of the project.

## SETTING

### Fundamentals of Environmental Noise

Noise may be defined as unwanted sound. Noise is usually objectionable because it is disturbing or annoying. The objectionable nature of sound could be caused by its *pitch* or its *loudness*. *Pitch* is the height or depth of a tone or sound, depending on the relative rapidity (frequency) of the vibrations by which it is produced. Higher pitched signals sound louder to humans than sounds with a lower pitch. *Loudness* is intensity of sound waves combined with the reception characteristics of the ear. Intensity may be compared with the height of an ocean wave in that it is a measure of the amplitude of the sound wave.

In addition to the concepts of pitch and loudness, there are several noise measurement scales which are used to describe noise in a particular location. A *decibel (dB)* is a unit of measurement which indicates the relative amplitude of a sound. The zero on the decibel scale is based on the lowest sound level that the healthy, unimpaired human ear can detect. Sound levels in decibels are calculated on a logarithmic basis. An increase of 10 decibels represents a ten-fold increase in acoustic energy, while 20 decibels is 100 times more intense, 30 decibels is 1,000 times more intense, etc. There is a relationship between the subjective noisiness or loudness of a sound and its intensity. Each 10 decibel increase in sound level is perceived as approximately a doubling of loudness over a fairly wide range of intensities. Technical terms are defined in Table 1.

There are several methods of characterizing sound. The most common in California is the *A-weighted sound level (dBA).* This scale gives greater weight to the frequencies of sound to which the human ear is most sensitive. Representative outdoor and indoor noise levels in units of dBA are shown in Table 2. Because sound levels can vary markedly over a short period of time, a method for describing either the average character of the sound or the statistical behavior of the variations must be utilized. Most commonly, environmental sounds are described in terms of an average level that has the same acoustical energy as the summation of all the time-varying events. This *energy-equivalent sound/noise descriptor* is called $L_{eq}$. The most common averaging period is hourly, but $L_{eq}$ can describe any series of noise events of arbitrary duration.

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

Since the sensitivity to noise increases during the evening and at night -- because excessive noise interferes with the ability to sleep -- 24-hour descriptors have been developed that incorporate artificial noise penalties added to quiet-time noise events. The *Community Noise Equivalent Level* (*CNEL*) is a measure of the cumulative noise exposure in a community, with a 5 dB penalty added to evening (7:00 pm - 10:00 pm) and a 10 dB addition to nocturnal (10:00 pm - 7:00 am) noise levels. The *Day/Night Average Sound Level* ($L_{dn}$) is essentially the same as CNEL, with the exception that the evening time period is dropped and all occurrences during this three-hour period are grouped into the daytime period.

**Fundamentals of Groundborne Vibration**

Ground vibration consists of rapidly fluctuating motions or waves with an average motion of zero. Several different methods are typically used to quantify vibration amplitude. One method is the Peak Particle Velocity (PPV). The PPV is defined as the maximum instantaneous positive or negative peak of the vibration wave. In this report, a PPV descriptor with units of mm/sec or in/sec is used to evaluate construction generated vibration for building damage and human complaints. Table 3 displays the reactions of people and the effects on buildings that continuous vibration levels produce.

The annoyance levels shown in Table 3 should be interpreted with care since vibration may be found to be annoying at much lower levels than those shown, depending on the level of activity or the sensitivity of the individual. To sensitive individuals, vibrations approaching the threshold of perception can be annoying. Low-level vibrations frequently cause irritating secondary vibration, such as a slight rattling of windows, doors, or stacked dishes. The rattling sound can give rise to exaggerated vibration complaints, even though there is very little risk of actual structural damage.

Construction activities can cause vibration that varies in intensity depending on several factors. The use of pile driving and vibratory compaction equipment typically generates the highest construction related groundborne vibration levels. Because of the impulsive nature of such activities, the use of the PPV descriptor has been routinely used to measure and assess groundborne vibration and almost exclusively to assess the potential of vibration to induce structural damage and the degree of annoyance for humans.

The two primary concerns with construction-induced vibration, the potential to damage a structure and the potential to interfere with the enjoyment of life, are evaluated against different vibration limits. Studies have shown that the threshold of perception for average persons is in the range of 0.008 to 0.012 in/sec PPV. Human perception to vibration varies with the individual and is a function of physical setting and the type of vibration. Persons exposed to elevated ambient vibration levels, such as people in an urban environment, may tolerate a higher vibration level.

Structural damage can be classified as cosmetic only, such as minor cracking of building elements, or may threaten the integrity of the building. Safe vibration limits that can be applied to assess the potential for damaging a structure vary by researcher and there is no general consensus as to what amount of vibration may pose a threat for structural damage to the building. Construction-induced vibration that can be detrimental to the building is very rare and has only been observed in instances where the structure is at a high state of disrepair and the construction activity occurs immediately adjacent to the structure.

**TABLE 1 Definition of Acoustical Terms Used in this Report**

| Term | Definition |
|---|---|
| Decibel, dB | A unit describing, the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure. The reference pressure for air is 20 micro Pascals. |
| Sound Pressure Level | Sound pressure is the sound force per unit area, usually expressed in micro Pascals (or 20 micro Newtons per square meter), where 1 Pascal is the pressure resulting from a force of 1 Newton exerted over an area of 1 square meter. The sound pressure level is expressed in decibels as 20 times the logarithm to the base 10 of the ratio between the pressures exerted by the sound to a reference sound pressure (e. g., 20 micro Pascals). Sound pressure level is the quantity that is directly measured by a sound level meter. |
| Frequency, Hz | The number of complete pressure fluctuations per second above and below atmospheric pressure. Normal human hearing is between 20 Hz and 20,000 Hz. Infrasonic sound are below 20 Hz and Ultrasonic sounds are above 20,000 Hz. |
| A-Weighted Sound Level, dBA | The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise. |
| Equivalent Noise Level, $L_{eq}$ | The average A-weighted noise level during the measurement period. |
| $L_{max}$, $L_{min}$ | The maximum and minimum A-weighted noise level during the measurement period. |
| $L_{01}$, $L_{10}$, $L_{50}$, $L_{90}$ | The A-weighted noise levels that are exceeded 1%, 10%, 50%, and 90% of the time during the measurement period. |
| Day/Night Noise Level, $L_{dn}$ or DNL | The average A-weighted noise level during a 24-hour day, obtained after addition of 10 decibels to levels measured in the night between 10:00 pm and 7:00 am. |
| Community Noise Equivalent Level, CNEL | The average A-weighted noise level during a 24-hour day, obtained after addition of 5 decibels in the evening from 7:00 pm to 10:00 pm and after addition of 10 decibels to sound levels measured in the night between 10:00 pm and 7:00 am. |
| Ambient Noise Level | The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location. |
| Intrusive | That noise which intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level. |

Source: Handbook of Acoustical Measurements and Noise Control, Harris, 1998.

**TABLE 2 Typical Noise Levels in the Environment**

| Common Outdoor Activities | Noise Level (dBA) | Common Indoor Activities |
|---|---|---|
| | 110 dBA | Rock band |
| Jet fly-over at 1,000 feet | | |
| | 100 dBA | |
| Gas lawn mower at 3 feet | | |
| | 90 dBA | |
| Diesel truck at 50 feet at 50 mph | | Food blender at 3 feet |
| | 80 dBA | Garbage disposal at 3 feet |
| Noisy urban area, daytime | | |
| Gas lawn mower, 100 feet | 70 dBA | Vacuum cleaner at 10 feet |
| Commercial area | | Normal speech at 3 feet |
| Heavy traffic at 300 feet | 60 dBA | |
| | | Large business office |
| Quiet urban daytime | 50 dBA | Dishwasher in next room |
| Quiet urban nighttime | 40 dBA | Theater, large conference room |
| Quiet suburban nighttime | | |
| | 30 dBA | Library |
| Quiet rural nighttime | | Bedroom at night, concert hall (background) |
| | 20 dBA | |
| | | Broadcast/recording studio |
| | 10 dBA | |
| | 0 dBA | |

Source: Technical Noise Supplement (TeNS), California Department of Transportation, November 2009.

**TABLE 3 Reaction of People and Damage to Buildings From Continuous or Frequent Intermittent Vibration Levels**

| Velocity Level, PPV (in/sec) | Human Reaction | Effect on Buildings |
|---|---|---|
| 0.01 | Barely perceptible | No effect |
| 0.04 | Distinctly perceptible | Vibration unlikely to cause damage of any type to any structure |
| 0.08 | Distinctly perceptible to strongly perceptible | Recommended upper level of the vibration to which ruins and ancient monuments should be subjected |
| 0.1 | Strongly perceptible | Virtually no risk of damage to normal buildings |
| 0.3 | Strongly perceptible to severe | Threshold at which there is a risk of damage to older residential dwellings such as plastered walls or ceilings |
| 0.5 | Severe - Vibrations considered unpleasant | Threshold at which there is a risk of damage to newer residential structures |

Source: Transportation and Construction Vibration Guidance Manual, California Department of Transportation, September 2013.

## Regulatory Criteria

The State of California and the City of Pittsburg establish guidelines, regulations, and policies designed to limit noise exposure at noise sensitive land uses. These plans and policies include: (1) the State CEQA Guidelines, Appendix G, (2) the City of Pittsburg General Plan, and (3) the City of Pittsburg Municipal Code.

***State CEQA Guidelines.*** The CEQA contains guidelines to evaluate the significance of effects of environmental noise attributable to a proposed project. CEQA asks the following applicable questions. Would the project result in:

(a) Exposure of persons to or generation of noise levels in excess of standards established in the local General Plan or Noise Ordinance, or applicable standards of other agencies?

(b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?

(c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?

(d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?

(e) For a project located within 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, exposure of people residing or working in the project area to excessive noise levels?

(f) For a project within the vicinity of a private airstrip, exposure of people residing or working in the project area to excessive noise levels?

Of these guidelines, items (a), (b), (c), and (d) are applicable to the proposed project. Guidelines (e) and (f) are not applicable because the project is not located in the vicinity of public airports or private airstrips.

***City of Pittsburg General Plan.*** Exterior and interior noise standards for residential land uses are established within the City of Pittsburg General Plan Noise Element. Policies contained in the Noise Element applicable to the proposed project include:

*Guiding Policies*

12-G-1 Protect public health and welfare by eliminating or minimizing the effects of existing noise problems, and by preventing increased noise levels in the future.

12-G-2 Encourage criteria such as building design and orientation, wider setbacks, and intense landscaping in lieu of sound walls to mitigate traffic noise along all major corridors, except along State Route 4.

12-G-3 Continue efforts to incorporate noise considerations into land use planning decisions, and guide the location and design of transportation facilities to minimize the effects of noise on adjacent land uses.

*Implementing Policies*

12-P-1 As part of development review, use Figure 12-3 (Noise and Land Use Compatibility Table – summarized below) to determine acceptable uses and installation requirements in noise impacted areas.

Exterior use areas associated with new single-family residences are considered *normally acceptable* up to a noise level of 60 dBA CNEL, *conditionally acceptable* where noise levels range from 55 to 70 dBA CNEL, *normally unacceptable* where noise levels range from 70 to 75 dBA CNEL, and *clearly unacceptable* where noise levels exceed 75 dBA CNEL.

Exterior use areas associated with new multi-family residences are considered *normally acceptable* up to a noise level of 65 dBA CNEL, *conditionally acceptable* where noise levels range from 60 to 70 dBA CNEL, *normally unacceptable* where noise levels range from 70 to 75 dBA CNEL, and *clearly unacceptable* where noise levels exceed 75 dBA CNEL.

12-P-4 Require noise attenuation programs for new development exposed to noise above normally acceptable levels. Encourage noise attenuation programs that avoid visible sound walls.

12-P-5 Require that applicants for new noise-sensitive development, such as schools, residences, and hospitals, in areas subject to noise generators producing noise levels greater than 65 dB CNEL, obtain the services of a professional acoustical engineer to provide a technical analysis and design of mitigation measures.

12-P-6 Ensure that new noise-sensitive uses, including schools, hospitals, churches, and homes, in areas near roadways identified as impacting sensitive receptors by producing noise levels greater than 65 dB CNEL, incorporate mitigation measures to insure that interior noise levels do not exceed 45 dB CNEL.

12-P-8 Develop noise attenuation programs for mitigation of noise adjacent to existing residential areas, including such measures as wider setbacks, intense landscaping, double-pane windows, and building orientation muffling the noise source.

12-P-9 Limit generation of loud noises on construction sites adjacent to existing development to normal business hours between 8:00 AM and 5:00 PM.

***City of Pittsburg Municipal Code.*** The City of Pittsburg regulates noise within the community in Chapter 9.44 (Noise) of the Municipal Code. Noise from project construction activities would be limited as follows:

> ***9.44.010 Prohibitions.***
> *It is unlawful for any person to make, continue or cause to be made or continued any noise which either unreasonably annoys, disturbs, injures or endangers the comfort, repose, health, peace or safety of others, within the limits of the city. The following acts, among others, are declared to be unreasonably loud, disturbing and endangering noises in violation of this chapter, but the enumeration shall not be deemed to be exclusive, namely:*
>
> > *H. Exhausts. The discharge into the open air of the exhaust of any steam engine, motorboat, stationary internal combustion engine or motor vehicle, except through a muffler or other device which will effectively prevent loud or explosive noises therefrom;*
> >
> > *J. Pile Drivers, Hammers and Similar Equipment. The operation between the hours of 10:00 p.m. and 7:00 a.m. of any pile driver, steam shovel, pneumatic hammer, derrick, steam or electric hoist or other appliance, the use of which is attended by loud or unusual noise, except in case of emergency.*

**Existing Noise Environment**

The project site is bounded on the north by Buchanan Road, to the east by the Contra Costa Canal and Somersville Road, to the south by the Black Diamond Estates residential development, and to the west by the Highlands Ranch residential development. The existing land uses surrounding the project consist primarily of residential developments. The project site bounds an existing Chevron facility (APN 089-150-015) accessed from Buchanan Road. Figure 1 shows the project site and vicinity.

Noise monitoring was completed between Wednesday, April 17, 2013 and Monday, April 22, 2013 in order to quantify existing ambient noise levels. The noise monitoring survey included three long-term noise measurements (LT-1 through LT-3) and three short-term measurements (ST-1 through ST-3). The existing noise environment at the site and in the vicinity results primarily from traffic on Buchanan Road and Somersville Road.

Long-term noise measurement LT-1 was made within Markley Creek Park, near the southeast corner of the project site. The measurement site was 60 feet from the centerline of Somersville Road, and noise levels measured at this site were primarily the result of traffic along the roadway. The daily trends in noise levels at LT-1 are shown on Figures 2-7. CNEL noise levels were 70 to 71 dBA during weekdays and 67 dBA over the weekend.

Noise measurement LT-2 was made near the southwest corner of the project site within the Highlands Ranch subdivision that forms the westernmost project boundary. Noise sources affecting measurements at this location were primarily local traffic along Canyon Oaks Circle and other neighborhood activities (e.g., landscaping, children playing, and barking dogs). The daily trends in noise levels at LT-2 are shown on Figures 8-13. CNEL noise levels were 53 dBA during weekdays and ranged from 54 to 57 dBA over the weekend.

Long-term noise measurement LT-3 was made within Highland Ranch Park, west of the project site. The measurement site was 75 feet from the centerline of Buchanan Road, and noise levels measured at this site were primarily the result of traffic along the roadway. The daily trends in noise levels at LT-3 are shown on Figures 14-19. CNEL noise levels were 70 dBA during weekdays and ranged from 68 to 69 dBA over the weekend.

Short-term noise measurements ST-1 through ST-3 were made at various locations surrounding the project site and were representative of existing noise-sensitive residential land uses. Table 4 summarizes the data collected at the short-term measurement locations. Observations were also made near the perimeter of the existing Chevron facility (APN 089-150-015). Activities at the facility appeared to be minimal during the site visits and any activities occurring at the facility are shielded by an approximate 10-foot high pre-cast concrete noise barrier. Noise sources associated with this facility were not notable or identifiable and were not in excess of existing ambient noise levels resulting from Buchanan Road traffic.

**TABLE 4 Summary of Short-Term Noise Measurement Data**

| Noise Measurement Location (Date, Time) | $L_{max}$ | $L_{(1)}$ | $L_{(10)}$ | $L_{(50)}$ | $L_{(90)}$ | $L_{eq}$ | CNEL |
|---|---|---|---|---|---|---|---|
| ST-1: ~ West end of Heaton Court. (4/22/2013, 1:30-1:40 p.m.) | 59 | 50 | 42 | 36 | 34 | 40 | <55 |
| ST-2: ~ 60 feet north of the Buchanan Road centerline. (4/22/2013, 2:20-2:30 p.m.) | 73 | 69 | 67 | 63 | 51 | 64 | 71 |
| ST-3: ~ Front of 37 Silver Saddle Court. (4/22/2013, 2:40-2:50 p.m.) | 56 | 52 | 47 | 42 | 39 | 44 | <55 |

## NOISE IMPACTS AND MITIGATION MEASURES

### Significance Criteria

Paraphrasing from Appendix G of the CEQA Guidelines, a project would normally result in significant noise impacts if noise levels generated by the project conflict with adopted environmental standards or plans, if the project would generate excessive groundborne vibration levels, or if ambient noise levels at sensitive receivers would be substantially increased over a permanent, temporary, or periodic basis. The following criteria were used to evaluate the significance of environmental noise resulting from the project:

- A significant noise impact would be identified if the project would expose persons to or generate noise levels that would exceed applicable noise standards presented in the General Plan or Municipal Code.

- A significant impact would be identified if the construction of the project would expose persons to excessive vibration levels. Groundborne vibration levels exceeding 0.3 in/sec PPV would have the potential to result in cosmetic damage to normal buildings.

- A significant impact would be identified if traffic generated by the project would substantially increase noise levels at sensitive receivers in the vicinity. A substantial increase would occur if: a) the noise level increase is 5 dBA CNEL or greater, with a future noise level of less than 60 dBA CNEL, or b) the noise level increase is 3 dBA CNEL or greater, with a future noise level of 60 dBA CNEL or greater.

- A significant noise impact would be identified if construction related noise would temporarily increase ambient noise levels at sensitive receivers. Hourly average noise levels intermittently exceeding 60 dBA $L_{eq,}$ and the ambient by at least 5 dBA $L_{eq}$, for a period of more than one year, would constitute a significant temporary noise increase at adjacent residential land uses.

**Impact 1:** **Noise and Land Use Compatibility.** Residential land uses proposed at the project site would be exposed to exterior noise levels greater than the "normally acceptable" noise level standards presented in the City of Pittsburg General Plan. **This is a significant impact.**

*Future Exterior Noise Environment – Single-Family Residential Land Uses*

Future cumulative noise conditions at the project site are graphically summarized on Figure 20 and discussed in detail below:

Buchanan Road. The future noise environment along Buchanan Road is calculated to increase by about 1 dBA CNEL under cumulative conditions reaching 71 dBA CNEL at a distance of 75 feet (residential lots 1-3). Exterior noise levels at single-family residential lots 1-3 would be approximately 11 dBA CNEL above the 60 dBA CNEL "normally acceptable" noise level standard for single-family residential land uses. Traffic noise levels would attenuate with distance from the roadway and are calculated to reach 60 dBA CNEL at a distance of 440 feet from the roadway centerline. Future exterior noise levels within approximately 440 feet of the roadway centerline would exceed the "normally acceptable" noise level standard for single-family residential land uses (60 dBA CNEL). Intermittent noise from the existing Chevron facility would also be expected at receptors in the Buchanan Road/Tuscany Drive vicinity.

Somersville Road. The future noise environment along Somersville Road is also calculated to increase by about 1 dBA CNEL under cumulative conditions and reach 71 dBA CNEL at a distance of 75 feet from the roadway centerline. Exterior noise levels at single-family residential lots 539-557, 569-576, and 901-915 would be approximately 11 dBA CNEL above the 60 dBA CNEL "normally acceptable" noise level standard for single-family residential land uses.

James Donlon Boulevard. The future noise environment along Somersville Road is calculated to reach 66 dBA CNEL under cumulative conditions (with Bypass) at a distance of 75 feet from the roadway centerline. Exterior noise levels at single-family residential lots 232-234 would be approximately 6 dBA CNEL above the 60 dBA CNEL "normally acceptable" noise level standard for single-family residential land uses.

*Future Exterior Noise Environment – Multi-Family Residential Land Uses*

Buchanan Road. The project would construct up to 365 multi-family units on Parcel A. The future noise environment on Parcel A would continue to result primarily from vehicular traffic along Buchanan Road, with intermittent noise from the existing Chevron facility located to the west. As noted above, future exterior noise levels are calculated to reach 71 dBA CNEL at a distance of 75 feet. Traffic noise levels would attenuate with distance from the roadway to 65 dBA CNEL at a distance of 205 feet from the centerline. Common outdoor use areas located in unshielded areas within 205 feet of the roadway centerline would be exposed to future exterior noise levels exceeding the "normally acceptable" noise level standard for multi-family residential land uses (65 dBA CNEL). Exterior noise levels would exceed 60 dBA CNEL within approximately 440 feet of the roadway centerline.

*Future Interior Noise Environment*

The City of Pittsburg requires that interior noise levels within new residential units be maintained at or below 45 dBA CNEL. In buildings of typical construction, with the windows partially open, interior noise levels are generally 15 dBA lower than exterior noise levels. With the windows closed, standard residential construction typically provides about 20 to 25 decibels of noise reduction. For example, a unit exposed to exterior noise levels of 71 dBA CNEL would be 56 dBA CNEL inside with the windows partially open and would range from 46 to 51 dBA CNEL with the windows shut. Interior noise levels would exceed the maximum allowable interior sound level of 45 dBA CNEL inside residential units exposed to exterior noise levels of 60 dBA CNEL when windows are open for ventilation. Attaining the necessary noise reduction from exterior to interior spaces is possible with proper wall construction techniques, the selection of proper windows and doors, and the incorporation of a forced-air mechanical ventilation system to allow the occupant the option of controlling noise by closing the windows. Preliminary calculations indicate that windows and doors with minimum sound transmission class (STC) ratings from STC 26 to STC 32 would be necessary to maintain interior noise levels at or below 45 dBA CNEL.

**Mitigation 1:** The following measures shall be required to reduce exterior noise levels in private outdoor use areas of single-family residential land uses and common outdoor use areas of multi-family residential land uses to "normally acceptable" noise levels:

- Provide noise barriers six feet to twelve feet in height, as measured above the adjacent private outdoor activity areas, to shield private outdoor spaces adjacent to Buchanan Road, Somersville Road, and James Donlon Boulevard. The barriers would provide about 6 to 11 dBA of attenuation, reducing the noise exposure to 60 dBA CNEL or less. The specific height and locations of the noise barriers will be confirmed based upon the final approved site and grading plans. Generally, an effective noise barrier is constructed without cracks or gaps and has a surface weight of at least 3 lbs/ft$^2$. A preliminary barrier plan is shown on Figure 21. A qualified acoustical consultant shall review the final site and grading plans to determine the barrier heights and locations necessary to reduce exterior noise levels to 60 dBA CNEL or lower.

- Locate common outdoor use areas a minimum distance of 205 feet from the Buchanan Road centerline, or in areas shielded by multi-family residential buildings or noise barriers, in order to reduce the noise exposure to 65 dBA CNEL or less. The location of outdoor use areas, or attenuation provided by buildings or noise barriers, will be confirmed based upon the final approved site and grading plans.

The following measures shall be required to reduce interior noise levels of single-family and multi-family residential land uses to "normally acceptable" noise levels:

- A qualified acoustical consultant shall review final site plans, building elevations, and floor plans prior to construction to calculate expected interior noise levels as required by the City of Pittsburg to confirm that the design results in interior noise levels reduced to 45 dBA CNEL or lower. The specific determination of what noise insulation treatments are necessary will be conducted on a unit-by-unit basis. Results of the analysis, including the

description of the necessary noise control treatments, will be submitted to the City along with the building plans and approved prior to issuance of a building permit.

- Provide a suitable form of forced-air mechanical ventilation, as determined by the local building official, for units throughout the site, so that windows can be kept closed at the occupant's discretion to control interior noise and achieve the interior noise standards.

The implementation of the above measures would reduce the impact to a less-than-significant level.

**Impact 2**: **Construction Vibration.** Vibration levels generated during demolition and construction activities may at times be perceptible at neighboring land uses, and could at times exceed safe vibration limits used to avoid cosmetic damage to the nearest buildings. **This is significant impact.**

The construction of the project may generate perceptible vibration when heavy equipment or impact tools (e.g., jackhammers, hoe rams, etc.) are used. Construction activities would include excavation, grading, site preparation work, foundation work, and new building framing and finishing.

The California Department of Transportation recommends a vibration limit of 0.5 in/sec PPV for buildings structurally sound and designed to modern engineering standards, 0.3 in/sec PPV for buildings that are found to be structurally sound but where structural damage is a major concern, and a conservative limit of 0.08 in/sec PPV for ancient buildings or buildings that are documented to be structurally weakened. No ancient buildings or buildings that are documented to be structurally weakened adjoin the project site. Therefore, groundborne vibration levels exceeding 0.3 in/sec PPV would have the potential to result in a significant vibration impact.

Table 5 presents typical vibration levels that could be expected from construction equipment at a distance of 25 feet. Jackhammers typically generate vibration levels of 0.035 in/sec PPV and drilling typically generates vibration levels of 0.09 in/sec PPV at a distance of 25 feet. Vibration levels from vibratory rollers can reach 0.210 in/sec PPV at 25 feet. Vibration levels would vary depending on soil conditions, construction methods, equipment used, and with distance from the source of the vibration.

Existing residences bordering the site are typically located about 20 to 25 feet from the common property line, but one residence along the west boundary of the site (Canyon Oaks Circle) is located as near as about 10 feet from the property line. At a distance of 10 feet, vibration levels from most construction equipment would be less than the 0.3 in/sec PPV threshold, however, the use of a vibratory roller at a distance of 10 feet would result in vibration levels of about 0.6 in/sec PPV. At more typical distances of 20 feet or greater, vibration levels from all construction equipment would be at or below the 0.3 in/sec PPV vibration threshold. Vibration generated by construction activities occurring near the common property line would at times be perceptible, but would only be expected to exceed the 0.3 in/sec PPV vibration threshold when activities occur closer than 20 feet of existing residences. This is a significant impact.

**TABLE 5 Vibration Source Levels for Construction Equipment[1]**

| Equipment | | PPV at 25 ft. (in/sec) | Approximate $L_v$ at 25 ft. (VdB) |
|---|---|---|---|
| Pile Driver (Impact) | upper range | 1.158 | 112 |
| | typical | 0.644 | 104 |
| Pile Driver (Sonic) | upper range | 0.734 | 105 |
| | typical | 0.170 | 93 |
| Clam shovel drop | | 0.202 | 94 |
| Hydromill (slurry wall) | in soil | 0.008 | 66 |
| | in rock | 0.017 | 75 |
| Vibratory Roller | | 0.210 | 94 |
| Hoe Ram | | 0.089 | 87 |
| Large bulldozer | | 0.089 | 87 |
| Caisson drilling | | 0.089 | 87 |
| Loaded trucks | | 0.076 | 86 |
| Jackhammer | | 0.035 | 79 |
| Small bulldozer | | 0.003 | 58 |

Source: Transit Noise and Vibration Impact Assessment, United States Department of Transportation, Office of Planning and Environment, Federal Transit Administration, May 2006.

**Mitigation 2:** Prohibit the use of heavy vibratory compaction equipment within 20 feet of existing residential land uses adjoining the project site. Plate compactors and smaller, rubber-tired equipment shall be utilized as feasible.

The implementation of this measure would reduce the impact to a less-than-significant level.

**Impact 3:** **Project-Generated Traffic Noise:** Project generated traffic would not substantially increase traffic noise levels in the area. **This is a less-than-significant impact.**

A noise impact would be identified at noise-sensitive land uses where: 1) the noise level increase is 5 dBA CNEL or greater, with a future noise level of less than 60 dBA CNEL, or 2) the noise level increase is 3 dBA CNEL or greater, with a future noise level of 60 dBA CNEL or greater.

Traffic volume information at the study area intersections was reviewed as part of the traffic noise analysis. Traffic data provided by *Abrams & Associates* estimates 9,940 net new daily trips as a result of the project with a total of 797 trips occurring in the AM Peak Hour and 947 trips occurring in the PM Peak Hour.

Traffic volumes under the "Existing" and "Near-Term Project" traffic scenarios were compared to calculate the relative increase in traffic noise attributable to the proposed project. This comparison showed that traffic noise levels would not be substantially increased with the project as compared to existing conditions at sensitive land uses along roadway segments serving the project site.

[1] Transit Noise and Vibration Impact Assessment, United States Department of Transportation, Office of Planning and Environment, Federal Transit Administration, May 2006.

Traffic noise levels are calculated to increase by 0 to 1 dBA CNEL as a result of the project and such noise increases would not be considered substantial. Table 6 summarizes future traffic noise level increases expected with the proposed project.

**TABLE 6 Traffic Noise Levels at 75 feet from the Centerline (dBA, CNEL)**

| Roadway | Existing | Near-Term Project | Cumulative | Cumulative Plus Project |
|---|---|---|---|---|
| Buchanan Road | 70 | 71 | 71 | 71 |
| Somersville Road | 70 | 71 | 71 | 71 |
| James Donlon Boulevard | NA | NA | 66 | 66 |

**Mitigation 3:** None required.

**Impact 4:** **Cumulative Traffic Noise.** Traffic volumes along roadways serving the project site will increase as a result of cumulative growth planned in and around the City of Pittsburg. Significant cumulative traffic noise impacts are not anticipated in the project vicinity and the project would not make a "cumulatively considerable" contribution to cumulative traffic noise increases. **This is a less-than-significant impact.**

The project would result in a significant cumulative traffic noise impact if existing sensitive receptors would be exposed to cumulative traffic noise level increases greater than 3 dBA $L_{dn}$ above existing traffic noise levels and if the project would make a "cumulatively considerable" contribution to the overall traffic noise increase. A "cumulatively considerable" contribution would be defined as an increase of 1 dBA $L_{dn}$ or more attributable solely to the proposed project.

Traffic volumes under the "Existing" and "Cumulative plus Project with Bypass" traffic scenarios were calculated to determine the cumulative traffic noise increase expected at build-out. Cumulative traffic noise levels, with or without the proposed project, are not anticipated to increase substantially along the majority of roadways serving the project site, and the project's contribution to cumulative traffic noise level increases is calculated to be 0.8 dBA CNEL or less. The one exception would be James Donlon Boulevard. Traffic noise levels would increase substantially along this proposed Bypass route; however, residential land uses along the existing segment of James Donlon Boulevard have been designed to account for these future increases in traffic and noise. Cumulative traffic noise increases would not be considered substantial, and the project would not make a cumulatively considerable contribution to increased noise levels.

**Mitigation 4:** None required.

**Impact 5:** **Construction Noise.** Residences in the vicinity of the site would be exposed to noise levels substantially above ambient conditions over the duration of project construction activities. **This is considered a significant noise impact.**

Construction of the proposed project would require grading of the site for the proposed roads and building pads, trenching for water, sewer, and storm drainage improvements, and the construction of up to 917 single-family homes and up to a 365-multi-family apartment complex. The single-

family homes would consist of one- and two-story, wood-framed structures with interior post-tension concrete slab foundations. The multi-family apartment buildings would be three- to four-story, wood-framed structures on post-tensioned slab foundations.

Construction of the project would involve site improvements, such as the establishment of utilities, site grading and excavation, the construction of foundations, building framing, paving, and landscaping. The project would also generate truck trips along roadways serving the site.

Noise impacts from construction activities depend on the various pieces of construction equipment, the timing and length of noise generating activities, and the distance between the construction noise sources and noise sensitive areas. Construction noise impacts primarily result when construction activities occur during noise-sensitive times of the day (e.g., early morning, evening, or nighttime hours), when the construction occurs in areas adjoining noise sensitive land uses, or when construction lasts over extended periods of time.
During each stage of construction, there would be a different mix of equipment operating. Construction noise levels would vary by stage and vary within stages based on the amount of equipment in operation and location where the equipment is operating. Typical construction noise levels at a distance of 50 feet are shown in Tables 7 and 8. Table 7 shows the average noise level ranges by construction phase. Most demolition and construction noise for domestic housing is in the range of 81 to 88 dBA $L_{eq}$ at a distance of 50 feet from the source. For reference, typical daytime ambient noise levels at receptors away from major roadways in the project vicinity are less than 50 dBA $L_{eq}$.

Table 8 shows the maximum noise level ranges for different construction equipment. The highest noise levels would be generated during demolition, excavation, and foundation construction. Jackhammers typically generate maximum noise levels of 85 dBA $L_{max}$ at a distance of 50 feet. Large pieces of earth-moving equipment, such as graders, excavators, and bulldozers, generate maximum noise levels of 85 to 90 dBA $L_{max}$ at a distance of 50 feet.

Construction noise levels drop off at a rate of about 6 dBA per doubling of distance between the noise source and receptor, so average noise levels at 100 feet from the more typical construction activity at this site would range from 75 to 82 dBA $L_{eq}$ during busy construction periods. Noise levels at 200 feet would be expected to range from 69 to 76 dBA $L_{eq}$, and noise levels at 400 feet would be expected to range from 63 to 70 dBA $L_{eq}$, and so on. Therefore, construction activities occurring on the vast majority of the site, in the vicinity of existing noise-sensitive residential land uses, would have the potential to substantially increase ambient noise levels over a temporary basis.

Based on this analysis, project development would expose existing area residences to construction-generated noise over multiple building seasons. Given the potential for substantial increases in noise at adjacent residences as a result of project construction and the likelihood that substantial noise increases would likely occur for more than one year, construction of the project is determined to result in a significant unavoidable, short-term noise impact.

**TABLE 7 Typical Ranges of Energy Equivalent Construction Noise Levels at 50 Feet, $L_{eq}$ in dBA**

| | Domestic Housing | | Office Building, Hotel, Hospital, School, Public Works | | Industrial Parking Garage, Religious Amusement & Recreations, Store, Service Station | | Public Works Roads & Highways, Sewers, and Trenches | |
|---|---|---|---|---|---|---|---|---|
| | **I** | **II** | **I** | **II** | **I** | **II** | **I** | **II** |
| Ground Clearing | 83 | 83 | 84 | 84 | 84 | 83 | 84 | 84 |
| Excavation | 88 | 75 | 89 | 79 | 89 | 71 | 88 | 78 |
| Foundations | 81 | 81 | 78 | 78 | 77 | 77 | 88 | 88 |
| Erection | 81 | 65 | 87 | 75 | 84 | 72 | 79 | 78 |
| Finishing | 88 | 72 | 89 | 75 | 89 | 74 | 84 | 84 |

**I** - All pertinent equipment present at site.
**II** - Minimum required equipment present at site.

Source: U.S.E.P.A., Legal Compilation on Noise, Vol. 1, p. 2-104, 1973.

**TABLE 8 Construction Equipment 50-foot Noise Emission Limits**

| Equipment Category | $L_{max}$ Level (dBA)[1,2] | Impact/Continuous |
|---|---|---|
| Arc Welder | 73 | Continuous |
| Auger Drill Rig | 85 | Continuous |
| Backhoe | 80 | Continuous |
| Bar Bender | 80 | Continuous |
| Boring Jack Power Unit | 80 | Continuous |
| Chain Saw | 85 | Continuous |
| Compressor[3] | 70 | Continuous |
| Compressor (other) | 80 | Continuous |
| Concrete Mixer | 85 | Continuous |
| Concrete Pump | 82 | Continuous |
| Concrete Saw | 90 | Continuous |
| Concrete Vibrator | 80 | Continuous |
| Crane | 85 | Continuous |
| Dozer | 85 | Continuous |
| Excavator | 85 | Continuous |
| Front End Loader | 80 | Continuous |
| Generator | 82 | Continuous |
| Generator (25 KVA or less) | 70 | Continuous |
| Gradall | 85 | Continuous |
| Grader | 85 | Continuous |
| Grinder Saw | 85 | Continuous |
| Horizontal Boring Hydro Jack | 80 | Continuous |
| Hydra Break Ram | 90 | Impact |
| Impact Pile Driver | 105 | Impact |
| Insitu Soil Sampling Rig | 84 | Continuous |
| Jackhammer | 85 | Impact |
| Mounted Impact Hammer (hoe ram) | 90 | Impact |
| Paver | 85 | Continuous |
| Pneumatic Tools | 85 | Continuous |
| Pumps | 77 | Continuous |
| Rock Drill | 85 | Continuous |
| Scraper | 85 | Continuous |
| Slurry Trenching Machine | 82 | Continuous |
| Soil Mix Drill Rig | 80 | Continuous |
| Street Sweeper | 80 | Continuous |
| Tractor | 84 | Continuous |
| Truck (dump, delivery) | 84 | Continuous |
| Vacuum Excavator Truck (vac-truck) | 85 | Continuous |
| Vibratory Compactor | 80 | Continuous |
| Vibratory Pile Driver | 95 | Continuous |
| All other equipment with engines larger than 5 HP | 85 | Continuous |

Notes:

1 Measured at 50 feet from the construction equipment, with a "slow" (1 sec.) time constant.

2 Noise limits apply to total noise emitted from equipment and associated components operating at full power while engaged in its intended operation.

3 Portable Air Compressor rated at 75 cfm or greater and that operates at greater than 50 psi.

**Mitigation Measure 5:** The contractor shall prepare a detailed construction plan identifying the schedule for major noise-generating construction activities. The construction plan shall identify a procedure for coordination with adjacent residential land uses so that construction activities can be scheduled to minimize noise disturbance. The plan shall implement, but not be limited to, the following available control measures to reduce construction noise levels as low as practical:

- Construction activities shall be limited to the hours between 8:00 a.m. and 5:00 p.m., Monday through Friday. No construction activities should occur on Saturdays, Sundays, or federal holidays (Consistent with General Plan Policy 12-P-9);

- Equip all internal combustion engine-driven equipment with mufflers, which are in good condition and appropriate for the equipment;

- Prohibit all unnecessary idling of internal combustion engines;

- Route construction related traffic to and from the site via designated truck routes and avoid residential streets where possible;

- Utilize “quiet” models of air compressors and other stationary noise sources where technology exists;

- Locate all stationary noise-generating equipment, such as air compressors and portable power generators, as far away as possible from adjacent land uses;

- Shield adjacent sensitive uses from stationary equipment with individual noise barriers or partial acoustical enclosures;

- Locate staging areas and construction material storage areas as far away as possible from adjacent land uses;

- Designate a "disturbance coordinator" who would be responsible for responding to any local complaints about construction noise. The disturbance coordinator will determine the cause of the noise complaint (e.g., starting too early, bad muffler, etc.) and will require that reasonable measures warranted to correct the problem be implemented. Conspicuously post a telephone number for the disturbance coordinator at the construction site and include it in the notice sent to neighbors regarding the construction schedule; and

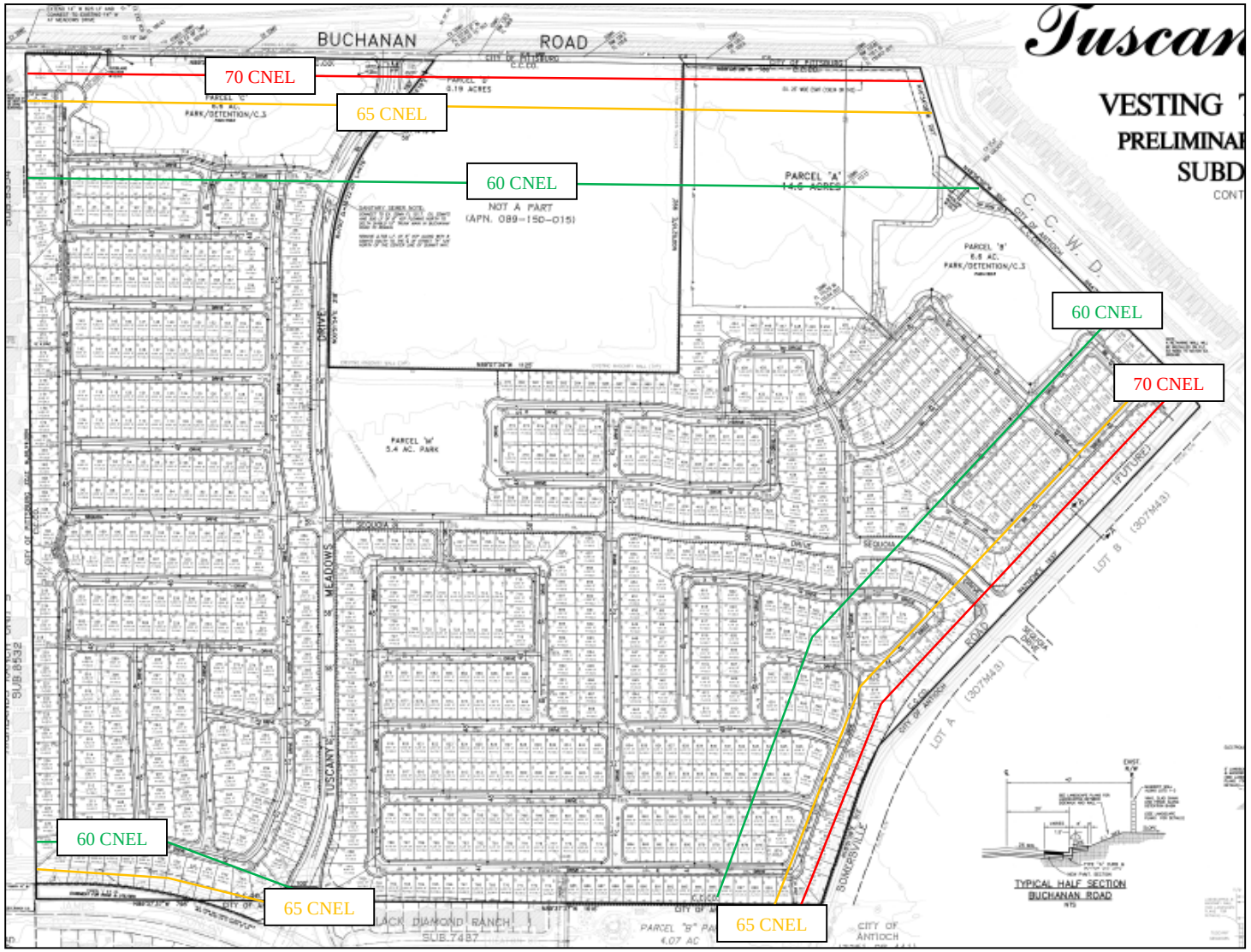
- Hold a preconstruction meeting with the job inspectors and the general contractor/on-site project manager to confirm that noise mitigation and practices (including construction hours, construction schedule, and noise coordinator) are completed.

The implementation of the above mitigation measures would reduce the effects of construction noise upon existing residences in the area. Even after implementation of these measures, however, noise levels at adjacent residences would continue to substantially exceed existing ambient noise levels. For this reason, and because construction is expected to last over several years, project construction noise would represent a significant and unavoidable impact.

**Figure 1 Aerial Photo Showing Noise Monitoring Locations**

**Figure 2-19 Long-Term Noise Data Summaries**

**Figure 20 Future CNEL Noise Contours[2]**




[2] Contours do not assume attenuation provided by noise barriers or structures.

**Figure 21 Preliminary Noise Barrier Plan**