2.11 NOISE

Issues (and Supporting Information Sources):	*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
NOISE—Would the proposed 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, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

SETTING

BACKGROUND

Noise is defined as unwanted sound. Sound, traveling in the form of waves from a source exerts a sound pressure level (referred to as sound level) which is measured in decibels, with zero dB corresponding roughly to the threshold of human hearing and 120 to 140 dB corresponding to the threshold of pain. Pressure waves traveling through air exert a force registered by the human ear as sound.

The typical human ear is not equally sensitive to all frequencies of the audible sound spectrum (20 to 20,000 cycles/second [Hz]). As a consequence, when assessing potential noise impacts, sound is measured using an electronic filter that de-emphasizes the frequencies below 1,000 Hz and above 5,000 Hz in a manner corresponding to the human ear's decreased sensitivity to low and extremely high frequencies instead of the frequency mid-range. This method of frequency weighting is referred to as A-weighting and is expressed in units of A-weighted decibels. Frequency A-weighting follows an international standard method of frequency de-emphasis and is typically applied to community noise measurements. In practice, the level of a sound source is

measured using a sound level meter that includes an electrical filter corresponding to the A-weighting curve. Some representative noise sources and their corresponding A-weighted noise levels are shown in **Figure 2.11-1**. All of the noise levels reported herein are A-weighted unless otherwise stated.

Noise Exposure and Community Noise

An individual's noise exposure is a measure of noise over a period of time. A noise level is a measure of noise at a given instant in time. The noise levels presented in **Figure 2.11-1** are representative of measured noise at a given instant in time, however, they rarely persist consistently over a long period of time. Rather, community noise varies continuously over a period of time with respect to the contributing sound sources of the community noise environment. Community noise is primarily the product of many distant noise sources, which constitute a relatively stable background noise exposure, with the individual contributors unidentifiable. The background noise level changes throughout a typical day, but does so gradually, corresponding with the addition and subtraction of distant noise sources such as traffic and continually changing atmospheric conditions. What makes community noise constantly variable throughout a day, besides the slowly changing background noise, is the addition of short duration single event noise sources such as aircraft flyovers, vehicle passbys, sirens, etc., which are readily identifiable to the individual. These successive additions of sound to the community noise environment vary the community noise level from instant to instant, requiring the measurement of noise exposure over a period of time to legitimately characterize a community noise environment and evaluate cumulative noise impacts. This time-varying characteristic of environmental noise is described using statistical noise descriptors. The most frequently used noise descriptors are summarized below:

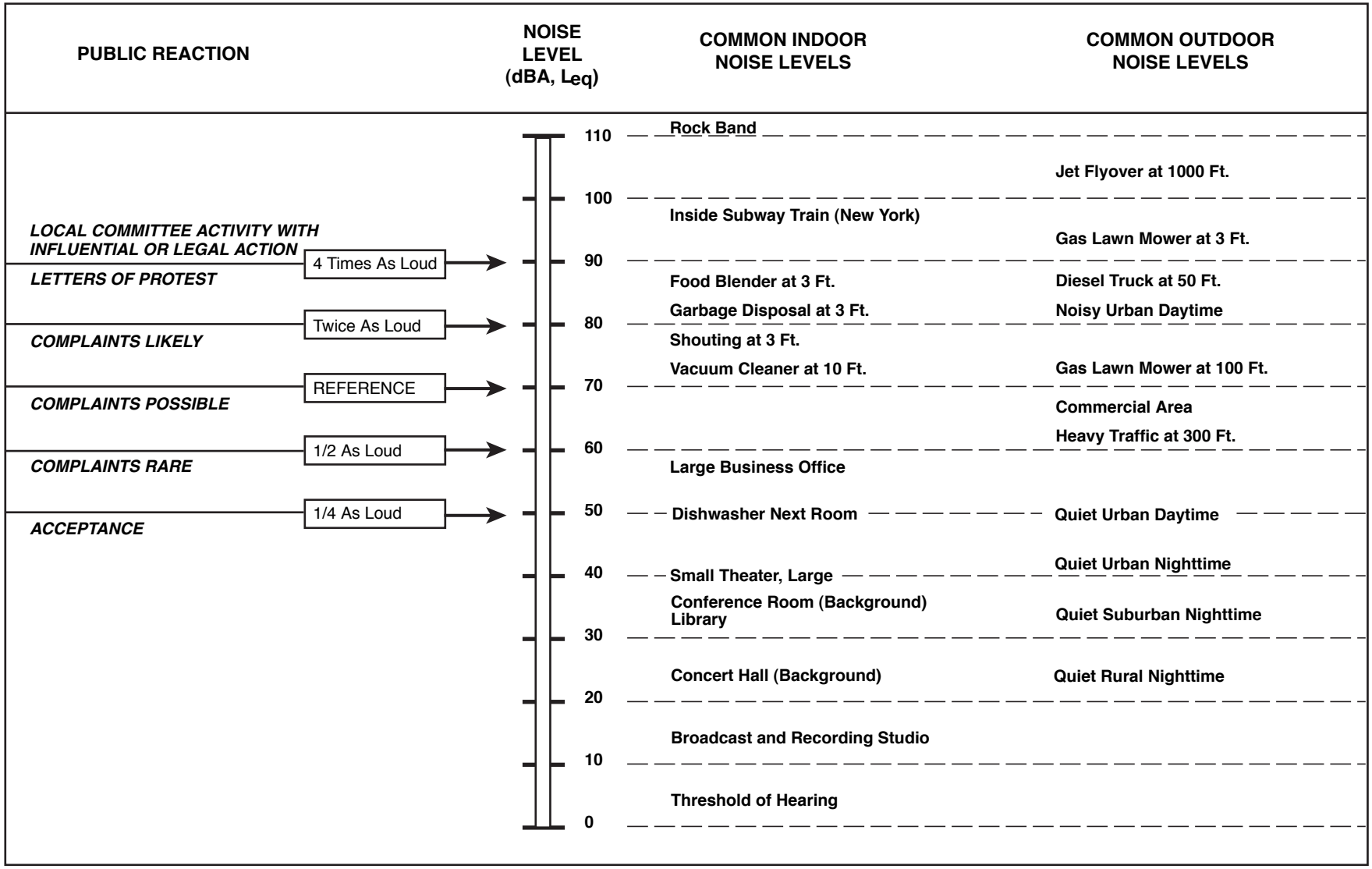
Leq: the equivalent sound level is used to describe noise over a specified period of time, typically one hour, in terms of a single numerical value. The Leq is the constant sound level that would contain the same acoustic energy as the varying sound level, during the same time period (i.e., the average noise exposure level for the given time period).

Lmax: the instantaneous maximum noise level for a specified period of time.

L10: the noise level that is equaled or exceeded 10 percent of the specified time period. The L10 is often considered the maximum noise level averaged over the specified time period.

L90: the noise level that is equaled or exceeded 90 percent of the specified time period. The L90 is often considered the background noise level averaged over the specified time period.

DNL (or Ldn): 24-hour day and night A-weighed noise exposure level which accounts for the greater sensitivity of most people to nighttime noise by weighting noise levels at night ("penalizing" nighttime noises). Noise between 10:00 p.m. and 7:00 a.m. is weighted (penalized) by adding 10 dBA to take into account the greater annoyance of nighttime noise.



SOURCE: Caltrans Transportation Laboratory Noise Manual (1982)

Figure 2.11-1
Effects of Noise on People

CNEL: similar to the DNL, the Community Noise Equivalent Level adds a 5 dBA "penalty" for the evening hours between 7:00 p.m. and 10:00 p.m. in addition to a 10 dBA penalty between the hours of 10:00 p.m. and 7:00 a.m.

Effects of Noise on People

The effects of noise on people can be placed in three categories:

- Subjective effects of annoyance and dissatisfaction;
- Interference with activities such as speech, sleep, learning; and
- Physiological effects such as hearing loss or sudden startling.

Environmental noise typically produces effects in the first two categories. Workers in industrial plants can experience noise in the last category. There is no completely satisfactory way to measure the subjective effects of noise or the corresponding reactions of annoyance and dissatisfaction. A wide variation in individual thresholds of annoyance exists, and different tolerances to noise tend to develop based on an individual's past experiences with noise.

Thus, an important way of predicting a human reaction to a new noise environment is the way it compares to a baseline noise condition (typically the existing environment) to which one has adapted: the so called "ambient noise" level. In general, the more a new noise exceeds the previously existing ambient noise level, the less acceptable the new noise would be judged by those hearing it. With regard to increases in A-weighted noise level, the following relationships occur:

- under controlled conditions in an acoustics laboratory, the trained healthy human ear is able to discern changes in sound levels of 1 dBA;
- outside of such controlled conditions, the trained ear can detect changes of 2 dBA in normal environmental noise;
- it is widely accepted that the average healthy ear, however, can barely perceive noise level changes of 3 dBA;
- a change in level of 5 dBA is a readily perceptible increase in noise level; and
- a 10 dBA change is recognized as twice as loud as the original source (Caltrans, 1998).

These relationships occur in part because of the logarithmic nature of sound and the decibel system. Because the decibel scale is based on logarithms two noise sources do not combine in a simple linear fashion, but rather logarithmically. For example, if two identical noise sources produce noise levels of 50 dBA, the combined sound level would be 53 dBA, not 100 dBA.

Sensitive Receptors

Sensitive populations (i.e., children, senior citizens and acutely or chronically ill people) are more susceptible to the effects of air pollution than are the general population. Land uses where sensitive receptors are typically found include residences, schools, playgrounds childcare centers,

parks, hospitals, clinics, rehabilitation centers, convalescent homes, and retirement homes. The closest sensitive receptor identified is the residential development on 25th Street, Minnesota Street and Cesar Chavez Street.

Noise Attenuation

Stationary "point" sources of noise, including stationary mobile sources such as idling vehicles, attenuate (lessen) at a rate of 6 to 7.5 dBA per doubling of distance from the source, depending on environmental conditions (i.e., atmospheric conditions, ground conditions, and noise barriers). Widely distributed noises, such as a large industrial facility spread over many acres or a street with moving vehicles (a "line" source), would typically attenuate at a lower rate, approximately 3 to 4.5 dBA per doubling distance from the source (also dependent upon environmental conditions) (Caltrans, 1998). Noise from large construction sites would have characteristics of both "point" and "line" sources, so attenuation would probably range between about 4.5 and 7.5 dBA per doubling of distance.

EXISTING SITE CONDITIONS

Noise measurements were collected at representative locations with key noise parameters presented in **Table 2.11-1** (Essex Environmental, 2003). The San Francisco Land Use Compatibility Chart for Community Noise (San Francisco, 1999) identifies residential land uses as satisfactory when the Ldn is less than 60. In this context, satisfactory means satisfactory assuming that normal conventional construction is used in buildings. As indicated by the measurements, existing noise levels along the proposed project route are at or above satisfactory noise levels for residential use. The proposed project route is in a highly urban area with high noise levels, much of the noise being from vehicle traffic and buses.

TABLE 2.11-1
NOISE MEASUREMENTS ALONG PROPOSED PROJECT ROUTE

Location (Street intersections)	Noise Levels (dBA)					
	Average (L_{eq})	Minimum (L_{eq})	Maximum (L_{eq})	Average (L_{50})	Average (L_{90})	Average (L_{dn})
Illinois and Humboldt	61.7	48.3	81.8	64.8	56.4	65.6
Cesar Chavez and Mississippi	73.8	61.21	93.4	70.8	65.3	77.8
Evans and Jennings	65.8	53.7	85.7	69.3	63.0	69.8

dBA A-weighted decibels
L_{eq} Equivalent sound level
L_{50} Sound Level at the 50th percentile
L_{90} Sound Level at the 90th percentile
L_{dn} day-night equivalent noise level

SOURCE: Essex Environmental (2003)

REGULATORY CONTEXT

City and County of San Francisco General Plan

The City and County of San Francisco General Plan does not specifically address community noise issues as it relates to stationary sources. However, the Transportation Noise section of the Environmental Protection Element includes a table that lists acceptable noise levels with land use types. In Objective 11, "Promote Land Uses that are Compatible with Various Transportation Noise Levels," a table titled "Land Use Compatibility Chart for Community Noise" is included. In that table under Commercial Land Use, the stated noise level "Satisfactory, with no special noise insulation requirements" is a maximum 78 A-weighted decibels (dBA)-day-night equivalent noise level (L_{dn}).

San Francisco Police Code

The San Francisco Police Code, Article 29, "Regulation of Noise," states: "[i]t is hereby declared to be the policy of the City and County to prohibit unnecessary, excessive, and offensive noise from all sources subject to its police power." Section 2901.11 defines unnecessary, excessive, or offensive noise as "…any sound or noise conflicting with the criteria, standards, or levels set forth in the Article for permissible noises. In the absence of specific maximum noise levels, a noise level which exceeds the ambient noise level by 5 dBA or more measured at the nearest property line…"

Article 29, "Regulation of Noise" of the San Francisco Police Code states in Section 2090, "Fixed Source Noise Level," that for property zoned M-2 (the area in which the project is located) "...it is unlawful for any person to operate any fixed machinery or equipment, or similar mechanical device in any manner so as to create any noise which would cause the noise level measured at the Property Line by noise emissions..." to exceed 75 dBA at any time.

Section 2907, "Construction Equipment" states, "…it shall be unlawful for any person, including the City and County of San Francisco, to operate any powered construction equipment, regardless of age or date of acquisition, if the operation of such equipment emits noise at a level in excess of 85 dBA when measured at a distance of 100 feet from such equipment or an equivalent sound level at some other convenient distance." However, Subsection (c) states: "[t]he provisions …of this Section shall not be applicable to impact tools and equipment, provided that …such impact tools and equipment shall have intake and exhaust mufflers recommended by the manufacturers thereof and approved by the Director of Public Works as best accomplishing maximum noise attenuation, and that pavement breakers and jackhammers shall also be quipped with acoustically attenuated shields or shrouds recommended by the manufactures…"

Section 2909, "Construction Work at Night" states: "[i]t shall be unlawful for any person, between the hours of 8 p.m. of any day and 7 a.m. of the following day to erect, construct, demolish, excavate for, alter, or repair any building or structure if the noise level created thereby is in excess of the ambient noise level by 5 dBA at the nearest *property line*, unless a special permit...has been...granted..."

IMPACTS DISCUSSION OF NOISE

METHODOLOGY AND SIGNIFICANCE CRITERIA

Based on the California Environmental Quality Act (CEQA) Guidelines (Governor's Office of Planning and Research, 1996), a project may be deemed to have a significant effect on the environment if it would increase substantially the ambient noise levels for adjoining areas. With regard to increases in A-weighted noise level, it is widely accepted that the average person can barely perceive noise level changes of 3 dBA, while a change in noise levels of 5 dBA is a readily perceptible increase in noise levels and the minimum required increase for a change in community reaction (Caltrans, 1998; U.S. DOT, 1990). With temporary noise impacts, identification of "substantial increases" depends upon the duration of the impact, the temporal daily nature of the impact, as well as the absolute change in dBA levels and the time of day in which the noise occurs.

The analysis of the potential intensity of impacts to noise was derived from noise data from like sources in the project area. This information was compared with the construction and design criteria of the proposed project. To determine the level of significance of the impacts anticipated from the proposed project, the proposed project's effects were evaluated as provided under the CEQA Guidelines. This significance criteria, as set forth in CEQA Guidelines Appendix G, are summarized in the checklist provided at the beginning of this section.

ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Construction of the proposed project components could result in short term noise impacts. Once constructed, the operational phase of the proposed project would result in a less than significant impact on community noise levels. The only change in noise would be a minimal increase in noise in the switchyards and the noise from vehicles during regular inspection of powerlines, instrumentation and control, and support systems.

Impact NOI-1: Construction activities would intermittently and temporarily generate noise levels above existing ambient levels in the project vicinity This would be a less than significant impact with implementation of Mitigation Measure NOI-1. Additionally, Mitigation Measure LUP-1, provided in Section 2.9 *Land Use*, shall be implemented to minimize impacts to sensitive receptors.

The proposed project would result in potentially significant noise impacts from construction required for the trench. Project ground disturbance would be limited to trenching activities between the Potrero and Hunters Point switchyards and small excavations associated with foundation construction for new structures at the switchyards. Outside of the switchyards, all ground disturbing activities would be conducted in existing paved roadways, a parking lot, and a vacant lot.

The proposed project route would be located within 45 feet of residential uses on 25th Street, Minnesota Street, and Cesar Chavez Street. Project construction equipment would generate high

noise levels during trenching operations. Noisy equipment would include saw-cutting and pavement-breaking machines and jackhammers (used sparingly) to break up sections of concrete that the saw-cutting and pavement-breaking machines can not reach; as well as, portable generators, air compressors, and backhoes. **Table 2.11-2** shows typical noise levels of construction equipment and noise levels achievable with feasible controls. With the exception of the pile driver (not proposed for this project), all equipment noise levels could be reduced to 85 dBA or less at 100 feet, in compliance with the San Francisco Police Code**.**

TABLE 2.11-2
CONSTRUCTION EQUIPMENT NOISE LEVELS AND ABATEMENT POTENTIAL

Equipment	Noise Level (dBA) @ 50 Feet	With Feasible Noise Control[a]
Earthmoving		
Front Loader	79	75
Backhoe	85	75
Dozer	80	75
Tractor	80	75
Scraper	88	80
Grader	85	75
Paver	89	80
Materials Handling		
Concrete Mixer	85	75
Concrete Pump	82	75
Crane	83	75
Stationary		
Pump	76	75
Generator	78	75
Impact		
Pile Driver	101	95
Jack Hammer	88	75
Rock Drill	98	80
Pneumatic Tools	86	80
Other		
Saw	78	75
Vibrator	76	75

[a] Estimated levels obtainable by selecting quieter procedures or machines and implementing noise-control features requiring no major redesign or extreme cost.

SOURCE: U.S. EPA (1971)

In addition to trenching in the existing streets, there are three areas where the project could require three bores. The proposed project could use either horizontal boring or directional

drilling. Noise levels for these methods can be higher than trenching, but would still be subject to compliance with the San Francisco Police Code.

Mitigation Measure NOI-1: PG&E shall ensure that the following measures are implemented:

- **Construction hours shall be limited to between the hours of 7:00 a.m. and 8:00 p.m. in areas where residential receptors exist within 100 feet of construction or in accordance with the requirements of the excavation permit issued by the City of San Francisco.**
- **All equipment used on the project shall be muffled and maintained in good operating condition. All internal combustion engine-driven equipment shall be fitted with intake and exhaust mufflers which are in good condition.**
- **Construction contractors shall locate fixed construction equipment such as compressors as far as possible from noise-sensitive receptors during construction.**
- **Intake and exhaust mufflers recommended by the manufacturers will be installed on impact tools and equipment.**

Impact NOI-2: Project construction could result in adverse impacts to nearby buildings or receptors due to excessive construction vibration. This would be a less than significant impact with implementation of Mitigation Measure NOI-2. Additionally, Mitigation Measure LUP-1, provided in Section 2.9 *Land Use*, shall be implemented to minimize impacts to sensitive receptors.

Both trenching and boring involve heavy equipment that can produce vibrations. There are no Federal Highway Administration (FHWA) or state standards for vibrations. Vibration levels as low as 0.05 inches/second can cause potential damage to historic, un-reinforced buildings (Essex Environmental, 2003). Caltrans research has found that extreme construction activities such as pavement breaking and extensive pile driving can potentially damage buildings at distances of less than 25 feet from the source. Building damage from pavement breaking and extensive pile driving can also occur within 50 to 100 feet from the source for historical buildings, buildings in poor condition, or buildings previously damaged in earthquakes (Caltrans, 2002).

Mitigation Measure NOI-2: PG&E shall ensure that the following measures are implemented:

- **Vibratory drivers instead of conventional pile drivers shall be used where feasible and effective in reducing impact noise from shoring of jack-pit and thrust-block excavations in close proximity to sensitive receptors.**
- **Pavement breakers and jack hammerers shall be equipped with acoustically attenuated shields or shrouds recommended by the manufacturers.**

CHECKLIST IMPACT CONCLUSIONS

a) The long-term operational noise impact of the proposed project would not exceed 75 dBA at the property line (San Francisco Police Code Section 2090). The standard set of construction equipment used for the proposed project would comply with Section 2907 of the San Francisco Police Code for construction equipment noise (see also the discussion for impact d) below).

b) During project construction, the proposed project would involve temporary sources of localized groundborne vibration and groundborne noise from the operation of heavy equipment that could be perceptible at residences or other sensitive uses in the immediate vicinity of the construction (ref to land use map if applicable). However, since the duration of impact at any one location would be very limited and since the impact would occur during less sensitive daytime hours, the impact from construction-related groundborne vibration and groundborne noise would be less than significant on the residents. **Mitigation Measures NOI-1** and **NOI-2** would reduce the potential impact to structures to a less than significant level.

   Over the long-term (after construction), the proposed project would not generate groundborne vibration and groundborne noise.

c) Once constructed, the operational phase of the proposed project would have a less than significant impact on community noise levels. The only change in noise would be a minimal increase in noise in the switchyards and the noise from vehicles during regular inspection of powerlines, instrumentation and control, and support systems. These noise sources would not substantially increase ambient noise levels in the project area.

d) The proposed project would result in substantial temporary increases in noise levels during the expected 9-month timeframe for construction. The construction noise impacts during the 9-month construction period would move from one area to the next along the proposed project route installing the cable line, therefore, no location would experience increased noise from the proposed project for more than one to two months. The anticipated noise levels would not be expected to exceed the limits of Article 29 (San Francisco Police Code Regulation of Noise), which limits construction noise to 85 decibels at a distance of 100 feet. The project construction would occur between 7:00 a.m. and 8:00 p.m., or during times set by the City in the Excavation Permit. If trenching work would cause traffic congestion, the City may require nighttime work to avoid traffic disruption. **Mitigation Measures NOI-1** is required to mitigate potential noise impacts that could occur if nighttime construction is required.

e) The nearest public airports are Metro Oakland International Airport and San Francisco International Airport. Both airports are more than five miles from the project area and do not generate excessive noise levels in the project area.

f) There are no private airstrips in the project vicinity.

REFERENCES – Noise

California Department of Transportation (Caltrans), 1998. Traffic Noise Analysis Protocol for New Highway Construction and Highway Reconstruction Projects. October 1998.

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