5.12 Noise

NOISE Would the project:	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
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?	☐	☐	☐	☒

Significance criteria established by CEQA Guidelines, Appendix G.

5.12.1 Setting

Existing Conditions

Community Noise. To describe environmental noise and to assess project impacts on areas that are sensitive to community noise, a measurement scale that simulates human perception is used. The A-weighted scale of frequency sensitivity accounts for the sensitivity of the human ear, which is less sensitive to low frequencies, and correlates well with human perceptions of the annoying aspects of noise. The A-weighted decibel scale (dBA) is cited in most noise criteria. Decibels are logarithmic units that can be used to conveniently compare wide ranges of sound intensities.

Community noise levels can be highly variable from day to day as well as between day and night. For simplicity, sound levels are usually best represented by an equivalent level over a given time period (Leq) or by an average level occurring over a 24-hour day-night period (Ldn). The Leq, or equivalent sound level, is a single value (in dBA) for any desired duration, which includes all of the time-varying sound energy in the measurement period, usually one hour. The L50, is the median noise level that is exceeded fifty per cent of the time during any measuring interval. The Ldn, or day-night average sound level, is equal to the 24-hour A-weighted equivalent sound level with a 10-decibel penalty applied to nighttime sounds occurring between 10:00 p.m. and 7:00 a.m. Community Noise Equivalent Level (CNEL) is another metric that is the average equivalent A-weighted sound level during a 24-hour day, obtained after addition of five decibels to sound levels in the evening from 7:00 p.m. to 10:00 p.m. and after addition of 10 decibels to sound levels in the night from 10:00 p.m. to 7:00 a.m. To estimate the day-night level caused by any noise source emitting steadily and continuously over 24-hours, the Ldn is 6.4 dBA higher than the source's Leq. For example, if the expected continuous noise level from equipment is 50.0 dBA Leq for every hour, the day-night noise level would be 56.4 dBA Ldn.

Community noise levels are usually closely related to the intensity of human activity. Noise levels are generally considered low when below 45 dBA, moderate in the 45 to 60 dBA range, and high above 60 dBA. In wilderness areas, the Ldn noise levels can be below 35 dBA. In small towns or wooded and lightly used residential areas, the Ldn is more likely to be around 50 or 60 dBA. Levels around 75 dBA are more common in busy urban areas, and levels up to 85 dBA occur near major freeways and airports. Although people often accept the higher levels associated with very noisy urban residential and residential-commercial zones, they nevertheless are considered to be adverse to public health.

Surrounding land uses dictate what noise levels would be considered acceptable or unacceptable. Lower levels are expected in rural or suburban areas than what would be expected for commercial or industrial zones. Nighttime ambient levels in urban environments are about seven decibels lower than the corresponding daytime levels. In rural areas away from roads and other human activity, the day-to-night difference can be considerably less. Areas with full-time human occupation and residency are often considered incompatible with substantial nighttime noise because of the likelihood of disrupting sleep. Noise levels above 45 dBA at night can result in the onset of sleep interference. At 70 dBA, sleep interference effects become considerable (USEPA, 1974).

Fundamentals of Vibration. As described by the Federal Transit Administration (FTA), ground-borne vibration, in contrast to airborne noise, is not a common environmental problem, and it is uncommon for vibration caused by heavy vehicles, such as trucks and buses, to be perceptible, even close to major roads. However, the FTA notes that "ground-borne vibration can be a serious concern for nearby neighbors of a transit system route or maintenance facility, causing buildings to shake and rumbling sounds to be heard." Another common source of vibration is certain construction activities, such as pile-driving and the operation of heavy earthmoving equipment. The effects of energy transferred through the soils to building foundations can include perceptible movement of building floors or rumbling sounds. Most construction-related vibration would not be capable of structural damage, with the exception of impact activities such as pile driving. Annoyance from vibration often occurs when the vibration exceeds the threshold of perception by only a small margin. The vibration level that causes annoyance is well below the damage threshold for normal buildings. Receptors sensitive to vibration include certain structures (especially older masonry structures), people (especially residents, the elderly, and sick), and vibration-sensitive equipment.

Several different methods are used to quantify vibration. The peak particle velocity (PPV) is defined as the maximum instantaneous peak of the vibration signal in inches per second. The PPV is most frequently used to describe vibration impacts to buildings. The root mean square (RMS) amplitude is most frequently used to describe the effect of vibration on the human body. The RMS amplitude is defined as the average of the squared amplitude of the signal. Decibel notation (VdB) is commonly used to measure RMS (relative to 10^{-6} inches per second). The decibel notation acts to compress the range of numbers required to describe vibration. Typically, ground-borne vibration generated by man-made activities attenuates rapidly with distance from the source of the vibration.

Noise Environment in the Project Area

The project would be located entirely in San Francisco. The proposed transmission line would be primarily underwater in the San Francisco Bay, with the underground portion of the line in city streets terminating at the Potrero Switchyard and Embarcadero Substation.

Embarcadero Substation and Northern Onshore Area. The northern onshore portion of the line would follow a route from the shore of the bay to Embarcadero Substation. This area is developed with commercial and residential uses (see Figure 5.10-1), and noise from traffic on the Bay Bridge affects loca-

tions in the area that have a line-of-sight to the bridge. The nearest residential uses are along Spear Street and Folsom Street adjacent to where the line would be constructed, and a day care center is on Spear Street. Residential buildings are also adjacent to the Embarcadero Substation. Street-level residences (townhomes) also occur on Spear Street adjacent to the proposed northern HDD transition area. Day-night noise levels are highest near the Bay Bridge, where modeling indicates levels over 70 dBA Ldn along Spear Street and 65 to 70 dBA Ldn along Folsom Street, as shown in the San Francisco General Plan (San Francisco Planning Department, 2009). Noise measurements were collected by PG&E in the HDD area between July 31, 2012 and August 2, 2012 (see Figure 5.10-1). These data show that minimum nighttime noise levels are 62 dBA Leq and normal daytime levels are between 68 and 70 dBA Leq, as presented in Table 5.12-1.

Potrero Switchyard and Southern Onshore Area. The southern onshore portion of the line would follow a route from the shore of the bay to a new Potrero 230 kV Switchyard. This area is developed with industrial and commercial uses and the existing terminus for the Trans Bay Cable transmission line (see Figure 5.10-2). Noise measurements were taken between September 12 and 13, 2005 at the facility across 23rd Street from the Potrero Switchyard as part of the Trans Bay Cable EIR (City of Pittsburgh, 2006). The daytime Leq measured at this site was 63.8 dBA, and the nighttime Leq was measured at 52.9 dBA.

The San Francisco General Plan includes a map of background noise levels throughout the City, based on noise modeling done by the San Francisco Department of Public Health of baseline traffic from the San Francisco County Transportation Authority travel demand model. The map of background noise levels shows the range of Ldn values that occurs along every street in San Francisco. The maps show that the adjacent roadway segments of 23rd Street and Illinois Street cause noise levels between 50 and 55 dBA Ldn at the Potrero Switchyard (San Francisco Planning Department, 2009).

The nearest residential use is located approximately 700 feet from the proposed Potrero 230 kV Switchyard (PG&E, 2012a).

Marine Environment. Noise sources in the marine portion of the project area include intermittent ships and environmental factors. The Embarcadero, including the Bay Trail/Pedestrian Promenade, is near the northern end of the proposed submarine route. At the southern end of the proposed submarine route, line would be near existing industrial and commercial areas (see Figures 5.10-1 and 5.10-2).

Underwater noise is produced by marine vessels or construction occurring in the water, and excessive underwater sound pressure levels can cause adverse effects to marine mammals (see Section 5.4.1, Biological Resources). Source levels between 180 to 190 decibels referenced to 1 micropascal at one meter (180 to 190 dB re 1 µPa) occur from common anthropogenic sources, such as large marine vessels. Smaller workboats and ships have source levels around 160 to 180 dB re 1 µPa at one meter, and typical dredging and underwater drilling source levels are lower than or comparable to those from large vessels at 145 to 190 dB re 1 µPa (Defra-Cefas, 2009; Table 3).

Hydroacoustic noise diminishes over distance as it emanates from the source, although noise propagation through water is much more efficient than it is through the air. Ambient underwater noise levels in the project area are heavily influenced by the anthropogenic activity throughout the bay. The California Department of Transportation reports that receivers 100 meters away from a typical large ship experience levels up to 160 dB (Caltrans, 2009). Peaks between 120 to 155 dB and an average (RMS) underwater ambient noise level of 133 dB represent the baseline ambient underwater noise for the open water of the San Francisco Bay and Oakland outer harbor (Caltrans, 2009).

Table 5.12-1. Noise Measurements at the Northern HDD Area

Date	Time	Leq	L10	L50	L90	Date	Time	Leq	L10	L50	L90
31-Jul	7:00 PM	69	70	66	64	1-Aug	4:00 PM	68	71	66	64
31-Jul	8:00 PM	68	70	68	66	1-Aug	5:00 PM	70	73	68	65
31-Jul	9:00 PM	68	69	68	66	1-Aug	6:00 PM	70	73	67	64
31-Jul	10:00 PM	68	70	68	66	1-Aug	7:00 PM	67	69	65	62
31-Jul	11:00 PM	67	70	67	64	1-Aug	8:00 PM	68	69	67	65
1-Aug	12:00 PM	66	69	65	62	1-Aug	9:00 PM	68	69	67	66
1-Aug	1:00 AM	65	67	63	58	1-Aug	10:00 PM	64	67	62	57
1-Aug	2:00 AM	63	66	62	56	1-Aug	11:00 PM	66	68	66	63
1-Aug	3:00 AM	62	65	61	55	2-Aug	12:00 AM	66	68	65	62
1-Aug	4:00 AM	64	67	62	57	2-Aug	1:00 AM	66	67	63	59
1-Aug	5:00 AM	66	69	66	61	2-Aug	2:00 AM	63	65	62	57
1-Aug	6:00 AM	69	71	69	66	2-Aug	3:00 AM	62	65	60	55
1-Aug	7:00 AM	70	72	70	68	2-Aug	4:00 AM	64	67	62	57
1-Aug	8:00 AM	68	70	67	64	2-Aug	5:00 AM	66	69	66	62
1-Aug	9:00 AM	69	71	68	66	2-Aug	6:00 AM	69	71	69	66
1-Aug	10:00 AM	69	71	69	67	2-Aug	7:00 AM	69	71	69	65
1-Aug	11:00 AM	68	70	68	66	2-Aug	8:00 AM	68	71	68	65
1-Aug	12:00 PM	68	70	68	65	2-Aug	9:00 AM	69	71	69	67
1-Aug	1:00 PM	67	69	66	63	2-Aug	10:00 AM	69	71	68	66
1-Aug	2:00 PM	68	70	67	64	2-Aug	11:00 AM	68	70	68	66
1-Aug	3:00 PM	69	72	67	65	2-Aug	12:00 PM	69	70	67	63

Source: PG&E 2012a.

Noise Sensitive Areas

Noise sensitive receptors include residences, day cares, schools, religious facilities, hospitals, and parks (see Figures 5.10-1 and 5.10-2 for a map of nearby sensitive receptors). Residential land uses in the northern onshore section are typically apartments or condominium towers, often with commercial use at street level (see Figure 5.10-1). These towers occur along Spear and Folsom Streets and the HDD area where project construction would occur. Street-level apartments occur along the partial block of Spear Street south of Harrison Street, within 25 feet of the proposed underground construction and the northern HDD transition work area. The final location of the line within the streets, and thus precise distance to these residences, would be determined by final engineering design. A day care facility with a street-level outdoor play area, the Bright Horizons/Marin Day School at Hills Plaza, also occurs on Spear Street adjacent to the proposed alignment, and Eucharist SF church is along the proposed alignment on Folsom Street (Google Earth, 2013). As noted above, the closest sensitive receptors to the Potrero Switchyard portions of the project are residences approximately 700 feet from the proposed alignment and switchyard (see Figure 5.10-2). The submarine portion of the project route would not encounter any noise-sensitive land uses (see Figure 5.10-1 and Figure 5.10-2).

Applicable Regulations

Regulating environmental noise is generally the responsibility of local governments. In 1974 the USEPA published guidelines on recommended maximum noise levels to protect public health, and the State of California maintains recommendations for local jurisdictions in the General Plan Guidelines published by the Governor's Office of Planning and Research (OPR, 2003). Because there is no statewide noise regulation or specific threshold for determining what constitutes a "substantial increase" in noise, the CEQA lead agency defines what noise level increase would be considered substantial. Given that environmen-

tal noise levels vary widely over time, a three dBA change is the minimum change in environmental noise that is perceptible and recognizable by the human ear. Permanent increases in day-night environmental noise levels of more than 5 dBA (Ldn or CNEL) are considered to be substantial. Intermittent noise sources, such as construction, may be temporary or periodic and may cease after a short time. Factors to be considered in determining the significance of an adverse construction impact include: (1) the resulting noise or vibration level, (2) the duration and frequency of the noise or vibration, (3) the number of people affected, and (4) the land use designation of the affected receptor sites.

The following summarizes the local requirements.

San Francisco General Plan, Environmental Protection Element. The General Plan identifies the ranges of noise levels considered generally compatible or incompatible with various land uses to guide decisions on providing sound insulation for affected properties. The General Plan focuses on the effect that noise from ground-transportation noise sources has on the community. Residential uses are considered compatible in areas where the noise level is 60 dBA Ldn or less, and schools, which is taken to include day care centers or pre-school, are compatible in areas where the noise level is 65 dBA Ldn or less.

San Francisco Police Code, Article 29, establishes the regulatory framework for addressing operational and construction related noise and was amended in June 2012. Section 2909 of the code limits the increase of operational noise over existing ambient levels. Noise sources located on commercial and industrial properties are allowed up to an 8 dBA increase over the existing local ambient noise level as measured outside the property plane. Section 2907 of the code limits construction noise from individual powered construction equipment between the hours of 7:00 a.m. to 8:00 p.m. to 80 dBA when measured at 100 feet. There are additional limitations on pieces of impact equipment (such as pavement breakers and jackhammers) which require intake and exhaust silencers in addition to acoustical attenuation shields or shrouds. Section 2908 of the code requires that nighttime construction noise (8:00 p.m. to 7:00 a.m.) be no more than 5 dBA above existing local ambient noise levels at the property plane; however, the Director of Public Works or Building Inspection may grant a special permit, especially if the proposed night work is in the general public interest.

Federal Transit Administration Guidelines. The Federal Transit Administration (FTA) has guidelines for judging the significance of vibration produced by transportation sources and construction activity. These guidelines recommend vibration levels in RMS from 72 VdB to 80 VdB for residential uses and buildings where people normally sleep; and 75 VdB to 83 VdB for institutional land uses with primarily daytime operations (e.g., schools, churches, clinics, offices). The higher vibration levels in these ranges apply to infrequent events (less than 30 per day) and the lower levels apply to frequent vibration events (more than 70 per day). According to FTA guidelines for rail transit systems, a vibration level of 65 VdB is the threshold of perceptibility for humans and recurring levels over 80 VdB would cause residential annoyance (FTA, 2006).

Applicant Proposed Measures

PG&E proposes to implement measures during the design, construction, and operation of the Proposed Project to ensure it would occur with minimal environmental impacts in a manner consistent with applicable rules and regulations. Applicant Proposed Measures (APMs) are considered part of the Proposed Project in the evaluation of environmental impacts. CPUC approval would be based upon PG&E adhering to the Proposed Project as described in this document, including this project description and the APMs, as well as any adopted mitigation measures identified by this Initial Study (see Table 5.12-2).

Table 5.12-2. Applicant Proposed Measures (APMs) Related to Noise

APM Number	Issue Area
	Noise
APM NO-1	**Noise Minimization with Portable Barriers.** Compressors and other small stationary equipment used during construction will be shielded with portable barriers if located within 200 feet of a residence.
APM NO-2	**Noise Minimization with Quiet Equipment.** Quiet equipment (for example, equipment that incorporates noise-control elements into the design; e.g., quiet model compressors can be specified) will be used during construction whenever possible.
APM NO-3	**Noise Minimization through Direction of Exhaust.** Equipment exhaust stacks and vents will be directed away from buildings where feasible.
APM NO-4	**Noise Minimization through Truck Traffic Routing.** Truck traffic will be routed away from noise-sensitive areas where feasible.
APM NO-5	**Noise Disruption Minimization through Residential Notification.** In the event that nighttime construction is necessary because of clearance restrictions, affected residents will be notified in advance by mail, personal visit, or door-hanger and informed of the expected work schedule.
APM NO-6	**HDD Noise Minimization Measures.** Temporary barriers utilizing materials such as intermodal containers or frac tanks, plywood walls, mass-loaded vinyl (vinyl impregnated with metal) or hay bales will be used to reduce noise generated by the onshore HDD operations. If night-time HDD activities are required, the project will monitor actual noise levels from HDD activities between 8:00 p.m. and 7:00 a.m. If the noise levels created by the HDD operation are found to be in excess of the ambient noise level by 5 dBA at the nearest property plane, PG&E will, within 24 hours of the excess measurement, employ additional minimization measures necessary to limit the increase to 5 dBA. Such measures may include ensuring semi-permanent stationary equipment (generators, lights, etc.) are stationed as far from sensitive areas as practicable, utilize "quiet" or "Hollywood/Movie Studio" silencing packages, and/or modify barriers to further reduce noise levels.
APM NO-7	**Noise Minimization Equipment Specification.** PG&E will specify general construction noise reduction measures that require the contractor to ensure all equipment is in good working order, adequately muffled and maintained in accordance with the manufacturers' recommendations.

5.12.2 Environmental Impacts and Mitigation Measures

a. Would the project result in 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?

LESS THAN SIGNIFICANT WITH MITIGATION – CONSTRUCTION. Construction of the Proposed Project would involve use of augur drill rigs, backhoes, cranes, dump trucks, graders, pickup trucks, tractors, compressors, generators, and other equipment. Transmission line construction duration would involve approximately 15 months of work offshore and in city streets, 5 days per week, during daytime hours, progressing from one area to another along the route. Trench excavation and manhole installation would cause the highest noise levels of the underground construction, and the duration for this work, not including cable pulling and HDD operations, would be approximately four months along the northern underground segment and two months along the southern underground segment.

Construction noise sources would occur within the streets of the proposed 230 kV transmission line route: Folsom Street, Spear Street, and 23rd Street. Construction of the proposed Potrero 230 kV Switchyard would occur approximately 700 feet away from the nearest residences. However, activities for underground construction along the northern onshore segment would occur through a densely developed urban mixed-use area, with some activity being as near as 25 feet from apartment buildings, condominium buildings, and the day care center at Hills Plaza, depending on final engineering design. All construction traffic would gain access to the proposed work areas by existing city streets in the project area. Noise levels for typical pieces of construction equipment (at 50 feet) that would be used are listed in Table 5.12-3.

All construction activities would create both intermittent and continuous noises. Intermittent noise would result from periodic, short-term equipment use, such as cranes for positioning equipment or backhoes for trenching. Continuous noise would result from steady equipment operation over longer periods of each workday, such as generator use. The maximum intermittent construction noise levels would range from 81 to 85 dBA at 50 feet from an active construction area (PG&E, 2012a).

Table 5.12-3. Typical Noise Levels for Construction Equipment

Equipment	Typical Noise Levels (dBA, at 50 feet)
Drill Rig	70-85
Backhoes	80-85
Cranes	85
Pick-up truck	55
Dump truck	76
Equipment/tool van	55
Compactors	82
Grader	85
Hole auger	84

Sources: Adapted from USEPA, 1974.

Trenching and Other Linear Work. The linear nature of the underground construction would create a construction zone that spreads equipment along the corridor so that sources are not likely to be grouped together. PG&E modeled the typical noise levels for construction equipment in a linear configuration for this transmission line, and found that locations adjacent to the alignment would be exposed to approximately 83 dBA Leq, as shown in Table 5.12-4.

Table 5.12-4. Linear Work Zone Construction Noise Levels versus Distance

Distance from Construction Activity (feet)	Leq Noise Level (dBA)
50	83
100	79
200	74
400	69
800	63

Source: PG&E, 2012a.

Sound from stationary sources decreases by six dBA with every doubling of distance from the source. At a distance of 100 feet between the noise source and the receiver, the maximum noise level would be approximately 79 dBA, and thus would be less than 80 dBA at 100 feet and within the daytime noise limit established by the San Francisco Police Code. The Bright Horizons/ Marin Day School is licensed to provide care for 31 children (CCLD, 2013), and the site includes an outdoor play area adjacent to the sidewalk on Spear Street that could be used by children during project construction hours. Trenching and other underground construction along Spear Street could be within 25 feet of the outdoor day care play area; the resulting peak noise levels could briefly be very high, potentially over 85 dBA. Trenching activity would progress at approximately 50 feet per day along the along the onshore segment. Within the four-month period of trench excavation and manhole installation along Folsom and Spear Streets, trenching within 100 feet of any single location would be limited in duration to about four days as crews would gradually move along the linear work zone. For any single location, all construction noise would be short term and intermittent, with maximum noise levels not maintained at all times.

APMs NO-1 through NO-7 would reduce the construction noise levels and by doing so would also reduce the number of people affected. Specifically, under APM NO-1 PG&E would shield compressors and small stationary equipment with portable barriers if located within 200 feet of a residence, including along Spear Street near the day care center at Hills Plaza. Additionally truck traffic would be routed away from noise-sensitive areas where feasible (APM NO-4), and PG&E would require its contractors to ensure all equipment is in good working order, adequately muffled and maintained in accordance with the manufacturers' recommendations (APM NO-7). Implementation of APM NO-6 would include measures, such as temporary barriers, to minimize HDD noise, as discussed separately below.

Although daytime construction noise caused by the work zones would not exceed the standards of the San Francisco Police Code, nighttime construction could be warranted for certain activities including HDD, discussed separately below, and additional mitigation would be warranted to ensure enforceability of the APMs. As noted in the Project Description (Section 4.11), if trenching work would cause potential traffic congestion, the project may require nighttime work to avoid traffic disruption. In the event that nighttime construction is necessary, the likelihood of sleep disturbance would increase, but under APM NO-5, affected residents would be notified in advance by mail, personal visit, or door-hanger and informed of the expected work schedule. During nighttime construction, no children would be present at the Bright Horizons/Marin Day School day care center.

Mitigation is recommended to ensure consistency with local community plans. General Construction Noise Control Measures were recently adopted by the City for the Transit Center District Plan (TCDP) area (San Francisco Planning Department, 2011), and supplementing the APMs with these General Construction Noise Control Measures would ensure that development in the northern onshore project area would not cause significant noise impacts. The City's General Construction Noise Control Measures in the TCDP EIR include: using best available noise control techniques, locating equipment away from sensitive land uses, installing portable barriers, which would be partially implemented by APMs NO-1 and NO-7. Mitigation is also necessary to enforce the proposal that PG&E would use equipment that incorporates noise-control elements into the design (APM NO-2) and that equipment exhaust stacks and vents would be directed away from buildings (APM NO-3). The TCDP EIR also includes additional feasible noise control measures that have not been proposed within the APMs for this project, including: specifications for impact tools; requiring noise control requirements in contractor specifications; and following a plan to respond to and track complaints pertaining to construction noise. To ensure that construction noise would occur in a manner consistent with local community plans, Mitigation Measure N-1 would implement the portions of the City's General Construction Noise Control Measures that would not otherwise be implemented by the APMs. The discussion of HDD noise appears separately below.

With implementation of Mitigation Measure N-1, the noise levels from trenching and other underground linear construction would be less than significant under this criterion.

Mitigation Measure for Underground Transmission Line Construction Noise

MM N-1 **Implement General Noise Control Measures**. PG&E shall implement the following general noise control measures in addition to APMs NO-1 to NO-7, with APMs NO-2 and NO-3 superseded:

- PG&E and contractors shall use equipment that incorporates noise-control elements into the design.
- PG&E and contractors shall ensure equipment exhaust stacks and vents are directed away from buildings.
- Where use of pneumatic tools, such as impact tools (e.g., jack hammers and pavement breakers), is unavoidable, a noise source screen such as a barrier around the activity using the tools, an external noise jacket, or an exhaust muffler on the compressed air exhaust shall be used and shall be designed to reduce noise levels from the source by 10 dBA.
- PG&E shall include noise control requirements in specifications provided to construction contractors. Such contract specifications would include, but not be limited to, performing all work in a manner that minimizes noise; use of equipment with effective mufflers; undertaking the most noisy activities during times of least disturbance

to surrounding residents, day care operations, and commercial uses; and using haul routes that avoid residential buildings inasmuch as such routes are otherwise safely available.

- PG&E shall respond to and track complaints pertaining to construction noise. PG&E shall provide a complaint hotline phone number that shall be answered at all times during construction and designate an on-site construction complaint and enforcement manager for the project. The noise complaint and response process shall be described in the residential notifications required under APM NO-5 and posted publicly near work areas that are within 300 feet of residential buildings or day care operations.

Horizontal Directional Drilling. HDD would be used at two locations: the Embarcadero HDD Transition Area (see Figure 4-8) and the Potrero HDD Transition Area (see Figure 4-9). Figures 5.10-1 and 5.10-2 show the location of the HDD construction areas and the surrounding uses, where noise-generating activities related to HDD excavation and drill rig use would occur. The drill rig would typically require 13 days per each of three bores, drilled separately, for a total of 39 days of drill rig use in each transition area. At each HDD transition area, the drilling would run up to 6 days per week and 10 hours per day, extending over a period of about 6 to 7 weeks. PG&E's proposal would include the following HDD equipment at each transition area:

- DD-330 American Augers trailer mounted drill rig or equivalent
- Mud rig
- Mud pump
- Two centrifugal pumps
- Excavator
- Engines equipped with "hospital grade" exhaust mufflers (PG&E, 2012a).

Based on these plans, sound pressure levels from the operation of construction equipment could be as high as 83 dBA at 100 feet (PG&E, 2012a), potentially exceeding the 80 dBA threshold established by the San Francisco Police Code. Noise barriers described in APM NO-6 were modeled by PG&E to reduce these levels by a minimum of 5 dBA, resulting in a controlled maximum sound pressure level of 78 dBA at 100 feet. Table 5.12-5 provides noise estimates after implementation of APM NO-6 (PG&E, 2012a). The barriers described in APM NO-6 would ensure that daytime construction noise caused by the HDD equipment would not exceed the standards of the San Francisco Police Code. A discussion of nighttime HDD activity follows.

Table 5.12-5. HDD Equipment Noise Levels after Implementation of Noise Reduction Measures

Distance from HDD Entry Point (feet)	Leq Noise Level (dBA)
50	83
100	78
200	72
400	66
600	63
800	60

Source: PG&E, 2012a.

The street-level Harbor Lofts townhomes (46 live/work lofts at 400 Spear Street) would be the nearest residences, at approximately 25 feet from the nearest edge of the HDD work area. Because of the proximity, these residences would experience very high exterior noise levels caused by the HDD activities, potentially over 85 dBA. Although PG&E plans to conduct the HDD activities during the daytime over a limited duration of 7 weeks at each transition area, the impact from HDD noise during the nighttime hours would be more severe. If soil conditions are such that the integrity of the hole cannot be readily maintained with daytime only activities, HDD operations would have to proceed on a 24-hour basis.

Nighttime HDD work would allow the installation to occur more quickly, and this would shorten the duration of the noise impact to less than 7 weeks. However, residences could be exposed to construction noise in excess of the nighttime standards in the San Francisco Police Code. Because of the close proximity of residences to the HDD area, in some cases construction noise could exceed the 5 dBA above ambient noise nighttime threshold established by the Police Code.

Implementation of Applicant Proposed Measures, especially APM NO-5, under which PG&E would notify affected residents in advance by mail, personal visit, or door-hanger, would improve residents' ability to anticipate and prepare for nearby nighttime construction, which would reduce the number of people affected by the increased noise. To be consistent with Section 2908 of the Police Code, nighttime or 24-hour activity would require a special permit from the Director of Public Works or Building Inspection.

Mitigation is recommended to supplement the HDD noise control strategies in APM NO-6 (HDD Noise Minimization Measures), which specifically require monitoring the actual noise levels at night and taking corrective action to minimize the noise associated with HDD work. Mitigation would also ensure enforceability of the noise controls to be consistent with the nighttime standard in the Police Code. Mitigation Measure N-2 would ensure that PG&E obtains the special permit from the Director of Public Works or Building Inspection in anticipation of 24-hour HDD activity, should it become necessary. With the recommended Mitigation Measure N-2 and implementation of the APMs, the noise impact from the nighttime HDD activity would be reduced to a less-than-significant level.

Mitigation Measure for 24-Hour HDD Noise

MM N-2 **Obtain Special Permit for Nighttime HDD Noise.** This mitigation measure is to supplement and ensure enforceability of APM NO-6 for noise sources at the Embarcadero HDD Transition Area.

- PG&E shall apply to the San Francisco Director of Public Works and obtain a special permit for nighttime or 24-hour activity at the Embarcadero HDD Transition Area, consistent with Section 2908 of the Police Code. Prior to commencing construction of the HDD, PG&E shall provide to the CPUC a copy of the special permit or evidence that no permit is required by San Francisco.
- PG&E shall provide to the CPUC at least 7 days prior to commencing construction of the Embarcadero HDD Transition Area the results of actual ambient hourly (Leq) noise measurements for each hour between 8:00 p.m. to 7:00 a.m. at the edge of the nearest private property containing residential use obtained from monitored noise levels as specified in APM NO-6.
- PG&E and contractors conducting nighttime work at the Embarcadero HDD Transition Area, between 8:00 p.m. to 7:00 a.m., shall implement noise attenuation features, including acoustical barriers, blankets and enclosures as identified in APM NO-6, to achieve no more than 5 dBA above existing local ambient noise levels at the edge of the nearest private property containing residential use, based on 1-hour Leq.
- PG&E shall provide a report to the CPUC actions taken to reduce the duration or level of noise within 48 hours of monitoring noise levels found to be in excess of the ambient noise level by 5 dBA, at the edge of the nearest private property containing residential use, based on 1-hour Leq.

LESS THAN SIGNIFICANT – SUBMARINE CABLE INSTALLATION. In the marine segment, cables would be installed by using a jet plow or other similar cable burying technique. As the majority of cable laying activity would

occur underwater, equipment used on the barges and other marine vessels would not create substantial increases to ambient airborne noise levels onshore. Aside from marine biological resources, which are addressed in Section 5.4, no sensitive land uses would occur near the offshore installation of the transmission line, which would be at least a quarter-mile from land. Because the submarine construction would not result in exposure of persons to or generation of noise levels in excess of any applicable standards, this impact would be less than significant.

Underwater sound levels would be affected by the cable laying barge and hydroplow. The available literature indicates that the underwater noise source level could reach 185 dB from high pressure water jets for cable-laying (Talisman, 2005) or for dredging (Defra-Cefas, 2009). PG&E proposes to use a hydro-plow with low pressure water jets that would cause less noise and generally be engaged below the seabed, which would also act to attenuate or dampen noise generated by the water jets (PG&E, 2013). To put this source into context, a compendium of hydroacoustic source level data for pile insertion methods shows that underwater noise levels at 10 meters (32.8 feet) distance in shallow water from vibratory installation of small piles (less than 12 inches) range up to 171 dB peak with an average of 155 dB (Caltrans, 2012). For comparison, the analysis of underwater cable laying in the Trans Bay Cable EIR (City of Pittsburgh, 2006) found that the shallow-water sound levels within approximately 800 feet of a hydroplow could be over 160 dB. Similar underwater sound levels would be likely to occur during cable laying and hydroplow use for the Proposed Project. Underwater acoustics throughout the active shipping areas of the San Francisco Bay are presently affected by large vessels, barges, and tugs, which currently occur intermittently in the marine project area. Baseline ambient underwater sound levels range up to 155 dB peak with an average of 133 dB in the open water of the San Francisco Bay (Caltrans, 2009). Based on the various data, 170 to 185 dB peak levels could occur near the sources of the underwater noise from the Proposed Project. These levels would attenuate to become comparable to the background ambient conditions at a distance of about 800 feet.

LESS THAN SIGNIFICANT – OPERATION AND MAINTENANCE. There are three potential sources of operational noise associated with the electric power lines and substations in this project: corona noise from the transmission line; transformer and shunt reactor noise from Potrero Switchyard; and vehicle noise from maintenance vehicles.

Audible corona noise would not be a design concern for underground and submarine portions of the Proposed Project, given that the line would be buried. The existing Embarcadero Substation is within an enclosed building and the northern terminal of the proposed transmission line would occur inside either the existing building or the building being developed as part of the Embarcadero 230 kV Bus Upgrade Project. As a result, all operational noise impacts at the Embarcadero Substation would occur inside and would not increase outdoor ambient levels, resulting in an impact that would be less than significant.

The new outdoor transformer and shunt reactor for the proposed Potrero 230 kV Switchyard would be designed to achieve PG&E's design criteria, resulting in a combined maximum sound level of 53 dBA at a distance of 400 feet (PG&E, 2012a). This sound level would be comparable to or less than the existing nighttime noise levels, which were measured at 52.9 dBA Leq (City of Pittsburgh, 2006) and are between 50 and 55 dBA Ldn based solely on traffic (San Francisco Planning Department, 2009), and the impact of the new sources would be further reduced by intervening structures and by enclosure of the facilities within a building. The nearest sensitive receptor is approximately 700 feet away. Adding the proposed outdoor equipment to the existing noise environment would not exceed the threshold for new sources or the limitation for sources on commercial and industrial properties in Article 29 of the San Francisco Police Code because the project would not cause an increase of 8 dBA over the existing ambient noise levels. Because the operation noise levels would be less than 60 dBA Ldn, the project would also con-

form with the compatibility guidelines of the General Plan. The impact of the operational noise would be less than significant.

Maintenance activities required for the Proposed Project would be substantially similar to those currently performed at the Potrero Switchyard and Embarcadero Substation. Maintenance activities would occur over short timeframes and generate minimal noise. For maintenance activities involving noise-generating equipment or vehicles, noise reduction measures would be employed to reduce temporary noise impacts as described in APMs above. Maintenance activities would thus not increase noise levels above existing conditions, and the impacts from maintenance noise would be less than significant.

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

LESS THAN SIGNIFICANT – CONSTRUCTION. The level of groundborne vibration that could reach sensitive receptors during construction depends on the distance to the receptor, what equipment is creating vibration, and the soil conditions surrounding the construction site. Vibration from construction equipment and activities would be perceptible to people in the immediate vicinity of construction activities while they were occurring. Tamping of ground surfaces, the passing of heavy trucks on uneven surfaces, and drilling would each create perceptible vibration in the immediate vicinity of the activity. Activities that generally create substantial groundborne vibration, such as pile driving, would not occur as part of the Proposed Project. Earthmoving equipment that could result in groundborne vibration or noise would occur during daytime hours. The impact from construction-related groundborne vibration would be confined to only the immediate area around the activity (within about 50 feet).

Vibration during project underground construction and installing the HDD could affect nearby structures, including the Bay Bridge, which includes a tower foundation that would be immediately adjacent to the proposed HDD area on Spear Street. Table 5.12-6 shows the typical vibration levels caused by construction equipment, and use of heavy equipment for underground construction could generate vibration levels up to 0.089 in/sec PPV or 87 VdB at a distance of 25 feet. Vibration levels, measured as PPV at a distance of 82.5 feet would be reduced by more than 80 percent. For the anticipated types of equipment, construction activities would generate ground-borne vibration levels that would not exceed the FTA criterion of 0.2 in/sec PPV, which would avoid the potential structural damage.

Table 5.12-6. Vibration Velocities for Construction Equipment

Equipment/Activity	PPV at 25 Feet (inch/second)	PPV at 82.5 Feet (inch/second)	RMS at 25 Feet (VdB)	RMS at 82.5 Feet (VdB)
HDD Rig (estimated)*	0.089	0.016	87	72
Large Bulldozer	0.089	0.016	87	72
Loaded Trucks	0.076	0.013	86	71
Small Bulldozer	0.003	0	58	43
Threshold to Avoid Potential Effects	0.2	0.2	80	80

RMS = Root mean square of vibration level, relative to 10^{-6} inches per second.
* Based on estimates for caisson drilling in FTA, 2006.
Source: FTA, 2006. San Francisco Planning Department, 2011.

Vibration from construction would most affect sensitive receptors on adjacent parcels. The rights-of-way for Spear Street and Folsom Street are both approximately 82.5 feet wide, but construction could occur within 25 feet of the nearest residential structures. At this distance, vibration could exceed 80 VdB and cause annoyance at residences. As such, construction within 25 feet of the residences could adversely affect occupants of the adjacent properties. The short-term, daytime, and intermittent nature of under-

ground activities would ensure that potentially annoying levels of vibration occur only occasionally as work crews move along the linear work zones. The impact of installing the HDD would be limited to about 39 days of drilling. PG&E plans to limit this activity to during the daytime when receptors are less sensitive unless soil conditions warrant 24-hour work. Implementing APM NO-5 to provide advance notification and inform people in the area would allow people to prepare for potential nighttime annoyance if it becomes unavoidable. The resulting vibration levels would not be considered excessive given the plan to avoid nighttime work, the limited number of residences adjacent to HDD installation, the limited duration of the vibration, and the steps that would be taken through APM NO-5 to avoid interfering with the nearest residential uses, and this impact would be less than significant.

NO IMPACT – OPERATION AND MAINTENANCE. Equipment associated with normal operation and maintenance of the Proposed Project would not produce any groundborne noise or vibration; therefore, operation and maintenance of the project would result in no impact.

c. Would the project result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?

NO IMPACT– CONSTRUCTION. Project construction would be temporary and therefore would not result in a substantial permanent increase in ambient noise levels.

LESS THAN SIGNIFICANT – OPERATION AND MAINTENANCE. The permanent noise sources that would result from the project are limited to transformer and shunt reactor operation at the existing and proposed Potrero Switchyard. Audible corona noise from the transmission line would not increase ambient noise levels because the line would be installed underground. Transformer operations at the Embarcadero Substation would not change. Enclosure within the substation building would prevent any increase in ambient noise levels associated with the project. As noted above, PG&E's design criteria for the new outdoor transformer and shunt reactor at the proposed Potrero Switchyard would achieve a combined maximum sound level of 53 dBA at a distance of 400 feet (PG&E, 2012a), which would not cause ambient noise levels in the area of the Potrero Switchyard to increase substantially, as discussed under Item (a).

Noise would also occur from crews conducting routine inspection and maintenance activities. Routine inspection and maintenance of the Proposed Project would be accomplished through periodic visits to the project components and would not normally involve a large crew. These activities would be isolated, infrequent, and substantially similar to existing maintenance activities.

Given the above, there would be little to no permanent increase in ambient noise levels above existing conditions, and this impact would be less than significant.

d. Would the project result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?

LESS THAN SIGNIFICANT WITH MITIGATION. Noise impacts associated with construction equipment would mainly affect those receptors closest to proposed underground and HDD areas. Existing receptors would experience a temporary increase in noise. During trenching and other underground construction along Spear Street and other city streets with noise-sensitive land uses, peak noise levels could briefly be very high, potentially over 85 dBA and 83 dBA on an Leq basis (Table 5.12-4). Noise from HDD equipment would cause less than 78 dBA Leq at the day care center (Table 5.12-5). These levels would detract from enjoyment and normal use of the day care center and outdoor play area at Hills Plaza. As stated under Item (a), even when peak levels nearest the work could briefly be over 85 dBA, hourly Leq levels would be much lower and would comply with the Police Code threshold of 80 dBA at 100 feet. In addition, the short-term and intermittent nature of noise along the linear construction zone would limit the impacts. Compli-

ance APMs NO-1 through NO-7 would reduce the effects of noise caused by construction equipment and traffic by implementing feasible noise controls and providing advance notification. Notification would inform people in the area and allow them to prepare for potential nighttime disruptions that could still occur after implementing all feasible noise controls. To ensure that construction noise is minimized to the extent feasible and to ensure that residences and the day care center are not exposed a substantial increase in noise levels, Mitigation Measure N-1 (Implement General Noise Control Measures) and Mitigation Measure N-2 (Obtain Special Permit for Nighttime HDD Noise) would require additional controls and specifications for construction equipment and would establish a complaint and resolution process. With the recommended Mitigation Measures N-1 and N-2, along with implementation of APMs NO-1 through NO-7, the impact of temporary construction noise would be reduced to a less-than-significant level.

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?

NO IMPACT. The southern end of the proposed transmission line, at Potrero Switchyard, would be located approximately 9 miles north of the San Francisco International Airport. All project construction, operation, and maintenance would occur greater than 2 miles from the airport, and there would be no impact.

f. For a project within the vicinity of a private air strip, would the project expose people residing or working in the project area to excessive noise levels?

NO IMPACT. The Proposed Project is not located within two miles of a private airstrip, and there are no private airstrips in San Francisco. The Hall of Justice Heliport is approximately 1.1 miles from the Embarcadero Substation, and the helipad under development at the Children's Hospital in Mission Bay would be approximately one mile from the Potrero Switchyard. The Proposed Project would not expose people to excessive noise from aircraft.