12 NOISE

12.1 INTRODUCTION

This chapter describes the existing and potential noise impacts from construction and operation of Pacific Gas and Electric Company's (PGandE) proposed Delta Distribution Planning Area Capacity Increase Substation Project (project). The project will not have a significant impact on noise levels.

12.2 METHODOLOGY

Evaluation of potential noise impacts resulting from the project included reviewing relevant City of Antioch and Contra Costa County (County) noise standards, characterizing the existing noise environment, and projecting noise from constructing and operating substations and transmission lines. Noise survey data contain averages of multiple measurements taken at locations representative of noise levels at the project site.

12.3 EXISTING CONDITIONS

12.3.1 Regulatory Background

12.3.1.1 Contra Costa County

The County does not currently have a noise ordinance. Noise complaints within the County are addressed as "noise complaints" and handled through application of peace disturbance sections of the County Police Code.

The Noise Element of the Contra Costa County General Plan designates that for industrial land uses within the County, the normally acceptable noise level is in the range of 50 to 75 A-weighted decibels (dBA)-day-night equivalent noise level (L_{dn}), and the conditionally acceptable range is 70 to 80 dBA-L_{dn}. For low-density residential land uses, the normally acceptable noise level is in the range of 50 to 60 dBA-L_{dn}, and the conditionally acceptable range is 55 to 70 dBA-L_{dn}.

12.3.1.2 City of Antioch

Section 11 Environmental Hazards of the City of Antioch General Plan states that the noise objective is to achieve and maintain exterior noise levels at:

- Residential—60 dBA
- School classrooms—65 dBA
- Hospitals and libraries—60 dBA

Section 11.6.2 Stationary Source Noise requires that industrial and commercial uses be designed and operated to prevent the generation of noise within sensitive land use areas to:

- 55 dBA-energy equivalent sound level (L_{eq}) (7 a.m. to 10 p.m.)
- 45 dBA-L_{eq} (10 p.m. to 7 a.m.)

The General Plan regulates construction activities to unspecified hours of operation "in order to avoid or mitigate noise impact on adjacent noise-sensitive land uses." It also requires that all construction equipment use noise reduction features that are no less effective than those originally installed by the manufacturer.

12.3.2 Existing Noise Levels

To determine the existing noise levels in the project area, noise measurements were taken over weekend and weekday periods. The measurements were collected at positions representative of the current background noise levels and serve as a reference to assess the effects of the project on nearby sensitive receptors (i.e., residences). Multiple 24-hour periods were measured and hourly average noise data was produced. Sound-level data were obtained using a calibrated microphone and integrating a sound level meter/statistical data logger. Additionally, short-term sound measurements were taken at two locations representing the acoustical conditions at the substation site. Analyses of the 1/3-octave sound spectra were produced from the sound recordings to more effectively understand the tonal components of the ambient noise conditions.

12.3.2.1 Noise Survey Results

Table 12-1 summarizes the noise survey conducted between July 9 and 14, 2003, in terms of average L_{eq}, minimum L_{eq}, maximum L_{eq}, statistical descriptors in which noise level is exceeded 50 and 90 percent of the time, and L_{dn}, respectively.

Table 12-1: Noise Measurement Results (A-weighted decibels)

Average (L_{eq}) [1]	Minimum (L_{eq})	Maximum (L_{eq})	Average (L_{50}) [2]	Average (L_{90}) [3]	Average (L_{dn}) [4]
57.3	40.4	74.1	54.8	49.0	60.6

[1] Energy equivalent sound level
[2] Sound level at the 50th percentile
[3] Sound level at the 90th percentile
[4] Day-night equivalent noise level

12.3.2.2 Sensitive Receptors

Noise-sensitive receptors are those facilities or activities (i.e., residential areas, hospitals, schools, performance spaces, and offices) for which excessive noise may cause annoyance or loss of business (e.g., commercial activities with heavy telephone use for which a quiet environment is required).

The nearest sensitive receptor to the substation site is a residence approximately 0.4 mile from the substation property line. After area build-out, the nearest sensitive receptors to the substation fenceline will be no closer than 200 feet.

12.4 IMPACTS

12.4.1 Significance Criteria

12.4.1.1 Construction

Some local agencies do not set noise-level limits for construction activities occurring during specified hours (usually between 7 a.m. and 6 p.m.). Instead, they require that construction contractors use available noise-suppression devices and techniques to minimize disturbance to nearby businesses and residences.

Significance criteria for construction-related noise activities are not established because of the temporary nature of noise generated from construction activities. The following construction-noise specifications are often used for similar projects.

In residential areas, construction noise from stationary noise sources that generate repetitive or long-term noise lasting more than three hours would be significant if the L_{eq} measured over any 30-minute period exceeds 65 dBA at a distance of 0.04 mile (in this case) or at the nearest sensitive receptor. (WIA, 1998)

12.4.1.1.1 Vibrations

Most local agencies have not established specific criteria for the evaluation of vibration impacts. Tables 12-2 and 12-3 recommend vibration criteria for various vibration-sensitive uses. The human-annoyance criteria are primarily intended for construction projects that require several days in one location. Both the building-damage criteria and the microelectronics criteria are applicable regardless of the project duration. Tables 12-2 and 12-3 indicate the levels at which a significant vibration impact will occur for humans and for buildings, respectively.

Table 12-2: Vibration Criteria (Human Annoyance)

Vibration Type and Permissible Aggregate Duration	Vibration Limit (root-mean-square)
Sustained (≥ 1 hour/day)	0.01 inch/second
Transient (> 1 hour/day)	0.03 inch/second
Transient (< 10 minutes/day)	0.10 inch/second

Table 12-3: Vibration Criteria (Potential Building Damage)

Type of Building	Vibration Limit (peak particle velocity)
Industrial, heavy office, modern construction	1.0 inch/second
Residential, reinforced	0.15 inch/second
Historic, unreinforced	0.05 inch/second

12.4.1.2 Operations and Maintenance

Operational noise impacts from the substation would be considered significant if the substation generated noise levels that exceeded any of the following criteria:

- produce 45 to 55 dBA at sensitive receptor's property lines within cities and towns in the project area,
- produce 50 to 60 dBA-L_{dn} at sensitive receptor's property lines within unincorporated areas of Contra Costa County,
- can be considered a public nuisance in the project area,
- result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project,
- result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project, or
- for a project located within an airport land use plan, within 2 miles of a public or public use airport, or within the vicinity of a private airstrip, exposes people residing or working in the project area to excessive noise levels.

In addition, Appendix G of the California Environmental Quality Act (CEQA) Guidelines states that a project may be deemed to have a significant effect on the environment if it would increase substantially the ambient noise levels of adjoining areas (CEQA Guidelines, Appendix G, Section XI, Subsection c). A change in noise level of less than 3 dBA is barely perceptible to the human ear. This analysis assumes that a permanent increase in noise environment of 5 dBA or greater constitutes a significant noise impact (Harris, 1997).

12.4.2 Construction

12.4.2.1 Substation

Construction of the substation site will involve the use of earthmoving equipment, trucks, and cranes. The noise levels will vary with the type of activity and the actual equipment used. Typical noise levels at 50 feet and 0.4 mile for many types of construction equipment, including equipment that will be used during construction of the substation and transmission towers, are listed in Table 12-4.

The potential noise from these activities will be up to 70 dBA at the nearest noise-sensitive receptor (approximately 0.4 mile from the site). However, with implementation of the measures identified in Section 12.6 Mitigation Measures, these impacts will be less than significant. Since the project is not located within an airport land use plan or within 2 miles of an airport or private airstrip, there will be no impact.

Table 12-4: Noise Levels of Typical Construction Equipment

Equipment	At 0.4 Mile	At 50 feet
Earth Moving		
Front loaders	40–52	72–84
Backhoes	40–61	
Tractors, Dozers	44–64	
Scrapers, Graders	48–61	
Pavers	54–56	
Trucks	54–62	86–94
Rollers	44–64	
Graders	46–70	
Material Handling		
Concrete mixers	43–56	
Concrete pumps	49–51	
Cranes (movable)	43–54	75–86
Cranes (derrick)	54–56	
Forklifts	44–50	76–82
Tensioners	44–54	76–86
Cable Pullers	42–49	74–81
Pneumatic Tools		
Pneumatic tools	51–56	84–88
Jack hammers and rock drills	49–66	
Compactors	52–58	

Source: Magrab, 1975

12.4.2.2 Vibrations

Vibration levels from tamping activities are expected to generate vibration levels of 0.03 inch/second peak particle velocity at 50 feet. These levels are highly dependent on the soil type at the construction site and type of equipment used (WIA, 1998). Since vibration levels exceeding 0.01 inch/second for an aggregate period of more than one hour per day could cause some persons to become annoyed, tamping operations could temporarily impact persons in buildings within 50 feet of construction equipment. However, the nearest residence is located approximately 0.4 mile away. Therefore, vibration impacts will be less than significant.

12.4.3 Operations and Maintenance

To predict the noise impact of the transformers in operation, the transformer noise characteristics were computer-modeled using the CYMAUDI2 produced by CYME International, Inc. It is designed to compute the noise levels generated outdoors by large power apparatus such as power transformers and converters. The results are shown in Figure 12-1, which represents noise impacts from traditional substation configuration.

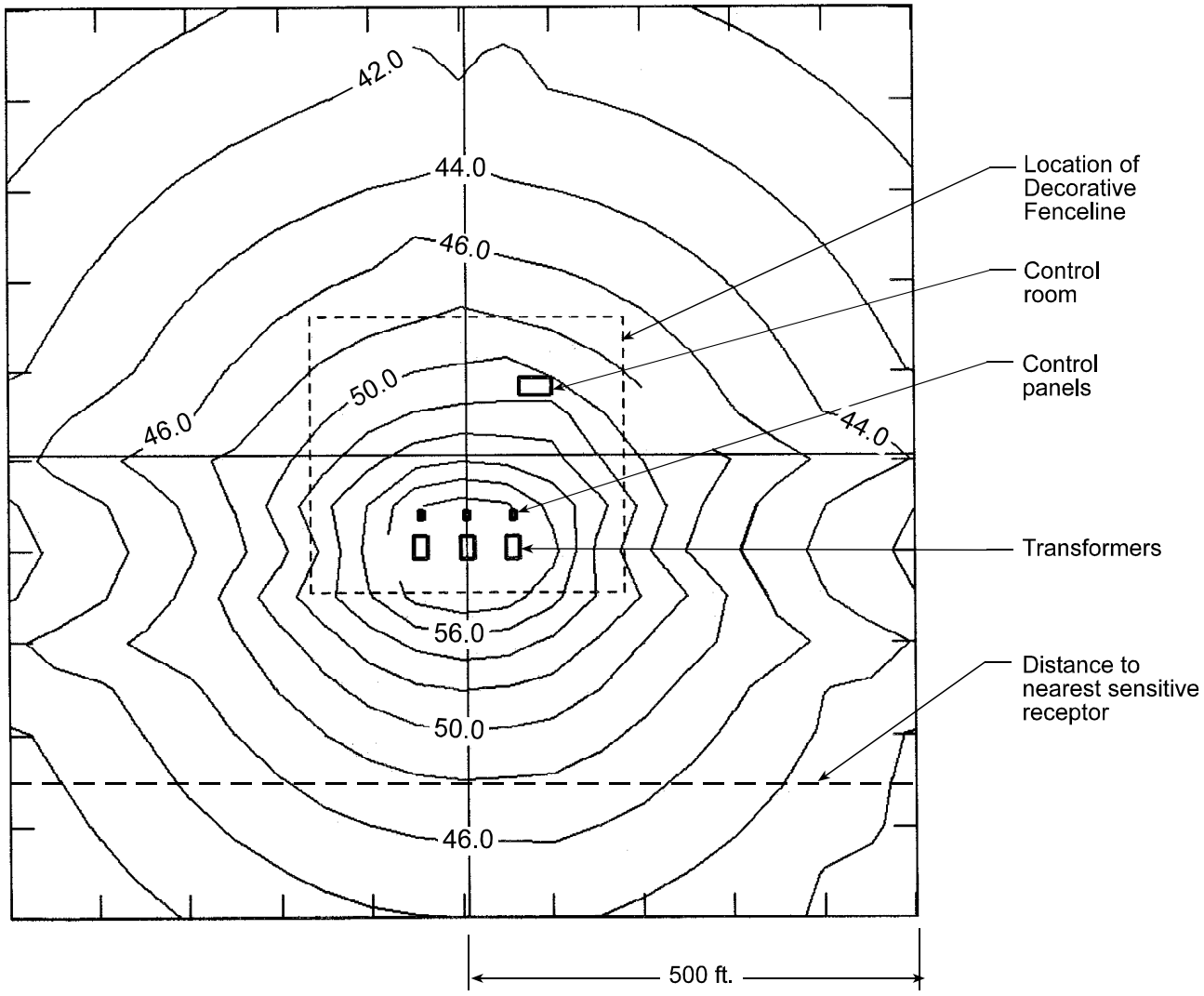
A worst-case scenario was analyzed: full load, daytime operation at FA rating (all cooling fans operational). Contours presented in Figure 12-1 can be used to assess the noise impacts at various distances from the substation during quiet periods (late night and early morning). These contours do not include the potential acoustic benefits from the installation of a decorative sound wall. At the completion of residential development in the area, it is estimated that the nearest sensitive receptor at approximately 0.4 mile away from the preferred site distance, would be exposed to substation noise at approximately 44 dBA-L_{eq}, considerably less than the average ambient noise level (57 dBA-L_{eq}), and approximately equal to the measured average-minimum ambient noise level (40 dBA-L_{eq}). During periods of higher ambient noise, sound levels from the substation may be inaudible. Therefore, noise impacts during substation operation will be less than significant.

There is, additionally, an independent switching noise produced when the transformers are energized or de-energized by a switching operation. This noise occurs only rarely, in the case of line failure or emergency, so it is not considered significant and was not included in the estimates of substation noise.

Transformer noise is known to contain pure tone or “hum” components. This hum occurs at even harmonics (multiples) of the line frequency (e.g., 120, 240, 360, etc., Hertz) and could be audible to proposed residential developments, assuming they are constructed. However, since these residences would be at least 200 feet away from the substation site, any impact will be less than significant.

Figure 12-1: Noise Propagation Isophones

Normal Substation Configuration
Sound Level Contours with Three Transformers Operating with Fan On



12.5 MITIGATION MEASURES

The following mitigation measures are proposed to reduce construction-related noise impacts:

- All construction equipment will use noise reduction features that are no less effective than those originally installed by the manufacturer.

- Construction will be limited to the hours between 7 a.m. and 6 p.m., except for California Independent System Operator-mandated interconnection clearances.

While impacts associated with operation of the substation will be less than significant, PGandE will take the following measures to further reduce noise impacts:

- The three 45 MVA, 230/21 kV transformers will meet 70 dBA, OA rating (without fans operating) and 72 dBA, first FA rating, and 73 dBA top FA rating.

- The substation will be designed to maintain a minimum 200-foot distance between the transformer back and the nearest sensitive receptors to maintain noise levels below the 55 dBA ordinance during day time full load operation.

- Transformers will be operated at reduced loading and without fan cooling between the hours of 10 p.m. and 7 a.m. where operationally possible.

- A decorative wall will be installed on all sides of the substation of a material such as cinder blocks to further reduce sound levels.

12.6 REFERENCES

City of Fremont. 1996. *Draft Supplemental Environmental Impact Report—Pacific Commons General Plan Amendment and Planned District Rezonin*g. May 1, 1996.

City of Antioch. 2003. "Public Welfare, Morals and Conduct." *City of Antioch Municipal Code: Title 5, Chapter 17, Disturbing the Peace*. Sections 5-17.01–5-17.05.

City of Antioch. 2003. "Environmental Hazards." Ci*ty of Antioch General Plan, Chapter 11, Noise Objective and Policies*. Section 11.6. May 2003.

City of Brentwood. 2002. "Public Peace, Morals and Welfare." *City of Brentwood Municipal Code Title 9, Chapter 9.32, Noise Regulations.* Sections 9.32.010–9.32.020.

City of Brentwood. 2001. *City of Brentwood General Plan, Chapter IV, Noise Element*.

County of Contra Costa. 1982. *County of Contra Costa Ordinance Code of the County Contra Costa, Chapter 5.5.* Articles 1–9.

County of Contra Costa. 1996. "Noise Element." *Contra Costa County General Plan, Chapter 11*. Sections 11.1–11.10. July 1996.

Cyme International, Inc. 1996. *Audible Noise Level Calculations User's Guide and Reference Manual*.

Harris, C.M. 1997. *Handbook of Noise Control.* Second Edition. McGraw-Hill.

Magrab, Edward B. 1975. *Environmental Noise Control.* John Wiley & Sons. New York.

Nelson, James T., et al. 1982. *Handbook of Urban Rail Noise and Vibration Control*. Prepared for U.S. Department of Transportation, Urban Mass Transportation Administration.

Nguyen, Chinh, T. and Roger Bueauchemin. 1990. "A program for Calculating Audible Noise Levels around Power Substations." *IEEE Computer Applications in Power*. April 1990.

Pacific Gas and Electric Company (PGandE). 1986. *Vineyard 230 kV Transmission Line PEA*. October 1986.

Wilson, Ihrig & Associates, Inc. (WIA). 1998. Noise Chapter, "Northeast San Jose Transmission Reinforcement Project, Proponents Environmental Assessment."