4.10 NOISE

4.10.1 SETTING

INTRODUCTION

Sound is mechanical energy transmitted by pressure waves through a medium such as air. Noise is defined as unwanted sound. Sound is characterized by various parameters that include the rate of oscillation of sound waves (frequency), the speed of propagation, and the pressure level or energy content (amplitude). In particular, the sound pressure level has become the most common descriptor used to characterize the loudness of an ambient sound level. Sound pressure level is measured in decibels (dB), with zero dB corresponding roughly to the threshold of human hearing, and 120 to 140 dB corresponding to the threshold of pain. Because sound pressure can vary by over one trillion times within the range of human hearing, a logarithmic loudness scale is used to keep sound intensity numbers at a convenient and manageable level.

Sound pressure fluctuations can be measured in units of hertz (Hz), which correspond to the frequency of a particular sound. Typically, sound does not consist of a single frequency, but rather a broad band of frequencies varying in levels of magnitude (sound power). When all the audible frequencies of a sound are measured, a sound spectrum is plotted consisting of a range of frequency spanning 20 to 20,000 Hz. The sound pressure level, therefore, constitutes the additive force exerted by a sound corresponding to the sound frequency/sound power level spectrum.

The typical human ear is not equally sensitive to all frequencies of the audible sound spectrum. 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 ears 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 (dBA).[1] Frequency A-weighting follows an international standard methodology of frequency de-emphasis and is typically applied to community noise measurements.

NOISE DESCRIPTORS AND PRINCIPLES

An individual's noise exposure is a measure of the noise experienced by the individual over a period of time. A noise level is a measure of noise at a given instant in time. However, noise levels rarely persist consistently over a long period of time. Rather, community noise varies continuously with 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

[1] All noise levels reported herein reflect A-weighted decibels unless otherwise stated.

and 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 (e.g., aircraft flyovers, motor vehicles, sirens), which are readily identifiable to the individual.

Effects of Noise on People

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

- subjective effects of annoyance, nuisance, 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 generally experience noise in the last category. There is no complete satisfactory way to measure the subjective effects of noise, or the corresponding reactions of annoyance and dissatisfaction. A wide variation exists in the individual thresholds of annoyance, 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 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 will be judged by those hearing it. With regard to increases in A-weighted noise level, the following relationships occur:

- except in carefully controlled laboratory experiments, a change of 1 dBA cannot be perceived;
- outside of the laboratory, a 3-dBA change is considered a just-perceivable difference;
- a change in level of at least 5 dBA is required before any noticeable change in human response would be expected; and
- a 10-dBA change is subjectively heard as approximately a doubling in loudness, and can cause adverse response

These relationships occur in part because of the logarithmic nature of sound and the decibel system. The human ear perceives sound in a non-linear fashion, hence the decibel scale was developed. Because the decibel scale is based on logarithms, two noise sources do not combine in a simple additive fashion, 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.

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 the topography of the area and environmental conditions (i.e., atmospheric conditions and noise barriers, either vegetative or manufactured, etc.). Widely distributed noise, such as a large

industrial facility spread over many acres or a street with moving vehicles, would typically attenuate at a lower rate, approximately 4 to 6 dBA.

NOISE SOURCES AND LEVELS

Transportation sources, such as automobiles, trucks, trains, and aircraft, are the principal sources of noise in the urban environment. Along major transportation corridors, noise levels can reach 80 DNL, while along arterial streets, noise levels typically range from 65 to 70 DNL. Industrial and commercial equipment and operations also contribute to the ambient noise environment in their vicinities.

SENSITIVE RECEPTORS

Human response to noise varies considerably from one individual to another. Effects of noise at various levels can include interference with sleep, concentration, and communication; physiological and psychological stress; and hearing loss. Given these effects, some land uses are considered more sensitive to ambient noise levels than others, due to the amount of noise exposure (in terms of both exposure duration and insulation from noise) and the types of activities typically involved. In general, residences, motels and hotels, schools, libraries, churches, hospitals, nursing homes, auditoriums, and parks and other outdoor recreation areas generally are more sensitive to noise. Commercial and industrial uses are considered the least noise-sensitive.

4.10.2 REGULATIONS, APPROVALS, AND PERMITS APPLICABLE TO NOISE

Noise issues are typically addressed in local General Plan policies, and local noise ordinance standards. The proposed project for Sempra Communications would be located in cities and municipalities of 15 counties in the state of California. Most of these cities and counties have adopted general plans. California Government Code Section 65302 lists the noise element as one of the seven essential elements cities and counties must include as part of their general plans. The General Plan noise element is a planning document that contains goals and policies to ensure compatible land use development with respect to noise. Cities and counties adopt noise ordinances for the implementation of the policies and standards in the general plan. Local General Plan policies and noise ordinance standards will be applicable to the proposed project when constructing or operating within the various jurisdictions.

4.10.3 IMPACTS AND MITIGATION MEASURES

SIGNIFICANCE CRITERIA

The analysis of the significance of impacts of the proposed project is based on the general criteria listed below. Based on the *CEQA Guidelines,* a project may be deemed to have a significant effect on the ambient noise environment if it would 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;

- A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project;

- A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project

As described earlier, a change in noise levels of less than three dBA is not discernible to the general population; an increase in average noise levels of three dBA is considered barely perceptible, while an increase of five dBA is considered readily perceptible to most people (Caltrans, 1998). For evaluating permanent increases in ambient noise levels, the following specific criteria are used for this analysis: a change of 5 DNL or more is considered significant where the resultant noise level remains "normally acceptable" for the affected land uses and a change of 3 DNL or more is considered significant where the resultant noise level would exceed the maximum level considered "normally acceptable" for the affected land uses.

IMPACT MECHANISMS

The impact mechanisms of the project would be the temporary increase in noise from construction equipment during the underground and aerial installation of the fiber optic cable facilities and the long-term increase in noise from operation of equipment at the OP-AMP stations. The equipment installed at OP-AMP stations may vary to include air conditioning units and an emergency back-up generator while others could rely on the air conditioning units within existing buildings and would not have an emergency back-up generator. Temporary increases in noise due to construction and long-term increases from equipment at the OP-AMP stations would have the potential to affect sensitive land uses, such as residences along route segments and within the vicinities of the OP-AMP stations. It is important to note, however, that there may be very few OP-AMP stations proposed. In addition, as advancement in fiberoptic technology continues, the need for new OP-AMP stations diminishes.

Impact NOI-1: Subsequent activities could generate noise levels in excess of local standards during project construction and operation. (Potentially Significant)

Subsequent activities could involve temporary noise sources associated with construction and long-term noise sources associated with the operation of HVAC units and generators at the OP-AMP stations. Such noise sources are typically regulated on the local level through enforcement of noise ordinances, implementation of general plan policies, and imposition of conditions of approval for permits.

Construction associated with subsequent activities could involve installation of new conduit for fiber optic cable using four different methods of installation – 1) open trenching, 2) plow and trench installation, 3) directional boring and 4) aerial installation on transmission and distribution

towers, and bridge attachments. Construction involving open trenching would typically proceed at a rate of 85 feet per day (metropolitan street trenching) to 2,600 feet per day (dirt trenching). Industrial or residential street trenching would proceed at the rate of approximately 200 feet per day. Directional drilling or boring, which would be a technique used at selected locations would typically proceed at a rate of approximately 300 feet per day, while aerial installation would proceed at the rate of approximately 1–3 miles per day.

Construction would also involve site preparation, construction of concrete slab foundations, and installation of structures and equipment at the OP-AMP stations (some of the OP-AMP stations could be installed within existing commercial buildings). The new structures at OP-AMP stations would be pre-fabricated concrete equipment buildings, and as such, they would not be constructed, per se, but would be attached to the concrete slab foundations.

During the construction period, noise levels generated by construction for installation of fiber optic cable facilities would vary depending on the particular type, number, and duration of use of various pieces of construction equipment. The mix of construction equipment would vary between the different types of construction: street trenching, plow and trench installation, directional boring and aerial installation. For street trenching, the equipment would include an asphalt paver, roller, windrow elevator, grinder, and two backhoes. For directional boring, the equipment would include a vacuum trailer, a drilling machine, a backhoe, a mini-excavator, and a water truck. The installation crew for hanging OPGW on transmission towers includes three 5-ton material trucks, two carry-alls, one cable dolly, one tensioner machine, one pulling machine, two splicing vans, one crane and a helicopter.

Such construction equipment typically generates between 80 and 90 dBA at 50 feet (U.S. Department of Transportation, 1995). Helicopters may be a method used for the proposed OPGW installation to facilitate transmission tower modifications, and in preparation for stringing operations. Helicopter fly-overs are noisier and longer in duration than motor vehicle pass-bys and can generate noise levels of up to 87 dBA. While helicopters can significantly shorten construction time and reduce ground disturbance, they would not be proposed for use in areas sensitive to noise and their use would be limited to the less noise-sensitive daytime hours.

At any one location throughout the project area, the duration of noise impacts would be relatively brief, approximately one to three days, given the rate at which installation would proceed. The duration of noise impacts from construction at OP-AMP stations would be slightly longer.

Most of the various jurisdictions through which subsequent activities would proceed have set standard construction hours and, in some cases, have established construction equipment noise standards as part of either the local general plan noise element or the noise ordinance. As indicated below, Sempra Communications would require its contractors to comply with the construction hour limitations and equipment standards for all applicable jurisdictions. For construction in those jurisdictions where there are no specific construction-related standards, Sempra Communications would require its contractors to limit noisy construction activity to the hours of 7:00 a.m. to 7:00 p.m., Monday through Saturday. Given these measures, the project

would not expose persons to or generate noise levels in excess of standards established in local general plans or noise ordinances, or applicable standards of other agencies.

Over the long-term, the project could introduce new stationary equipment noise sources to the OP-AMP sites. The equipment associated with the OP-AMP stations located within existing commercial buildings would not be expected to affect noise levels outside of those buildings and thus would not expose persons to or generate noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies. At locations where the OP-AMP stations would be newly constructed, the equipment would include air conditioning units and, at some of the OP-AMP stations, back-up generators. Generally, each OP-AMP site would include two or more equipment shelters, each of which would have two wall-mounted air conditioning units. Typically, only one of the two air conditioning units at each shelter would be operating at any one time: one would cycle "on" as the other cycles "off." Based on noise measurement data for the model of air conditioning unit used for similar applications (a Marvair Model AVP36 Compac I), each air conditioning unit would generate approximately 62 dBA at 20 feet (Hotinger, 2000). With two shelters, configured side-by-side, the two air conditioning units would generate approximately 65 dBA at 20 feet.

At some of the OP-AMP stations, a diesel-powered, back-up generator would be installed in its own shelter. These generators would provide 60 kilowatts of power and would be operated only for routine testing and maintenance or during an actual interruption in power from the utility grid. Routine testing and maintenance would include weekly tests of one-hour duration or less. Based on noise measurement data for the model of generator used for similar applications (an Onan Model 60DGCB), which includes a mounted muffler, each generator would generate approximately 84 dBA at 23 feet (Hotinger, 2000).

Depending on the jurisdiction in which the OP-AMP stations would be located and the distance to the nearest sensitive receptors from the OP-AMP stations, unmitigated noise levels from the operation of HVAC equipment and emergency standby generators could exceed local noise standards. As subsequent activities are identified, a more detailed, OP-AMP-site specific analysis shall be conducted by a qualified noise analyst to determine if standards in the local noise ordinance or general plan noise element would be exceeded due to the long-term operation of equipment at the OP-AMP stations. Based on the analysis, site-specific mitigation measures shall be identified to reduce any impacts and Sempra Communications would be required to implement the recommended OP-AMP site-specific measures. With implementation of the OP-AMP-specific measures, the project would not expose persons to or generate noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.

Mitigation Measure NOI-1a: Sempra Communications would require construction contractors to comply with the construction hours limitations and construction equipment standards set forth in the local general plan noise element and the noise ordinance of all applicable jurisdictions of cities and counties, or in compliance with conditions outlined in acquired permits from those applicable jurisdictions. For construction in those jurisdictions where there are no specific

construction-related standards, Sempra Communications would require its contractors to limit noisy construction activity to the hours of 7:00 a.m. to 7:00 p.m., Monday through Saturday.

Mitigation Measure NOI-1b: To reduce daytime noise impacts due to construction, Sempra Communications shall require construction contractors to implement the following measures:

- Equipment and trucks used for construction shall utilize the best available noise control techniques (*e.g.*, improved mufflers, equipment redesign, use of intake silencers, ducts, engine enclosures and acoustically-attenuating shields or shrouds, wherever feasible);

- Impact tools (*e.g.*, jack hammers, pavement breakers, and rock drills) used for construction shall be hydraulically or electrically powered wherever possible to avoid noise associated with compressed air exhaust from pneumatically powered tools. However, where use of pneumatic tools is unavoidable, an exhaust muffler on the compressed air exhaust shall be used; this muffler can lower noise levels from the exhaust by up to about 10 dBA. External jackets on the tools themselves shall be used where feasible, and this could achieve a reduction of 5 dBA. Quieter procedures shall be used, such as drills rather than impact equipment, whenever feasible; and

- Construction equipment shall be located as far from sensitive receptors as possible.

Mitigation Measure NOI-1c: To the extent feasible, avoid use of helicopters for stringing OPGW cable on transmission towers in residential areas and other sensitive land uses.

Mitigation Measure NOI-1d: If for any reason, construction activities adjacent to any noise sensitive receptors is expected to last more than a week, Sempra Communications shall establish a process for responding to and tracking complaints pertaining to construction noise with the following components:

- A procedure for notifying the local City/County Building Division staff and Police Department;

- A plan for posting signs on-site pertaining to permitted construction days and hours and complaint procedures and who to notify in the event of a problem;

- A listing of telephone numbers (during regular construction hours and off-hours); and

- The designation of a construction complaint manger for the project.

Mitigation Measure NOI-1e: Upon determining locations of OP-AMP stations, a more detailed, OP-AMP site specific noise analysis shall be conducted by a qualified noise analyst to determine the impact of the operation of HVAC equipment and the backup generators on the ambient noise level at nearby sensitive land uses. If the analysis indicates that the operational noise levels are expected to exceed the local noise standards, site-specific mitigation measures recommended by the analyst shall be implemented. The measures may not be limited to the following recommendations but could include some or all of the recommendations to reduce the impact on sensitive receptors to a less than significant level. Sempra Communications shall also be required to design the OP-AMP sites keeping in mind the following measures.

- Modify the air conditioning units or redesign the facility layout such that the air conditioning units would face away from sensitive receptors, to the maximum extent feasible.

- Install generators that provide an equivalent noise reduction greater than the model assumed as the basis for this analysis so as to meet the local noise standards. The required equivalent noise reduction would be determined based on the results of the site-specific noise analysis.

- Restrict the hours during which routine tests of the backup generators can be conducted to the less noise sensitive daytime hours.

Significance after Mitigation: Less than significant.

Impact NOI-2: Subsequent activities could expose sensitive receptors to localized groundborne vibration and groundborne noise. (Potentially Significant)

The project could involve temporary sources of groundborne vibration and groundborne noise during construction from operation of heavy equipment and long-term sources during its operational phase from operation of back-up generators. During construction, operation of heavy equipment would generate localized groundborne vibration and groundborne noise that could be perceptible at any nearby residences or other sensitive uses in the immediate vicinity of the construction route. However, since the duration of impact at any one location would be very brief (from one to three days) and since the impact would occur during less sensitive daytime hours, the impact from construction-related groundborne vibration and groundborne noise would not be significant.

Over the long-term, occasional use of back-up generators could generate groundborne vibration and groundborne noise in the immediate vicinity of generator equipment shelters at the OP-AMP stations located near sensitive land uses. If sensitive land uses are located at sufficient distances from the OP-AMP stations, the groundborne vibration and groundborne noise from the generators would attenuate to a level that would not be perceptible. Installation of the generator on top of an isolator pad at the OP-AMP stations located near sensitive uses would reduce the related groundborne vibration and groundborne noise to a less than significant level since the isolator pad would minimize the vibration produced by the generator. This impact would be further tempered by the fact that the use of the backup generators would normally be one hour per week or less.

Mitigation Measure NOI-2a: Where OP-AMP stations would be located near sensitive land uses, Sempra Communications would install generators on top of isolation pads to reduce the impact of groundborne vibration and noise.

Significance after Mitigation: Less than significant.

Impact NOI-3: Subsequent activities could result in permanent increases in ambient noise levels from use of equipment at OP-AMP stations. (Potentially Significant)

As described under Impact NOI-1, the project could introduce new permanent sources of noise at the OP-AMP stations (excluding OP-AMP stations that would be located within existing commercial buildings). Based on the location of the OP-AMP site and the its distance to the nearest sensitive land uses, this permanent increase in ambient noise level due to the operation of equipment at the OP-AMP stations could lead to a significant impact based on the previously identified significance thresholds. However, as described earlier, the level of significance of this impact can only be determined once the location of the OP-AMP stations has been identified. Therefore, as subsequent activities and OP-AMP locations are identified, a more detailed noise analysis shall be conducted by a qualified noise analyst to analyze the project's impact on the ambient noise level near OP-AMP sites. Increase in ambient noise due to the operation of equipment at the OP-AMP sites shall be compared to the previously identified significance thresholds and local noise standards. To address any significant impacts, Sempra Communications would implement the mitigation measures recommended by the analyst that may include some or all of the measures that are described under Mitigation NOI-1e. With implementation of these measures, the permanent increase in noise at the OP-AMP sites would constitute a less than significant impact.

Mitigation Measure NOI-3: Sempra Communications would implement the measures listed under Mitigation Measure NOI-1e.

Significance after Mitigation: Less than significant.

Impact NOI-4: Subsequent activities could result in temporary and intermittent noise increases during project construction. (Less than Significant)

The project could result in temporary and intermittent noise increases due to construction. (See Impact NOI-3 for a discussion of the noise from back-up generators at the proposed OP-AMP stations, which would represent another intermittent noise source associated with the project.) Project construction-related equipment and activities are described above under Impact NOI-1. The effect of this noise would depend upon how much noise would be generated by the equipment, the distance between construction activities and the nearest noise-sensitive uses, and the existing noise levels at those sensitive uses. Project construction would involve use of equipment that would typically generate noise levels in the 80 to 90 dBA range within 50 feet. It is possible that residential uses could be located as close as 20 to 30 feet from construction equipment along some segments of the alignment. In some areas, intervening structures/sound walls, trees and berms (between the construction zone and residences) may provide some noise attenuation.

Background noise levels would vary depending the location of the alignment. Even in urban areas where background noise levels are relatively high, the noise from construction equipment would be substantially above those background levels. Given compliance with local standards related to allowable construction hours (see Impact NOI-1), project construction would occur when a majority of people would be at work, but retired persons, people who work at home, and people caring for children in their homes could be annoyed by noise when construction activities occur in their immediate vicinity. However, the duration of impact for each sensitive receptor would likely be one to three days, from the commencement of site preparation to the completion of backfilling (shorter in case of aerial installation of OPGW), and given the short duration of the impact, the temporary increase in noise due to project construction would not be significant.

Mitigation Measure: No mitigation is required.

Impact NOI-5: Subsequent activities could be located within an airport land use plan or where such a plan has not been adopted, within two miles of a public use airport and could expose people residing or working in the project area to excessive noise levels. (Less than Significant)

The project does not involve the development of a noise-sensitive land use, and thus, would not expose people to excessive aircraft noise. However, if subsequent activities are located within an airport land use plan or within two miles of a public use airport, construction workers could be temporarily exposed to elevated levels of aircraft noise. However, due to the linear nature of the project this impact would be temporary lasting for one to three days and hence, this impact would be considered less than significant.

Mitigation Measure: No mitigation is required.

Impact NOI-6: Subsequent activities could be located within the vicinity of a private airstrip and would expose people residing or working in the project area to excessive noise levels. (Less than Significant)

The project does not involve the development of a noise-sensitive land use, and thus, would not expose people to excessive aircraft noise. However, if some portions of subsequent alignments are located in the vicinity of a private airstrip, construction workers could be temporarily exposed to elevated levels of aircraft noise. Due to the linear nature of the project this impact would be temporary lasting for a maximum of one to three days and hence, this impact would be considered less than significant.

Mitigation Measure: No mitigation is required.

REFERENCES – Noise

Caltrans, *Traffic Noise Analysis Protocol for New Highway Construction and Reconstruction Projects*, October 1998.

Hotinger, Herb, VFP, Inc., transmittal, February 9, 2000.

U.S. Department of Transportation, Federal Transit Administration, *Transit Noise and Vibration Impact Assessment*, April 1995.