CHAPTER 14 - NOISE

INTRODUCTION

This chapter describes the environmental setting (existing conditions and regulatory setting) for the regional noise environment in the MTP Plan Area. This section also presents the federal, state, and local policies and regulations that determine mitigation requirements and identifies impacts related to noise that may result from implementation of the proposed MTP 2035 projects, and mitigation measures to reduce these impacts where necessary.

The study area consists of transportation routes, including highways, rail alignments, bicycle trails, state routes, roads, and Caltrans right-of-way in the MTP Plan Area. The key sources of data and information used in the preparation of this section are listed below.

- Sacramento County General Plan 1993 (Sacramento County 1993)
- Yolo County General Plan (Yolo County 1983)
- Sutter County General Plan (Sutter County 1993)
- Yuba County General Plan (Yuba County 2004)
- Placer County General Plan (Placer County 2005)
- El Dorado County General Plan (El Dorado County 2004)

The information presented in this chapter is based on a review of existing and available information and is regional in scope. Data provided in this chapter should be considered preliminary and appropriate for general policy planning and tiering of subsequent environmental documents. Site-specific noise assessments will be necessary to determine future project-level environmental effects and appropriate mitigation.

Noise Terminology and Background

Describing Noise

Sound is defined as any pressure variation in air that the human ear can detect. If the pressure variations occur frequently enough (at least 20 times per second), they can be heard and hence are called *sound.* The number of pressure variations per second is called the *frequency of sound,* and is expressed as cycles per second, called hertz (Hz). *Noise* is often described as unwanted sound, and thus is a subjective reaction to characteristics of a physical phenomenon.

Measuring sound directly in terms of pressure would require a very large and awkward range of numbers. To avoid this, the decibel scale was devised. The decibel scale uses the hearing threshold of 20 micropascals as a point of reference, defined as 0 dB. Other sound pressures are then compared to the reference pressure, and the logarithm is taken to keep the numbers in a practical range. Another useful aspect of the decibel scale is that changes in levels (dB) correspond closely to human perception of relative loudness.

The perceived loudness of sounds is dependent upon many factors, including sound pressure level and frequency content. However, within the usual range of environmental noise, levels can be approximated by weighting the frequency response of a sound-level measurement device (called a sound level meter)

by means of the standardized A-weighting network. There is a strong correlation between A-weighted sound levels (expressed as sound levels in dB) and community response to noise. For this reason, the A-weighted sound pressure level has become the standard tool of environmental noise assessment.

Community noise is commonly described in terms of the *ambient* noise level, which is defined as the all-encompassing noise level associated with a given noise environment. A common measure used to quantify the ambient noise level is the equivalent sound level (Leq), which corresponds to a steady-state sound level containing the same total energy as a time-varying signal over a given time period (usually 1 hour). The Leq is the foundation of the composite noise descriptors such as Ldn, and shows very good correlation with community response to noise.

The following two composite noise descriptors are in common use today.

- Day-night Average Level (Ldn). Ldn is based upon the average hourly Leq over a 24-hour day, with a 10 decibel weighting applied to nighttime (10:00 p.m. to 7:00 a.m.) Leq values. The nighttime penalty is based upon the assumption that people react to nighttime noise exposures as though they were twice as loud as daytime exposures.

- Community Noise Equivalent Level (CNEL). CNEL, like Ldn, is based upon the weighted average hourly Leq over a 24-hour day, except that an additional 5-decibel penalty is applied to evening (7:00 p.m. to 10:00 p.m.) hourly Leq values. The CNEL was developed for the California Airport Noise Regulations, and is applied specifically to airport/aircraft noise assessment. For this reason, the Ldn descriptor, rather than CNEL, is used for the assessment of traffic noise levels in the MTP Plan Area.

Effects of Noise on People

Noise in a community has often been cited as a health problem, not in terms of actual damage such as hearing impairment, but in terms of inhibiting general well being and contributing to undue stress and annoyance. The health effects of noise in the community arise from interference with human activities such as sleep, speech, recreation, and tasks demanding concentration or coordination. When community noise interferes with human activities or contributes to stress, public annoyance with the noise source increases, and the acceptability of the environment for people decreases. This decrease in acceptability and the threat to public well being are the bases for land-use planning policies designed to prevent exposure of communities to excessive levels of noise.

Noise Planning Standards and Ordinances

To control noise from fixed sources that have developed from processes other than zoning or land use planning, many jurisdictions have adopted community noise-control ordinances. Such ordinances are intended to abate noise nuisances and to control noise from existing sources. They may also be used as performance standards to judge the creation of a potential nuisance, or potential encroachment of sensitive uses on noise-producing facilities. Community noise-control ordinances are generally designed to resolve noise problems on a short-term basis (usually by means of hourly noise-level criteria), rather than on the basis of 24-hour or annual cumulative noise exposures.

Noise ordinance criteria are not applicable to traffic on public roadways. However, General Plan Noise Elements provide noise standards for new noise-sensitive land uses that may be affected by transportation noise sources or for new transportation sources that may affect existing noise-sensitive uses.

For new noise-sensitive land uses affected by transportation noise sources, many jurisdictions consider land use compatibility criteria of 60 to 65 dB Ldn as being "normally acceptable." Typical options for mitigation of excessive traffic-noise levels include the use of setbacks or buffer areas between the roadway and the proposed noise-sensitive land use, noise barriers, residential unit design, and improvements to building façade construction.

Because many rural residential areas experience very low noise levels, residents may express concern about the loss of "peace and quiet" due to the introduction of a sound that was not audible previously. In very quiet environments, the introduction of virtually any change in local activities will cause an increase in noise levels. A change in noise level and the loss of "peace and quiet" is the inevitable result of land use or activity changes in such areas. Neither audibility of a new noise source nor an increase in noise levels within recognized acceptable limits is usually considered to be a significant noise impact, but these concerns should be addressed and considered in the planning and environmental review processes.

Noise Mitigation

In locations where noise-sensitive uses are located close to a traffic noise source, placement of a barrier between the source and the receiver is the most effective way to reduce noise impacts.

The effectiveness of a barrier depends on blocking the line-of-sight between the traffic noise source and receiver, and is improved with increasing the distance the sound must travel to pass over the barrier as compared to a straight line from source to receiver. For a noise barrier to be effective, it must not only be sufficiently tall to intercept line of sight from noise source to receiver, but it must also be sufficiently long to reduce the potential for sound to flank around ends of the barrier.

Barrier effectiveness depends on the relative heights of the source, barrier, and receiver. In general, barriers are most effective when placed close to either the receiver or the traffic noise source and are less effective if placed midway between the source and the receiver.

For maximum effectiveness, barriers must be continuous and relatively airtight along their length and height. To ensure that sound transmission through the barrier is insignificant, barrier mass should be about 4 lbs per square foot, though a lesser mass may be acceptable if the barrier material provides sufficient transmission loss in the frequency range of concern. Satisfaction of the above criteria requires substantial and well-fitted barrier materials, placed to intercept line of sight to all significant traffic noise sources. Earth, in the form of berms or the face of a depressed area, is also an effective barrier material.

There are practical limits to the noise reduction provided by barriers. For highway traffic noise, a 5 to 10 dB noise reduction may often be reasonably attained. A 15 dB noise reduction is sometimes possible, but a 20 dB noise reduction is extremely difficult to achieve. Barriers usually are provided in the form of walls, berms, or berm/wall combinations. The use of an earth berm in lieu of a solid wall will generally provide up to 3 dB additional attenuation over that attained by a solid wall alone, due to the absorption provided by the earth. Berm/wall combinations offer slightly better acoustical performance than solid walls, and are often preferred for aesthetic reasons.

Noise barriers currently exist or are planned in many areas of the SACOG region adjacent to state highways. In cases of new residential development adjacent to a major roadway in the SACOG region, the responsibility for noise mitigation is typically placed on the project developer. In such cases, noise barriers are commonly constructed just inside the highway right-of-way. In some cases, local jurisdictions and Caltrans have built barriers as part of roadway improvement projects or barrier retrofit programs.

SETTING

Environmental Setting

The noise environment in the MTP Plan Area comprises two major categories of noise sources: transportation and non-transportation noise sources. Transportation noise sources include surface traffic on public roadways, railroad line operations, and aircraft in flight. Non-transportation (or fixed) noise sources commonly consist of industrial activities, railroad yard activities, small mechanical devices (lawnmowers, leaf blowers, air conditioners, radios, etc.), and other sources not included in the traffic, railroad, and aircraft category.

Traffic Noise

The ambient noise environment in the MTP Plan Area is defined by a wide variety of noise sources. The most pervasive source of noise in the Plan Area is traffic noise. With thousands of miles of roadways in the MTP Plan Area, it is difficult to escape the sound of traffic. Traffic noise exposure is mainly a function of the number of vehicles on a given roadway per day, the speed of those vehicles, the percentage of medium and heavy trucks in the traffic volume, and the receiver's proximity to the roadway. Every vehicle passage on every roadway in the Plan Area radiates noise.

The existing traffic noise environment in the MTP Plan Area has been characterized by using traffic noise modeling. The FHWA Traffic Noise Model (TNM) Version 2.5 and daily traffic volumes on major roadways in the Plan Area were used to calculate the traffic noise level at a fixed distance of 150 feet from each roadway.

Rail Noise

The region is also affected by noise from freight and passenger railroad operations and light-rail train operations. While these operations generate significant noise levels in the immediate vicinity of the railroad tracks during train passages, these operations are intermittent and the tracks are widely dispersed throughout the region. For these reasons, the contribution of railroad noise to the overall ambient noise environment in the SACOG region is relatively minor.

Aircraft Noise

The SACOG region is home to many airports, including public, private, and military airports. In addition to the numerous daily aircraft operations that originate and terminate at these airports, aircraft not utilizing the regional airports frequently fly over the Plan Area. All of these operations contribute in some degree to the overall ambient noise environment in the MTP Plan Area. The intensity of aircraft noise exposure depends on one's proximity to the aircraft flight path; the type, speed, and altitude of airplane; and atmospheric conditions. The farther away the noise source, the more weather affects the sound propagation from source to receiver.

Industry and Other Non-Transportation Noise

A wide variety of industrial and other non-transportation noise sources are located in the MTP Plan Area, including manufacturing operations, power plants, food packaging and processing facilities, lumber mills, aggregate mining and processing plants, race tracks, shooting ranges, amphitheaters, and car washes, to name several. Noise generated by these sources varies widely, but in some cases can be a significant contributor to the local ambient noise environment. Although non-transportation noise sources

can define the ambient noise environment within a given distance to the noise source, the regional ambient noise environment is, nonetheless, defined primarily by traffic.

Regulatory Setting

Federal Regulations

The federal Noise Control Act of 1972 (Public Law 92-574) established a requirement that all federal agencies administer their programs to promote an environment free of noise that would jeopardize public health or welfare. The U.S. Environmental Protection Agency (EPA) was given the responsibility for:

- providing information to the public regarding identifiable effects of noise on public health and welfare,
- publishing information on the levels of environmental noise that will protect the public health and welfare with an adequate margin of safety,
- coordinating federal research and activities related to noise control, and
- establishing federal noise emission standards for selected products distributed in interstate commerce.

The Noise Control Act also directed that all federal agencies comply with applicable federal, state, interstate, and local noise control regulations.

Although the EPA was given a major role in disseminating information to the public and coordinating with other federal agencies, each federal agency retains authority to adopt noise regulations pertaining to agency programs. The EPA can, however, require other federal agencies, such as those listed below, to justify their noise regulations in terms of Noise Control Act policy requirements.

- Federal Highway Administration (FHWA): Noise standards for federally funded highway projects
- Federal Transit Administration (FTA): Noise standards for federally funded transit projects
- Federal Railroad Administration (FRA): Noise standards for federally funded rail projects

U.S. Environmental Protection Agency

In 1974, in response to the requirements of the federal Noise Control Act, the EPA identified indoor and outdoor noise limits to protect public health and welfare (communication disruption, sleep disturbance, and hearing damage). Outdoor Ldn limits of 55 dB and indoor Ldn limits of 45 dB are identified as desirable to protect against speech interference and sleep disturbance for residential, educational, and healthcare areas. Sound-level criteria to protect against hearing damage in commercial and industrial areas are identified as 24-hour Leq values of 70 dB (both outdoors and indoors).

Federal Highway Administration

FHWA regulations (23 CFR 772) specify procedures for evaluating noise impacts associated with federally funded highway projects and for determining whether these impacts are sufficient to justify funding noise abatement actions. The FHWA noise abatement criteria are based on worst hourly Leq sound levels, not Ldn or CNEL values. The worst-hour 1-hour Leq criteria for residential, educational,

and healthcare facilities are 67 dB outdoors and 52 dB indoors. The worst-hour 1-hour Leq criterion for commercial and industrial areas is 72 dB (outdoors).

Federal Transit Administration
FTA procedures for the evaluation noise from transit projects are specified in the document titled, "Transit Noise and Vibration Impact Assessment" (Federal Transit Administration, 2006). The FTA Noise Impact Criteria categorizes noise-sensitive land uses into the following categories.

- Category 1: Buildings or parks where quiet is an essential element of their purpose.
- Category 2: Residences and buildings where people normally sleep. This includes residences, hospitals, and hotels where nighttime sensitivity is assumed to be of utmost importance.
- Category 3: Institutional land uses with primarily daytime and evening use. This category includes schools, libraries, churches, and active parks.

Ldn is used to characterize noise exposure for residential areas (Category 2). For other noise sensitive land uses, such as outdoor amphitheaters and school buildings (Categories 1 and 3), the maximum 1-hour Leq during the facility's operating period is used. Noise impacts are identified based on absolute predicted noise levels and increases in noise associated with the project.

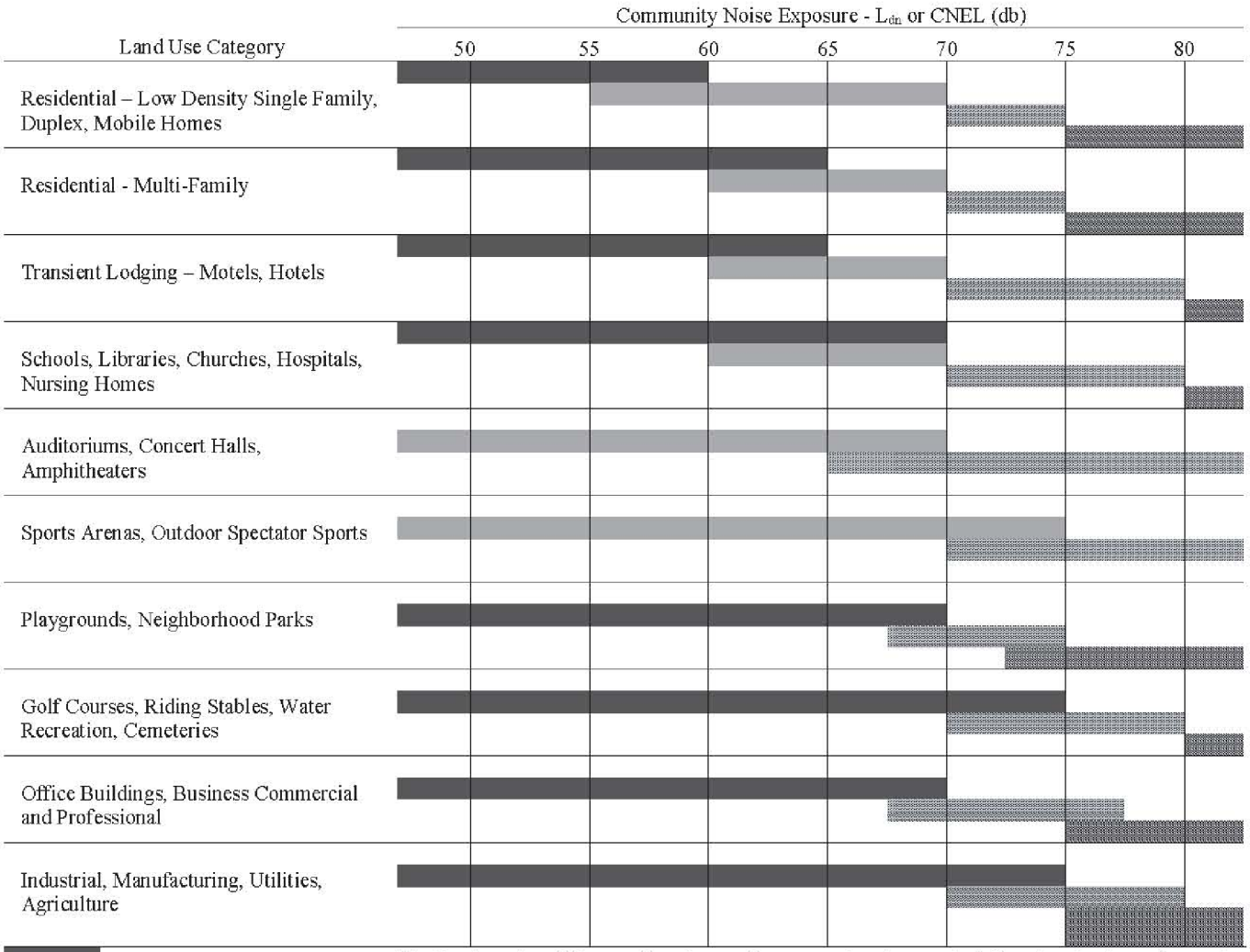
Federal Railroad Administration
FRA noise standards are the same as those specified by the FTA.

State Regulations

California Department of Transportation Traffic Noise Analysis Protocol
The California Department of Transportation (Caltrans) Traffic Noise Analysis Protocol (Protocol) specifies the policies, procedures, and practices to be used by agencies that sponsor new construction or reconstruction projects. The noise abatement criteria specified in the Protocol are the same as those specified in 23 CFR 772. The Protocol defines a noise increase as substantial when the predicted noise levels with project implementation exceed existing noise levels by 12 dBA. The Protocol also states that a sound level is considered to approach a Noise Abatement Criteria (NAC) level when the sound level is within 1 dB of the NAC identified in 23 CFR 772 (e.g., 66 dBA is considered to approach the NAC of 67 dBA, but 65 dBA is not).

State of California General Plan Guidelines
The State of California General Plan Guidelines (California Governor's Office of Planning and Research 2003) identifies guidelines for the noise elements of city and county general plans, including a sound level/land-use compatibility chart that categorizes, by land use, outdoor Ldn ranges in up to four categories (normally acceptable, conditionally acceptable, normally unacceptable, and clearly unacceptable). These guidelines provide the State's recommendations for city and county general plan noise elements. Compliance with the guidelines by the cities and counties is not required, but nonetheless is quite common because many general plan noise elements are based on these guidelines. These guidelines are not applicable to SACOG or projects without a city or county sponsor.

The noise element guidelines chart (Figure 14-1) identifies the normally acceptable range for low-density residential uses as less than 60 dB, and the conditionally acceptable range as 55–70 dB. The normally acceptable range for high-density residential uses is identified as Ldn values below 65 dB, and the conditionally acceptable range is identified as 60–70 dB. For educational and medical facilities, Ldn



Normally Acceptable	Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.
Conditionally Acceptable	New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features are included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.
Normally Unacceptable	New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.
Clearly Unacceptable	New construction or development generally should not be undertaken.

Source: California Governor's Office of Planning and Research, October 2003.

Figure 14-1: State Land Compatability Standards for Community Noise Environment

values below 70 dB are considered normally acceptable, and Ldn values of 60–70 dB are considered conditionally acceptable. For office and commercial land uses, Ldn values below 70 dB are considered normally acceptable, and Ldn values of 67.5–77.5 are categorized as conditionally acceptable.

These overlapping Ldn ranges are intended to indicate that local conditions (existing sound levels and community attitudes toward dominant sound sources) should be considered in evaluating land-use compatibility at specific locations.

California Noise Insulation Standards
Part 2, Title 24, of the California Code of Regulations, "California Noise Insulation Standards," establishes minimum noise insulation standards to protect persons within new hotels, motels, dormitories, long-term care facilities, apartment houses, and dwellings other than single family residences. Under this regulation, interior noise levels attributable to exterior noise sources cannot exceed 45 Ldn in any habitable room. Where such residences are located in an environment where exterior noise is 60 Ldn or greater, an acoustical analysis is required to ensure that interior levels do not exceed the 45 Ldn interior standard.

Local Regulations

SACOG includes six counties (El Dorado, Placer, Sacramento, Sutter, Yolo, and Yuba) and 22 cities, each with its own general-plan noise element. Some jurisdictions also have noise ordinances. The noise element and local noise ordinances are the two primary documents that local jurisdictions use to set noise standards in their community. A noise element is a required component of each jurisdiction's general plan. The noise element provides information on the current and future noise levels associated with local noise sources such as freeways and freeways, major streets and arterials, rail operations, aviation activities, and local industrial plants. The noise element also includes planning policies and implementation measures for limiting the exposure of people to noise.

The noise elements of the cities and counties located within the MTP Plan Area typically apply land-use compatibility criteria of 60–65 dB Ldn as being normally acceptable for new residential developments affected by transportation noise sources. The intent of these standards is to provide an acceptable noise environment for outdoor activities. In addition, an interior noise level criterion of 45 dB Ldn is commonly applied to residential land uses. The intent of this standard is to provide a suitable environment for indoor communication and sleep.

IMPACTS AND MITIGATION MEASURES

Methodology

Because noise is a highly localized impact, specific and detailed analyses are most appropriate at the project level. Future project-specific analysis under CEQA will be required to determine the magnitude of noise and vibration impacts and identify appropriate potential mitigations for individual projects. However, a regionwide noise analysis was performed to identify those roadway segments where significant increases in traffic could occur in the MTP Plan Area.

For this noise analysis, the FHWA Traffic Noise Prediction Model (FHWA-RD-77-108) and traffic data developed by SACOG for major roadways in the area were used to calculate the Ldn values associated with each roadway. The noise analysis identifies the direct noise impact of the project by comparing predicted traffic noise levels under the 2035 MTP to the 2035 no project condition. The 2035 no project condition assumes that the 2025 MTP would be in place in 2035 rather than the 2035 MTP. This

comparison indicates the incremental direct effect of the project by comparing traffic noise under project and no project conditions in the same time frame. A comparison of 2035 project condition to existing conditions does not indicate the direct effect of the project but rather indicates the cumulative increase in noise resulting from background cumulative background growth and the project. Accordingly, the comparison of the proposed project to existing conditions is not used to evaluate direct impacts for project but is rather used to identify cumulative noise impacts. For purposes of these comparisons, all values are calculated at a fixed distance of 150 feet from each roadway centerline.

The evaluation does not take into account whether there are sensitive receptors located adjacent to the freeways and arterials, but evaluates all roadways equally regardless of whether sensitive land uses are located adjacent thereto.

Criteria for Determining Significance

The proposed project would result in a significant noise impact if:

- short-term construction of projects included in the plan would result in extended, substantial construction noise in the vicinity of sensitive receptors,
- long-term operations of transportation projects included in the plan would increase noise by 3 dB or more relative to 2035 No Project conditions where no-project noise levels equal or exceed 65 Ldn, or
- people would be exposed to excessive groundborne vibrations or groundborne noise.

Environmental Impacts of the Proposed Project

This section describes potential impacts on noise issues that could result from the MTP 2035. Some projects within the MTP 2035 could significantly affect noise issues. However, prior to final approval of each project considered in the MTP 2035, the implementing agency will conduct the appropriate project-specific environmental review.

Impact NOI-1: Exposure of Noise Sensitive Land Use to Noise and Vibration From Construction Activities

Specific types of projects included in the proposed MTP 2035 generally fall into the following two categories:

- New systems (new highway, arterials, interchanges, bridge projects and transit facilities)
- Modifications to existing systems (widening roads, addition of carpool lanes, expansion of transit service, grade crossings, intelligent transportation systems, maintenance, and service alterations)

Construction activities associated with implementation of projects included in the 2035 MTP could result in temporary noise increases in the vicinity of the site-specific activity. The severity of construction noise impacts would depend on:

- the type of project proposed in the given area,
- the types of land uses in area and their proximity to the activity,
- the construction phase and associated equipment type,

- duration of proposed construction activities,
- distance between noise source and receptor, and
- presence or absence of barriers between noise source and receptor.

Table 14-1 summarizes typical construction noise levels for various phases of typical highway and roadway construction projects.

Table 14-1. Construction Noise Levels

Construction Phase	Typical Noise Level *
Ground clearing	84 dBA
Excavation	88 dBA
Foundations	88 dBA
Superstructure	78 dBA
Finishing	84 dBA
*Noisiest equipment located 50 feet from observer, other equipment located at 200 feet from the observer.	
Source: United States Environmental Protection Agency, 1971	

Noise from construction activity reduces at a rate of about 6 dB per doubling of distance. This means that land uses located within about 1,000 feet of site-specific construction sites could be exposed to noise in excess of 60 dBA. Non-impact construction activities such as the operation of bulldozers, scrapers, and trucks typically do not produce perceptible ground vibration beyond about 150 feet from the source (FTA 2006). Accordingly, the operation of non-impact equipment is not expected to expose people to excessive groundborne vibration or groundborne noise. Operation of impact pile drivers and similar highly dynamic equipment can, however, result in perceptible vibration within several hundred feet of the activity.

Based upon the general planning nature of the MTP 2035, development of detailed, site-specific information on this impact at the program level is not feasible. As a result, SACOG does not have sufficient reliable data to permit preparation of a meaningful and accurate report on the impact and no significance determination can be reasonably made. The implementing agency will conduct appropriate project-level environmental review and will be responsible for consideration of mitigation measures for significant effects on the environment. The following mitigation measure could be used by implementing agencies to address potential impacts during project-level review:

Mitigation Measure NOI-1: Employ Noise-Reducing Construction Practices

Undertake a detailed evaluation of noise impacts and identify project-specific mitigation measures, as necessary to reduce construction noise to a level that is in compliance with local noise standards. Ensue adherence to the mitigation measures prior to construction and will document compliance with the adopted mitigation measures. The following are measures that may be implemented to minimize the effects of construction noise:

- Comply with all local sound control and noise level rules, regulations, and ordinances.
- Limit the hours of construction to between 6:00 a.m. and 8:00 p.m. on Monday through Friday and between 7:00 a.m. and 8:00 p.m. on weekends, or as required by local noise ordinances in effect for site-specific projects.
- Require that equipment and trucks used for project construction utilize the best available noise control techniques (including mufflers, use of intake silencers, ducts, engine enclosures and acoustically attenuating shields or shrouds).
- Require that impact equipment (e.g., jack hammers, pavement breakers, and rock drills) used for project construction be hydraulically or electrical powered wherever feasible to avoid noise associated with compressed air exhaust from pneumatically powered tools. Where use of pneumatically powered tools is unavoidable, use of an exhaust muffler on the compressed air exhaust can lower noise levels from the exhaust by up to about 10 dBA. When feasible, external jackets on the impact equipment can achieve a reduction of 5 dBA. Whenever feasible, use quieter procedures, such as drilling rather than impact equipment operation.
- Locate stationary noise sources as far from sensitive receptors as possible. Stationary noise sources that must be located near existing receptors will be adequately muffled.
- Designate a complaint coordinator responsible for responding to noise complaints received during the construction phase. The name and phone number of the complaint coordinator will be conspicuously posted at construction areas and on all advanced notifications. This person will be responsible for taking steps required to resolve complaints, including periodic noise monitoring, if necessary.
- Mitigate noise generated from any rock-crushing or screening operations performed within 3,000 feet of any occupied residence by strategic placement of material stockpiles between the operation and the affected dwelling or by other means approved by the local jurisdiction.
- Direct contractors to implement appropriate additional noise mitigation measures including, but not limited to, changing the location of stationary construction equipment, shutting off idling equipment, rescheduling construction activity, notifying adjacent residents in advance of construction work, and installing acoustic barriers around stationary construction noise sources to comply with local noise control requirements.
- Prohibit pile-driving or blasting operations within 3,000 feet of an occupied residence on Sundays, legal holidays, or between the hours of 8:00 p.m. and 8:00 a.m. on other days, or as governed by local noise ordinances at site-specific locations.
- Use sonic or vibratory pile drivers instead of impact pile drivers (sonic pile drivers are only effective in some soils). If sonic or vibratory pile drivers are not feasible, provide acoustical enclosures as necessary to ensure that pile-driving noise does not exceed speech interference criterion at the closest sensitive receptor.

- Limit pile driving in residential areas to daytime working hours.
- Use engine and pneumatic exhaust controls on pile drivers as necessary to ensure that exhaust noise from pile driver engines is minimized to the extent feasible.
- Where feasible, pre-drill pile holes to reduce potential noise and vibration impacts.

Impact NOI-2: Exposure of Noise Sensitive Land Use to Increased Noise from the Operation of Expanded Roadway and Highway Facilities

The MTP includes new auxiliary and carpool lanes on all freeways and other expansion of existing roadways within the plan area along with other roadway improvement projects. Traffic noise in the MTP Plan Area has been evaluated under existing conditions, 2035 No Project conditions and 2035 conditions with the proposed MTP in place, using the FHWA Traffic Noise Prediction Model (FHWA-RD-77-108) and daily traffic volumes developed by SACOG. Traffic noise along 625 major roadways was calculated at a fixed distance of 150 feet from each roadway. The 2035 No Project condition assumes that the 2006 MTP would be in place in 2035 rather than the 2035 MTP.

Implementation of the MTP 2035 is predicted to decrease traffic noise by 3 dB or more along 44 of the roadway segments evaluated. Implementation of the MTP 2035 is predicted to increase traffic noise by 3 dB or more relative to 2035 no project conditions along the following 36 roadway segments evaluated:

- 14th Avenue (Extension from Power Inn Road – South Watt Avenue)
- 16th Street North (Elverta Road – Baseline Road)
- 16th Street North (Elkhorn Boulevard – Dry Creek Road – Elverta Road)
- 24th Street (Cosumnes River Boulevard – Meadowview Road)
- Algodon Road (Arboga Road to State Route 70)
- Blue Oaks Road (Watt Avenue – Fiddyment Road)
- Country Club Connector (Silva Valley Road – Bass Lake Road)
- Davis Road (Jefferson Boulevard – Village Parkway)
- Dowd Road (Catlett Road – State Route 65)
- Dowd Road (Catlett Road – Riosa Road)
- Dyer Parkway (North to Baseline Road)
- Dyer Parkway (Walerga Road – Baseline Road)
- East Avenue (State Route 193 – Nicolaus Road Extension)
- Empire Ranch Road/U.S. Highway 50 Westbound Meter
- Feather River Boulevard (Grand Avenue – Murphy Road)
- Fiddyment Road North (Placer Parkway – Moore Road)
- Fiddyment Road C (Blue Oaks Road – Realign)

- Fruitridge Road (South Watt Avenue – Mayhew Road)
- Garden Street
- Gibson Road (Pioneer Road – County Road 102)
- Gladding Road (Wise Road – State Route 65)
- Mayhew Road Extension (Jackson Road – Keifer Boulevard)
- Old Placerville Road (Bradshaw Road – Happy Lane)
- Old Placerville Road (Happy Lane – Mather Field Road)
- Placer Parkway East End (State Route 65 – Fiddyment Road)
- Placer Parkway North (Brewer Road – Pleasant Grove Boulevard)
- Placer Parkway North (Pleasant Grove Boulevard – Watt Avenue)
- Placer Parkway North (Watt Avenue – Fiddyment Road)
- Placer Parkway/State Route 65 Interchange
- Pleasant Grove (Fiddyment Road – Watt Avenue)
- Poppy Ridge Road (Franklin Boulevard – State Route 99)
- Railyards – 5th Street Extension
- U.S. Highway 50/State Route 99 Southeast HOV Connectors)
- Waterman Road (Gerber Road – Florin Road)
- Wise Road (Dowd Road – State Route 65 Bypass)
- Wise Road (State Route 65 Bypass – Gladding Road)

For the roadways evaluated, in no case is a 3 dB or more increase relative to 2035 no project conditions predicted to occur where the 2035 no project noise level is predicted to exceed 65 Ldn. This impact is therefore considered to be less than significant and no mitigation is required.

Impact NOI-3: Exposure of Noise Sensitive Land Use to Increased Noise from the Operation of New Roadway and Highway Facilities

The MTP includes new roadways and new or widened bridges to span the Sacramento, Feather and American Rivers. Where a new roadway or bridge will be constructed, noise levels at adjacent land uses will likely increase by 3 dB or more and noise will likely exceed 65 Ldn. This impact is therefore considered to be potentially significant.

Implementation of the following mitigation measure would reduce this impact. It is however, not anticipated that it will be feasible to mitigate this impact to a less-than-significant level in all cases. This impact is therefore considered to be significant and unavoidable. The following mitigation measure could be used by implementing agencies to address potential impacts during project-level review:

Mitigation Measure NOI-2: Employ Measures to Reduce Noise from Transportation Systems

Conduct a project level evaluation of noise impacts in accordance with applicable federal, state, and local noise standards. Where significant impacts are identified mitigation measures will be implemented where feasible to reduce noise to be in compliance with applicable noise standards. Measurements that can be implemented include but are not limited to:

- Construction of barriers in the form of sound walls or earth berms to attenuate noise at adjacent residences.
- Use of land use planning measures, such as zoning, restrictions on development, site design, and use of buffers to ensure that future development is compatible with adjacent transportation facilities.
- Maximizing the distance between noise-sensitive land uses and new roadway lanes, roadways, rail lines, transit centers, park-n-ride lots, and other new noise generating facilities.
- Constructing roadways so that they are depressed below-grade of the existing sensitive land uses to create an effective barrier between the roadway and sensitive receptors.
- Improvement of the acoustical insulation of dwelling units where setbacks and sound barriers do not sufficiently reduce noise.

Impact NOI-4: Exposure of Noise Sensitive Land Use to Increased Noise from the Operation of Expanded or Transit Operations

The MTP 2035 emphasizes widespread and frequent bus service on arterial streets with new services and strategic rail investments for transit. The plan includes rail transit extensions and operational improvements to enhance service frequencies. New transit services along new travel corridors would be established to connect suburban activity centers, using a wider spectrum of transit options, ranging from commuter rail through light rail, streetcar, bus rapid transit, enhanced bus, express bus, local bus, community shuttles and paratransit. Increased frequency of express bus service is included to maximize the capacity of the carpool lanes.

Specifically, the MTP 2035 calls for:

- Two more Capitol Corridor trains (heavy rail) daily
- South Sacramento Corridor Phase 2 light rail extension to Cosumnes River College
- Gold and Blue Line light rail track improvements for increased peak-period frequencies
- Light rail extension from downtown Sacramento to Natomas to Sacramento International Airport

- Increased local bus, shuttle, bus rapid transit, and express bus service

Heavy rail improvements will include two more Capitol Corridor trains per day. Because of the number of existing passenger and freight trains that use these tracks, two additional trains are not expected to increase daily noise (Ldn) along these tracks by more than 3dB. The impact associated with heavy rail improvements is considered to be less than significant. No mitigation is required.

The addition of local buses, shuttles, bus rapid transit, and express buses to existing streets and routes is unlikely to increase noise by more than 3 dB because of the existing high noise levels along those routes. Low frequency energy produced by accelerating buses can sometimes cause secondary effects such as rattling of windows that is perceived as vibration issue. Increased bus service may cause increase incidences of this effect. However, this effect however is not expected to be significant because this effect would occur in the context of existing bus service and existing high background sound levels. The impact associated with the addition of local buses, shuttles, bus rapid transit, and express buses is considered to be less than significant. No mitigation is required.

Light rail improvements will include improvements to existing corridors and the addition of new corridors. In general the proposed transit improvements along existing corridors will occur in developed urban areas where noise levels are already high from existing transportation systems. Because improvements along existing corridors would not double the number of daily trains, these improvements are not expected to increase daily noise (Ldn) along these corridors by more than 3dB. The impact associated with improvements to existing light rail corridors is considered to be less than significant. No mitigation is required.

Typical light rail operations (50 daytime trains, 15 nighttime trains traveling at 50 mph) produce a sound level of about 68 Ldn at 50 feet from the track (FTA 2006). The addition of light rail operations along new corridors could occur in areas existing noise is well below 68 Ldn. New light rail operations in these areas would increase daily noise (Ldn) by more than 3 dB and in some cases may be located adjacent to noise sensitive uses. The addition of new light rail corridors is therefore considered to result in potentially significant noise impacts.

Implementation of the following mitigation measure at the project level could reduce this impact. However, it is not anticipated that it will be feasible to mitigate this impact to a less-than-significant level in all cases. This impact is therefore considered to be significant and unavoidable.

Mitigation Measure NOI-2: Employ Measures to Reduce Noise from Transportation Systems

This mitigation measure is described above.