4.12 Noise

This section evaluates noise and vibration impacts of the proposed 2040 MTP/SCS. Both temporary impacts relating to construction activities and long-term impacts associated with implementation of the planned transportation projects and the land use scenario envisioned in the 2040 MTP/SCS are discussed.

4.12.1 Setting

a. Overview of Noise and Vibration

The following discussion describes the characteristics of noise and vibration. These characteristics are used to assess potential impacts at sensitive land uses. Noise- and vibration-sensitive land uses include locations where people reside or where the presence of unwanted sound could adversely affect the use of the land. Residences, senior facilities, schools, hospitals, guest lodging, libraries and some passive recreation areas are examples of typical noise- and vibration-sensitive land uses.

Noise

Noise level (or volume) is generally measured in decibels (dB) using the A-weighted sound pressure level (dBA). The A-weighting scale is an adjustment to the actual sound power levels to be consistent with that of human hearing response, which is most sensitive to frequencies around 4,000 Hertz (about the highest note on a piano) and less sensitive to low frequencies (below 100 Hertz). In addition to the actual instantaneous measurement of sound levels, the duration of sound is important since sounds that occur over a long period of time are more likely to be an annoyance or cause direct physical damage or environmental stress. One of the most frequently used noise metrics that considers both duration and sound power level is the equivalent noise level (Leq). The Leq is defined as the single steady A-weighted level that is equivalent to the same amount of energy as contained in fluctuating levels of sound over a period of time. Typically, Leq is summed over a one-hour period.

Sound pressure is measured on a logarithmic scale with the 0 dB level based on the lowest detectable sound pressure level that people can perceive (an audible sound that is not zero sound pressure level). Based on the logarithmic scale, a doubling of sound energy is equivalent to an increase of 3 dB and a sound that is 10 dB less than the ambient sound level has no effect on ambient noise. Because of the nature of the human ear, a sound must be about 10 dB greater than the reference sound to be judged as twice as loud. In general, a 3 dBA change in community noise levels is noticeable, while 1-2 dBA changes generally are not perceived. Quiet suburban areas typically have noise levels in the range of 40 to 50 dBA, while noise levels along arterial streets are generally in the 50 to 60+ dBA range. Normal conversational levels are in the 60-65 dBA range and ambient noise levels greater than that can interrupt conversations.

Noise levels typically attenuate at a rate of 6 dBA per doubling of distance from point sources such as industrial machinery. Noise from roads typically attenuates at a rate of about 4.5 dBA per doubling of distance over absorptive ground surfaces (e.g., grass). Noise from roads typically attenuates at about 3 dBA per doubling of distance over reflective ground surfaces (e.g., pavement).

The actual time period in which noise occurs is also important since noise that occurs at night tends to be more disturbing than that which occurs during the daytime. To evaluate community noise on a 24-hour basis, the day-night average sound level was developed (Ldn). Ldn is the time average of all

A-weighted levels for a 24-hour period with a 10 dB upward adjustment added to those noise levels occurring between 10:00 PM and 7:00 AM to account for the general increased sensitivity of people to nighttime noise levels. The Community Noise Equivalent Level (CNEL) is identical to the Ldn with one exception. The CNEL adds 5 dB to evening noise levels (7:00 PM to 10:00 PM). Thus, both the Ldn and CNEL noise measures represent a 24-hour average of A-weighted noise levels with Ldn providing a nighttime adjustment and CNEL providing both an evening and nighttime adjustment.

Vibration

Vibration is an oscillatory motion through a solid medium in which the motion's amplitude can be described in terms of displacement, velocity, or acceleration. Vibration can be a serious concern, causing buildings to shake and rumbling sounds to be heard. In contrast to noise, vibration is not a common environmental problem. It is unusual for vibration from sources such as buses and trucks to be perceptible, even in locations close to major roads.

There are several different methods that are used to quantify vibration. The peak particle velocity (PPV) is defined as the maximum instantaneous peak of the vibration signal. The PPV is most frequently used to describe vibration impacts to buildings and is usually measured in inches per second. 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. The decibel notation acts to compress the range of numbers required to describe vibration.

High levels of vibration may cause physical personal injury or damage to buildings. However, groundborne vibration levels rarely affect human health. Instead, most people consider groundborne vibration to be an annoyance that can affect concentration or disturb sleep. In addition, high levels of groundborne vibration can damage fragile buildings or interfere with equipment that is highly sensitive to groundborne vibration (e.g., electron microscopes).

In contrast to noise, groundborne vibration is not a phenomenon that most people experience every day. The background vibration velocity level in residential areas is usually 50 RMS or lower which is well below the threshold of perception for humans (human perception is around 65 RMS). Most perceptible indoor vibration is caused by sources within buildings, such as operation of mechanical equipment, movement of people, or slamming of doors. Typical outdoor sources of perceptible groundborne vibration are construction equipment, steel-wheeled trains, and traffic on rough roads. If the roadway is smooth, the vibration from traffic is rarely perceptible.

b. Noise and Vibration Sources

Many principal noise generators within the AMBAG region are associated with transportation (i.e., airports, freeways, arterial roadways and railroads). Local collector streets are not considered significant noise sources as traffic volume and speeds are generally much lower than for freeways and arterial roadways. Generally, transportation-related noise is the dominant noise source within urban environments.

Similar to the environmental setting for noise, the vibration environment is typically dominated by traffic from nearby roadways and activity on construction sites. Heavy trucks typically operate on major streets and can generate groundborne vibrations that vary depending on vehicle type, weight and pavement conditions. Nonetheless, vibration due to roadway traffic is typically not perceptible.

Motor Vehicle Traffic

Motor vehicles, including cars/light trucks, buses and various types of trucks, are the most substantial source of noise in most of the AMBAG region. This can be attributed to the extensive network of major, primary and secondary arterials, as well as the large number of vehicle trips that occur each day. Within Monterey County, U.S. Highway 101 and Highway 1 have the largest vehicle volumes and the highest noise levels. In 2015, daily traffic volumes on Highway 1 ranged from 13,178 vehicles south of Watsonville at County line during off-peak months to 83,272 vehicles between Del Monte Avenue/Fremont Boulevard and Lightfighter Drive. U.S. Highway 101 daily traffic volumes in Monterey County ranged from 6,345 vehicles south of Bradley Road during off-peak months to 77,780 vehicles between Boronda Road and Laurel Drive during peak months (TAMC 2016). Within Santa Cruz County, Highway 1 experiences the greatest level of traffic in the AMBAG region. In 2015, daily traffic on Highway 1 ranged from approximately 8,000 vehicles (Davenport Landing Road/Swanton Road) to 97,000 vehicles (Bay Avenue and also Soquel Avenue) (Caltrans 2015a). The noisiest single road corridor in San Benito County is U.S. Highway 101, although it traverses only seven miles though a relatively undeveloped portion of the County. In 2015, daily traffic on U.S. Highway 101 in San Benito County was between 25,000 and 60,200 vehicles (Caltrans 2015b). Levels of highway noise typically range from 70 to 80 dB(A) at a distance of 50 feet from the highway (Federal Highway Administration 2003).

Additionally, the AMBAG region has many arterial roadways. Typical arterial roadways have one or two lanes of traffic in each direction. Noise from these sources can be a substantial environmental concern where buffers (e.g., buildings, landscaping, etc.) are inadequate to reduce noise levels or where the distance from centerline to sensitive uses is relatively small. Given typical daily traffic volumes of 10,000 to 40,000 vehicle trips, noise levels along arterial roadways can typically range from Ldn 65 to 70 dBA at a distance of 50 feet from the roadway centerlines (FHA 2003).

Aircraft Operation

The AMBAG region has six public-use airports:

- Monterey Regional
- Salinas Municipal
- King City Municipal (Mesa del Rey)
- Marina Municipal
- Watsonville Municipal
- Hollister Municipal

Of these, only the Monterey Regional Airport has scheduled air carrier service.

In addition to the publicly-owned airports, several private airports operate in the region. Of these, the Frazier Lake Airpark is the only one that allows public use. The remaining privately owned airports are used to support the agricultural industry or are used for other business purposes.

There are currently two operational military airfields in the AMBAG region:

- Camp Roberts Army Airfield and Heliport
- Fort Hunter-Liggett Army Heliport

Railroad Operations

Rail lines for goods movement (e.g., agricultural materials) are located throughout the AMBAG region. The only regular rail passenger service currently operating in the region is provided by Amtrak, the most popular long distance passenger train in the U.S. The Coast Starlight, which connects Los Angeles to Seattle, stops in Salinas, is the only Amtrak rail station in the region. The route operates one train in each direction daily. In the future, Amtrak will expand the Coast Starlight service by adding stops at new stations in Soledad and King City (AMBAG 2017c).

In 2012 the SCCRTC purchased a rail line extending almost 32 miles from Davenport to Pajaro and is evaluating the potential use of this rail line, in combination with projects to improve parallel corridors, to enhance mobility in the region.

Railroad operations generate high, relatively brief, intermittent noise events. These noise events are an environmental concern for sensitive uses located along rail lines and near sidings and switching yards. Locomotive engines and the interaction of steel wheels and rails are one primary source of rail noise. The latter creates rolling noise which is caused by continuous rolling contact, impact noise when a wheel encounters a rail joint, turnout or crossover and squeal generated by wheel/rail friction on tight curves. For very high speed rail vehicles, air turbulence can be a significant source of noise. Air horns and crossing bell gates are another primary source of rail noise.

Rail operations generate varying noise levels depending on the type of rail activity. Heavier commuter or freight trains, which are diesel-powered, generate more noise than electrically-powered light-rail vehicles. According to the Federal Transit Administration (FTA), six commuter trains traveling at 50 miles per hour with a horn blowing generate a noise level of 81 dBA Leq at 50 feet. This same activity without a horn generates a noise level of 68 dBA Leq at 50 feet. In comparison, 12 light rail transit trains traveling 40 miles per hour generate a noise level of 65 dBA Leq at 50 feet. These same light rail transit trains generate a noise level of 57 dBA Leq at 20 miles per hour at 50 feet (FTA 2006).

According to the FTA Transit Noise and Vibration Impact Assessment guidance document (2006), vehicle propulsion rail units generate the following noises: (1) whine from electric control systems and traction motors that propel rapid transit cars, (2) diesel-engine exhaust noise from locomotives, (3) air-turbulence noise generated by cooling fans and (4) gear noise. Additional noise of motion is generated by the interaction of wheels/tires with their running surfaces. The interaction of steel wheels and rails generates three types of noise: (1) rolling noise due to continuous rolling contact, (2) impact noise when a wheel encounters a discontinuity in the running surface, such as a rail joint, turnout or crossover and (3) squeal generated by friction on tight curves.

When comparing electric- and diesel-powered trains, speed dependence is strong for electric-powered transit trains because wheel/rail noise dominates, and noise from this source increases strongly with increasing speed. On the other hand, speed dependence is less for diesel-powered commuter rail trains, particularly at low speeds where the locomotive exhaust noise dominates. As speed increases, wheel-rail noise becomes the dominant noise source and diesel- and electric-powered trains will generate similar noise levels. For transit vehicles in motion, close-by sound levels also depend upon other parameters, such as vehicle acceleration and vehicle length, plus the type/condition of the running surfaces. For very high-speed rail vehicles, air turbulence can also be a significant source of noise. In addition, the guideway structure can also radiate noise as it vibrates in response to the dynamic loading of the moving vehicle.

Industrial and Manufacturing

Noise from industrial complexes and manufacturing plants are characterized as stationary or point sources even though they may include mobile sources like heavy equipment. Local governments typically regulate noise from industrial, manufacturing and construction equipment and activities through enforcement of noise ordinance standards, implementation of general plan policies and imposition of conditions of approval for building or grading permits.

In general, in the AMBAG region and throughout California, industrial complexes and manufacturing plants are located away from sensitive land uses and, as such, noise generated from these sources has less of an effect on surrounding properties. In contrast to industrial and manufacturing facilities, construction sites are located throughout the AMBAG region and often within, or adjacent to, residential areas.

Construction Noise and Vibration

Noise and vibration from construction sites are characterized as stationary or point sources even though heavy construction equipment is often mobile. Construction activities typically generate high, intermittent noise and vibration on and adjacent to construction sites and related noise and vibration impacts are short-term, occurring primarily on week days and during daylight hours. The dominant source of noise from most construction equipment is their diesel engine. During pile driving or pavement breaking events, impact noise is the dominant source and equipment produces the highest vibration levels. Construction equipment operates in two modes, stationary and mobile. Stationary equipment operates in one location for one or more days at a time and can generate a constant noise level (e.g., pumps, generators and air compressors) or variable noise levels (e.g., pile drivers and pavement breakers). Mobile equipment moves around the construction site (e.g., dozers, tractors). Noise levels vary depending on the power cycle being used. Mobile equipment such as trucks, move to and from the site using adjacent streets/roads.

c. Regulatory Framework

Various federal agencies have set standards for transportation-related noise and vibration sources that participate in interstate commerce, such as aircraft, locomotives and trucks. The State sets noise standards for those noise sources that are not preempted from regulation, such as automobiles, light trucks and motorcycles. Noise and vibration sources associated with industrial, commercial and construction activities are generally subject to local control through noise ordinances and general plan policies.

Federal

Relevant federal regulations include those established by the FHWA, FTA, Federal Aviation Administration (FAA) and Department of Housing and Urban Development (HUD).

Federal Highway Administration

TRAFFIC NOISE

Traffic noise impacts, as defined in 23 CFR § 772.5, occur when the predicted noise level in the design year approach or exceed the Noise Abatement Criteria (NAC) specified in 23 CFR § 772, or a predicted noise level substantially exceeds the existing noise level (a “substantial” noise increase). A "substantial increase” is defined as an increase of 12 dB Leq during the peak hour of traffic. For

sensitive uses, such as residences, schools, churches, parks and playgrounds, the NAC for interior and exterior spaces is Leq 57 and 66 dB, respectively, during the peak hour of traffic noise. Table 38 summarizes NAC corresponding to various land use activity categories. Activity categories and related traffic noise impacts are determined based on the actual land use in a given area.

Table 38 Noise Abatement Criteria

Activity Category	Hourly Leq	Hourly L_{10}[1]	Analysis Location	Description of Activity Category
A	57	60	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose
B	67	70	Exterior	Residential
C	67	70	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails and trail crossings
D	52	55	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools and television studios
E	72	75	Exterior	Hotels, motels, offices, restaurants/bars and other developed lands, properties or activities not included in A-D or F
F				Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical) and warehousing
G				Undeveloped lands that are not permitted

[1] L_{10} is the level of noise exceeded for 10% of the time.
Source: FHWA 2017a

RAILROAD NOISE

Federal regulations for railroad noise are contained in 40 CFR Part 201 and 49 CFR Part 210. The regulations set noise limits for locomotives and are implemented through regulatory controls on locomotive manufacturers. Federal regulations also establish noise limits for medium and heavy trucks (more than 4.5 tons, gross vehicle weight rating) under 40 CFR Part 205, Subpart B. The federal truck pass-by noise standard is 80 dB at 15 meters from the vehicle pathway centerline. These controls are implemented through regulatory controls on truck manufacturers. The FHWA regulations for noise abatement must be considered for federal or federally-funded projects involving the construction of a new highway or significant modification of an existing freeway when the project would result in a substantial noise increase or when the predicted noise levels approach or exceed the NAC.

AIRCRAFT NOISE

Aircraft operated in the U.S. are subject to federal requirements regarding noise emissions levels. These requirements are set forth in Title 14 CFR, Part 36. Part 36 establishes maximum acceptable noise levels for specific aircraft types, taking into account the model year, aircraft weight and number of engines.

FEDERAL AND FEDERAL-AID HIGHWAY PROJECTS

Title 23 of the Code of Federal Regulations (23 CFR § 772) provides procedures for preparing operational and construction noise studies and evaluating noise abatement for federal and federal-aid highway projects. Under 23 CFR § 772.7, projects are categorized as Type I or Type II projects. FHWA defines a Type I project as a proposed federal or federal-aid highway project for the construction of a highway on a new location or the physical alteration of an existing highway which significantly changes either the horizontal or vertical alignment, or increases the number of through-traffic lanes. A Type II project is a noise barrier retrofit project that involves no changes to highway capacity or alignment.

Type I projects include those that create a completely new noise source, increase the volume or speed of traffic or move the traffic closer to a receiver. Type I projects include the addition of an interchange, ramp, auxiliary lane, or truck-climbing lane to an existing highway, or the widening an existing ramp by a full lane width for its entire length. Projects unrelated to increased noise levels, such as striping, lighting, signing and landscaping projects, are not considered Type I projects.

Under 23 CFR § 772.11, noise abatement must be considered for Type I projects if the project is predicted to result in a traffic noise impact. In such cases, 23 CFR § 772 requires that the project sponsor “consider” noise abatement before adoption of the environmental document. This process involves identification of noise abatement measures that are reasonable, feasible and likely to be incorporated into the project as well as noise impacts for which no apparent solution is available.

Federal Transit Administration

The FTA has developed guidance to evaluate noise impacts from operation of surface transportation modes (i.e. passenger cars, trucks, buses and rail) in the 2006 FTA *Transit Noise Impact and Vibration Assessment* (FTA 2006). All mass transit projects receiving federal funding must use these guidelines to predict and assess potential noise and vibration impacts. As ambient levels increase, smaller increments of change are allowed to minimize community annoyance related to transit operations.

Department of Housing and Urban Development

The mission of HUD includes fostering "a decent, safe and sanitary home and suitable living environment for every American." Accounting for acoustics is intrinsic to this mission as safety and comfort can be compromised by excessive noise. To facilitate the creation of suitable living environments, HUD has developed a standard for noise criteria. The basic foundation of the HUD noise program is set out in the noise regulation 24 CFR Part 51 Subpart B, Noise Abatement and Control.

HUD's noise policy clearly requires that noise attenuation measures be provided when proposed projects are to be located in high noise areas. Within the HUD Noise Assessment Guidelines, potential noise sources are examined for projects located within 15 miles of a military or civilian airport, 1,000 feet from a road or 3,000 feet from a railroad.

HUD exterior noise regulations state that 65 dBA Ldn noise levels or less are acceptable for residential land uses and noise levels exceeding 75 dBA Ldn are unacceptable. HUD's regulations do not contain standards for interior noise levels. Rather a goal of 45 decibels is set forth and the attenuation requirements are focused on achieving that goal. It is assumed that with standard construction methods and materials, any building will provide sufficient attenuation so that if the exterior level is 65 dBA Ldn or less, the interior level will be 45 dBA Ldn or less.

State

Relevant state noise regulations include those are discussed below. There are no adopted State policies or standards for groundborne vibration.

Governor's Office of Planning and Research

The Governor's Office of Planning and Research is required to adopt and periodically revise guidelines for the preparation and content of local general plans. The 2017 General Plan Guidelines (Governor's Office of Planning and Research, 2017) establish land use compatibility guidelines. Where a noise level range is denoted as "normally acceptable" for the given land use, the highest noise level in that range should be considered the maximum desirable for conventional construction that does not incorporate any special acoustic treatment. The acceptability of noise environments classified as "conditionally acceptable" or "normally unacceptable" will also depend on the anticipated amount of time that will normally be spent outside the structure and the acoustic treatment to be incorporated in structural design.

With regard to noise-sensitive residential uses, the recommended exterior noise limits are 60 dBA CNEL for single-family residences and 65 dBA CNEL for multi-family residences. The recommended maximum interior noise level is 45 dBA CNEL, which could normally be achieved using standard construction techniques if exterior noise levels are within the levels described above.

California Department of Transportation

Caltrans establishes noise limits for vehicles licensed to operate on public roads (Caltrans 2013). For heavy trucks, the State pass-by standard is consistent with the federal limit of 80 dB. The State pass-by standard for light trucks and passenger cars (less than 4.5 tons gross vehicle rating) is also 80 dB at 15 meters from the centerline. For new roadway projects, Caltrans uses the NAC discussed above in connection with FHWA. In addition, Caltrans has published the *Traffic Noise Analysis Protocol* guidelines for assessing noise levels associated with roadway projects (Caltrans 2011b).

California Streets and Highways Code

Section 216 of the California Streets and Highways Code relates to the noise effects of a proposed freeway project on public and private elementary and secondary schools. Under this code, a noise impact occurs if, as a result of a proposed freeway project, noise levels exceed 52 dBA Leq in the interior of public or private elementary or secondary classrooms, libraries, multipurpose rooms, or spaces. If a project results in a noise impact under this code, noise abatement must be provided to reduce classroom noise to a level that is at or below 52 dBA Leq. If the noise levels generated from roadway sources exceed 52 dBA Leq prior to the construction of the proposed freeway project, then noise abatement must be provided to reduce the noise to the level that existed prior to construction of the project.

Airport Noise Standards and Compatibility Planning

The State of California has the authority to establish regulations requiring airports to address aircraft noise impacts near airports. The State of California's Airport Noise Standards, found in Title 21 of the California Code of Regulations, identify a noise exposure level of 65 dB CNEL as the noise impact boundary around airports. Within the noise impact boundary, airport proprietors are required to ensure that all land uses are compatible with the aircraft noise environment or the airport proprietor must secure a variance from the California Department of Transportation.

California Noise Insulation Standards

The California Noise Insulation Standards found in Title 24 of the California Code of Regulations set requirements for new multi-family residential units, hotels and motels that may be subject to relatively high levels of transportation-related noise. For exterior noise, the noise insulation standard is 45 dB Ldn in any habitable room and requires an acoustical analysis demonstrating how dwelling units have been designed to meet this interior standard where such units are proposed in areas subject to noise levels greater than 60 dB Ldn.

California Aeronautics Act

The State Aeronautics Act (Public Utilities Code, Section 21670 et seq.) requires the establishment of Airport Land Use Commissions (ALUCs), which are responsible for developing airport land use compatibility plans (ALUCPs) for noise-compatible land uses in the immediate proximity of a commercial or public airport (Section 21675). ALUCs have two major roles: preparation and adoption of airport land use compatibility plans, which address policies for both noise and safety and review of certain local government land use actions and airport plans for consistency with the land use compatibility plan

The ALUCP is the major tool for ALUC land use regulation. The intent of the ALUCP is to encourage compatibility between airports and the various land uses that surround them. ALUCPs typically include the development of noise contours to identify excessive airport-related noise levels and measures to reduce noise levels. For example, Monterey Regional Airport encourages noise abatement procedures related to quiet departure techniques.

The Aeronautics Division of the California Department of Transportation has published the *California Airport Land Use Planning Handbook* (Caltrans 2011). The purpose of the *California Airport Land Use Planning Handbook* is to provide guidance for conducting airport land use compatibility planning. This handbook includes a section related to noise and states, "The basic strategy for achieving noise compatibility in the vicinity of an airport is to prevent or limit development of land uses that are particularly sensitive to noise. Common land use strategies are ones that either involve few people (especially people engaged in noise-sensitive activities) or generate significant noise levels themselves (such as other transportation facilities or some industrial uses)."

Local

To identify, appraise and remedy noise and vibration problems in local communities, each county and city in the AMBAG region is required to adopt a noise element as part of its General Plan. Local governments use the Governor’s Office of Planning and Research’s General Plan Guidelines (2017), including land use compatibility guidelines, to prepare General Plan noise elements.

Each noise element is required to analyze and quantify current and projected noise levels associated with local noise sources, including, but not limited to: highways and freeways, primary arterials and major local streets, rail operations, air traffic associated with the airports; local industrial plants; and other ground stationary sources that contribute to the community noise environment. Beyond statutory requirements, local jurisdictions are free to adopt their own goals and policies in their noise elements, although most jurisdictions have chosen to adopt noise/land use compatibility guidelines that are similar to those recommended by the State. The overlapping Ldn ranges indicate that local conditions (existing noise levels and community attitudes toward dominant noise sources) should be considered in evaluating land use compatibility at specific locations.

In addition to regulating noise through noise element policies, local jurisdictions regulate noise through enforcement of local ordinance standards. These standards generally relate to noisy activities (e.g., use of loudspeakers and construction) and stationary noise sources and facilities (e.g., air conditioning units and industrial activities).

As discussed above, the State Aeronautics Act (Public Utilities Code, Section 21670 et seq.) requires the preparation of an ALUCP for nearly all public-use airports in the State (Section 21675). An Airport Land Use Commission (ALUC) is responsible for preparing the ALUCPs and ensuring compatible land uses in the vicinity of airports within their jurisdiction (Section 21676). Monterey County and San Benito counties each have an ALUC and ALUCPs. The San Benito County ALUC most recently adopted an updated ALUCP for the Hollister Municipal Airport in 2012 (San Benito County ALUC 2012), and has a 2001 ALUCP for the Hollister Municipal Airport and the Frazier Lake Airpark (San Benito County ALUC 2001). The Monterey County ALUC is in the process of updating ALUCPs for Monterey Regional Airport and Marina Municipal Airport (Monterey County 2017b) because the current ALUCPs are from 1987 and 1996 respectively (Monterey County ALUC 1996 and 1987). Santa Cruz County, however, is exempt from having an ALUC or preparing an ALUCP because it has only one public use airport owned by a single city (Watsonville) (Caltrans 2011). Instead, the City of Watsonville is required to submit its general and specific plans to the Caltrans Division of Aeronautics for review.

4.12.2 Impact Analysis

a. Methodology and Significance Thresholds

The analysis of noise impacts considers the effects of both temporary construction-related noise and long-term noise associated with proposed transportation system improvements. Temporary construction noise was estimated based upon levels presented in the FTA *Transit Noise and Vibration Impact Assessment*. Long-term traffic-related noise was estimated using a modification of the Federal Highway Traffic Noise Model (TNM).

Appendix G of the State CEQA Guideline identifies the following criteria for determining whether a project's impacts would have a significant impact related to noise:

1. 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;
2. Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels;
3. A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project; and/or

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

The analysis of potential impacts includes an assessment of all applicable standards, including those established by local jurisdictions, counties, the State of California and federal agencies, where appropriate.

Since this document analyzes noise impacts on a program level only, project-level analyses for various projects within the 2040 MTP/SCS will be necessary in the future. The project proponent or local jurisdiction shall be responsible for ensuring adherence to the mitigation measures prior to construction.

b. Project Impacts and Mitigation Measures

This section describes generalized impacts associated with some of the projects anticipated in the 2040 MTP/SCS. Due to the programmatic nature of the 2040 MTP/SCS, a precise, project-level analysis of the specific impacts associated with individual transportation and land use projects is not possible. In general, however, implementation of proposed transportation improvements and future projects under the land use scenario envisioned by the 2040 MTP/SCS could result in noise impacts as described in the following sections.

Threshold 1:	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
Threshold 2:	Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels
Threshold 4:	A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project

Impact N-1 CONSTRUCTION ACTIVITIES ASSOCIATED WITH TRANSPORTATION PROJECTS AND LAND USE PROJECTS UNDER THE 2040 MTP/SCS WOULD CREATE TEMPORARY NOISE AND VIBRATION LEVEL INCREASES IN DISCRETE LOCATIONS THROUGHOUT THE AMBAG REGION. IMPACTS WOULD BE SIGNIFICANT AND UNAVOIDABLE.

Noise

The operation of equipment during the construction of roadway infrastructure, as well as infill development projects near transit and other land use development envisioned in the 2040 MTP/SCS, would result in temporary increases in noise in the immediate vicinity of individual construction sites. As shown in Table 39, average noise levels associated with the use of heavy equipment at construction sites can range from about 76 to 89 dBA at 50 feet from the source, depending upon the types of equipment in operation at any given time and the phase of construction. The highest noise levels generally occur during excavation and foundation development, which involve the use of equipment such as backhoes, bulldozers, shovels and front-end loaders.

Table 39 Typical Construction Noise Levels (dBA)

Equipment	Typical Level 25 Feet from the Source	Typical Level 50 Feet from the Source	Typical Level 100 Feet from the Source	Typical Level 200 feet from the Source	Typical Level 800 Feet from the Source
Air Compressor	87	81	75	69	57
Backhoe	86	80	74	68	56
Concrete Mixer	91	85	79	73	61
Grader	91	85	79	73	61
Paver	95	89	83	77	65
Saw	82	76	70	64	52
Scraper	95	89	83	77	65
Truck	94	88	82	76	64

Source: Federal Transit Administration, Transit Noise and Vibration Impact Assessment, May 2006.

Noise generated by construction activity would be variable depending on the project and intensity of equipment used. Roadway widening and new roadway projects would likely require the operation of many pieces of heavy-duty equipment that generate high noise levels. Alternatively, pedestrian trail improvements would typically be less intense requiring minimal, if any, use of heavy equipment. There are instances where activities that typically generate lower noise levels would generate relatively high noise levels. For example, a pedestrian trail improvement may include bridge pilings or require heavy equipment to clear vegetation. This conservative analysis assesses construction noise based on the operation of heavy-duty equipment. Noise levels from point sources such as construction sites typically attenuate at a rate of about 6 dBA per doubling of distance. Therefore, areas within 800 feet of construction site with heavy-duty equipment may be exposed to noise levels exceeding 65 dBA. Therefore, this impact is significant because applicable noise standards could be exceeded, or because a substantial temporary increase in ambient noise levels in the project vicinity could occur.

Vibration

Construction-related vibration has the potential to damage structures, cause cosmetic damage (e.g., crack plaster), or disrupt the operation of vibration sensitive equipment. Vibration can also be a source of annoyance to individuals who live or work close to vibration-generating activities. Heavy construction operations can cause substantial vibration near the source. As shown in Table 40, the highest impact caused by equipment such as pile drivers or large bulldozers can generate vibrations of 1.518 to 0.089 inches per second PPV at a distance of 25 feet. Similar to construction noise, vibration levels would be variable depending on the type of construction project and related equipment use.

Table 40 Construction Equipment Vibration Levels

Equipment		PPV at 25 feet (inches per second)	RMS at 25 feet (Vdb)
Pile Driver (Impact)	Upper Range	1.518	112
	Typical	0.644	104
Pile Driver (Sonic)	Upper Range	0.734	105
	Typical	0.170	93
Vibratory Roller		0.210	95
Clam Shovel Drop (Slurry Wall)		0.202	94
Hydrol Mill (Slurry Wall)	In Soil	0.008	66
	In Rock	0.017	75
Large Bulldozer		0.089	87
Caisson Drilling		0.089	87
Loaded Trucks		0.076	86
Jackhammer		0.035	79
Small Bulldozer		0.003	58

Source: Federal Transit Administration, Transit Noise and Vibration Impact Assessment, 2006

Typical project construction activities, such as the use of jackhammers, other high-power or vibratory tools, compactors and tracked equipment, may also generate substantial vibration (i.e., greater than 0.2 inches per second PPV) in the immediate vicinity, typically within 15 feet of the equipment. Through the use of scheduling controls, typical construction activities would be restricted to hours with least potential to affect nearby properties. Thus, perceptible vibration can be kept to a minimum and not result in human annoyance or structural damage.

Some specific construction activities result in higher levels of vibration. Pile driving has the potential to generate the highest vibration levels and is the primary concern for structural damage when it occurs within 50 feet of structures. Vibration levels generated by pile driving activities would vary depending on project conditions, such as soil conditions, construction methods and equipment used. Depending on the proximity of existing structures to each construction site, the structural soundness of the affected buildings and construction methods, vibration caused by pile driving or other foundation work with a substantial impact component such as blasting, rock or caisson drilling and site excavation or compaction may be high enough to be perceptible within 100 feet and damage existing structures within 50 feet. Therefore, this impact is significant because transportation or land use project construction could cause excessive groundborne vibration or groundborne noise levels.

Noise and Vibration Reduction Provided by Local Policies

Some of the cities and counties in the AMBAG region include specific regulations in their municipal code to reduce construction noise impacts. In most cases, these regulations restrict construction activities to specific times and days (e.g. Seaside, Marina, Pacific Grove and Hollister). Such local policies serve to reduce the impacts of noise and vibration on surrounding communities by prohibiting construction during the night when people are engaged in noise-sensitive activities like sleeping.

Mitigation Measures

For transportation projects under their jurisdiction, TAMC, SBtCOG and SCCRTC shall implement, and transportation project sponsor agencies can and should implement, the following mitigation measures developed for the 2040 MTP/SCS program where applicable for transportation projects that result in construction noise impacts. Cities and counties in the AMBAG region can and should implement these measures, where relevant to land use projects implementing the 2040 MTP/SCS. Project-specific environmental documents may adjust these mitigation measures as necessary to respond to site-specific conditions.

N-1(a) Measures to Ensure Compliance with Local Construction Noise and Vibration Regulations

Implementing agencies of 2040 MTP/SCS projects shall ensure that, where residences or other noise sensitive uses are located within 800 feet of construction sites, appropriate measures shall be implemented to ensure compliance with local ordinance requirements relating to construction noise and vibration. Specific techniques may include, but are not limited to: restrictions on construction timing, use of sound blankets on construction equipment, and the use of temporary walls and noise barriers to block and deflect noise.

Implementing Agencies
Implementing agencies for transportation projects include RTPAs and transportation project sponsor agencies. Implementing agencies for land use projects include cities and counties.

N-1(b) Pile Driving

For any project within 800 feet of sensitive receptors that requires pilings, the implementing agencies shall require caisson drilling or sonic pile driving as opposed to impact pile driving, where feasible. This shall be accomplished through the placement of conditions on the project during its individual environmental review.

Implementing Agencies
Implementing agencies for transportation projects include RTPAs and transportation project sponsor agencies. Implementing agencies for land use projects include cities and counties.

N-1(c) Construction Equipment Noise and Vibration Control

Implementing agencies of 2040 MTP/SCS projects shall ensure that equipment and trucks used for project construction utilize the best available noise and vibration control techniques, including mufflers, intake silencers, ducts, engine enclosures and acoustically attenuating shields or shrouds.

Implementing Agencies
Implementing agencies for transportation projects include RTPAs and transportation project sponsor agencies. Implementing agencies for land use projects include cities and counties.

N-1(d) Impact Equipment Noise Control

Implementing agencies of 2040 MTP/SCS projects shall ensure that impact equipment (e.g., jack hammers, pavement breakers and rock drills) used for project construction be hydraulically or electrically 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.

Implementing Agencies
Implementing agencies for transportation projects include RTPAs and transportation project sponsor agencies. Implementing agencies for land use projects include cities and counties.

N-1(e) Construction Activity Timing Restrictions

The following timing restrictions shall apply to MTP/SCS project construction activities located within 2,500 feet of a dwelling unit, except where timing restrictions are already established in local codes or policies.

Construction activities shall be limited to:

- Monday through Friday: 7 a.m. to 6 p.m.
- Saturday: 9 a.m. to 5 p.m.

Implementing Agencies
Implementing agencies for transportation projects include RTPAs and transportation project sponsor agencies. Implementing agencies for land use projects include cities and counties.

N-1(f) Placement of Stationary Noise and Vibration Sources

Implementing agencies of 2040 MTP/SCS projects shall locate stationary noise and vibration sources as far from sensitive receptors as feasible. Stationary noise sources that must be located near existing receptors will be adequately muffled.

Implementing Agencies
Implementing agencies for transportation projects include RTPAs and transportation project sponsor agencies. Implementing agencies for land use projects include cities and counties.

N-1(g) Physical Impacts Due to Vibration

Implementing agencies of 2040 MTP/SCS projects utilizing heavy construction equipment shall estimate vibration levels generated by construction activities and use the Caltrans vibration damage potential threshold criteria to screen for potential damage to buildings located on or off-site. If construction equipment would generate vibration levels exceeding the threshold criteria, a structural engineer or other appropriate professional shall be retained to ensure vibration levels do not exceed the thresholds during project construction. The structural engineer shall perform the following tasks, at minimum:

- Review the project's demolition and construction plans
- Survey the project site and vulnerable buildings, including geological testing, if necessary
- Prepare and submit a report to the lead agency or other appropriate party containing the following, at minimum:
- Any information obtained from the surveys identified above
- Any modifications to the estimated vibration thresholds based on building conditions, soil conditions and planned demolition and construction methods to ensure that vibration levels would remain below levels potentially damaging to vulnerable buildings

- Specific mitigation measures to be applied during construction to ensure vibration thresholds (or Caltrans guidelines, in lieu of specific limits) are not exceeded, including modeling to demonstrate the ability of mitigation measures to reduce vibration levels below set limits
- A monitoring plan to be implemented during demolition and construction that includes post-demolition and post-construction surveys of the vulnerable building(s) and documentation demonstrating that the mitigation measures identified in the report have been applied

Examples of mitigation that may be applied during demolition or construction include:

- Prohibiting of certain types of construction equipment
- Specifying lower-impact methods for demolition and construction, such as sawing concrete during demolition
- Phasing operations to avoid simultaneous vibration sources
- Installing vibration measure devices to guide decision-making

The implementing agency shall be responsible for implementing all the mitigation measures recommended in the report as detailed in the report's monitoring plan.

Implementing Agencies
Implementing agencies for transportation projects include RTPAs and transportation project sponsor agencies. Implementing agencies for land use projects include cities and counties.

Significance After Mitigation

Implementation of required mitigation would reduce impacts from construction noise. However, even with application of Mitigation Measures N-1(a) through N-1(g), construction noise from all 2040 MTP/SCS projects may not be reduced below applicable thresholds and impacts would remain significant and unavoidable. No additional mitigation measures to reduce this impact to less-than-significant levels are feasible.

Threshold 1:	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
Threshold 3:	A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project

Impact N-2 IMPLEMENTATION OF THE 2040 MTP/SCS WOULD POTENTIALLY EXPOSE EXISTING AND FUTURE SENSITIVE RECEPTORS TO SIGNIFICANT MOBILE SOURCE NOISE LEVELS. IMPACTS WOULD BE SIGNIFICANT AND UNAVOIDABLE.

Traffic

Overall traffic levels on highways and roadways in the AMBAG region are projected to increase as a result of regional growth through the year 2040 (refer to Section 4.14, *Transportation and Circulation*). The 2040 MTP/SCS includes projects that would potentially increase traffic noise by increasing traffic levels along and in the vicinity of affected facilities. Such projects include: construction of new interchanges, roadway widening, roadway extensions, new roadways and improvements to roads that would allow increased traffic volumes. Widening projects, roadway extension and new roadways would accommodate additional traffic volumes and/or relocate noise

sources closer to receptors. In addition, the anticipated number of annual vehicle miles traveled (VMT) in 2040 would be increased from 15,835,910 annually under existing conditions (2015) to 19,687,508 annually with the 2040 MTP/SCS (Revenue Constrained Scenario), an increase of approximately 4,062,402 VMT annually, or approximately 24 percent. Although many areas along freeway and roadway corridors are at least partially shielded from traffic noise by topography, buildings, walls and other barriers, an increase in VMT and new and extended roadways would result in higher traffic noise levels as compared to existing conditions. Therefore, this impact is significant because applicable noise standards could be exceeded, or because a substantial permanent increase in ambient noise levels in the project vicinity could occur.

Airports

The 2040 MTP/SCS includes airport improvements at the following airports: Marina Municipal Airport, King City (Mesa Del Rey) Municipal Airport and Monterey Regional Airport in Monterey County; Hollister Airport in San Benito County; and Watsonville Municipal Airport in Santa Cruz County. Proposed airport projects include lighting and fencing replacement, runway overlay, runway extension, installation of apron drainage system, taxiway improvements (e.g., markings, lighting, signage), construction of new hangers and terminal complex and related roadway construction.

Most of the proposed projects serve to improve or repair existing facilities and would not change aircraft activity and flight patterns and associated noise impacts. However, the extension project proposed for the Watsonville Municipal Airport (SC-AIR-P01-WAT) would potentially facilitate larger aircraft that could increase noise levels associated with flight activity. Specific project details are not known at this time and thus the potential noise increase associated with larger aircrafts cannot be determined. However, this project would require project-specific environmental review including noise impacts and would comply with existing Watsonville Municipal Airport regulations, which include noise abatement procedures (City of Watsonville 2017). Specific noise abatement procedures include using low RPM settings on Runway 20 and prevention of full power climb outs on downwind departures or over congested areas. Overall, noise impacts from airport projects would be less than significant.

Rail Operations

The 2040 MTP/SCS includes investments in passenger rail and train service, such as extending existing rail service from San Jose and Salinas, providing commuter rail service from Hollister to Gilroy, and establishing daily intercity Amtrak rail service between San Francisco and Los Angeles with stops in Salinas, Soledad and King City. The FTA has developed a screening procedure to identify locations where a rail project may cause a noise impact. The screening distances for requiring noise assessments for various types of projects are presented in Table 41.

Rail transit projects included in the 2040 MTP/SCS would be located in urban areas to facilitate ridership. Sensitive land uses would be located within proximity to new and expanded rail corridors, and would potentially be exposed to noise levels that exceed acceptable standards, a significant impact.

The 2040 MTP/SCS also includes new facilities that encourage more efficient intermodal transport using rail. The number of freight trains currently operating each day is dependent upon the demands of the industries using rail services and can vary greatly from day to day. While increases in freight rail transport would increase the number of freight trains, these trains would likely operate as-needed rather than on a fixed schedule. Therefore, noise levels and frequency of pass-by trips would continue to vary daily. Overall, however, an increase in train volumes would cause an

increase in noise levels adjacent to rail corridors. Sensitive land uses would be located within proximity to new and expanded rail corridors, and would potentially be exposed to noise levels that exceed acceptable standards, a significant impact.

Table 41 Screening Distances for Noise Assessments – Rail Transit Projects

Type of Project		Screening Distance (Feet)	
		Unobstructed	Intervening Buildings
Commuter Rail Mainline		750	375
Commuter Rail Station	With Horn Blowing	1,600	1,200
	Without Horn Blowing	250	200
Commuter Rail -Highway Crossing with Horns and Bells		1,600	1,200
Light Rail Transit		350	175
Access Roads		100	50
Low- and Intermediate-Capacity Transit	Steel Wheel	125	50
	Rubber Tire	90	40
	Monorail	175	70
Yards and Shops		1,000	650
Parking Facilities		125	75
Access Roads		100	50
Ventilation Shafts		200	100
Power Substations		250	125

Source: Federal Transit Administration, Transit Noise and Vibration Impact Assessment, May 2006

Bus Operations

The 2040 MTP/SCS includes projects to expand transit bus service, such as express bus service from the City of Hollister to Gavilan College and the Caltrain Station. Transit services along new routes may expose sensitive receptors to bus noise. The FTA has developed a screening procedure to identify locations where a bus project may cause a noise impact. The screening distances for requiring noise assessments for various types of projects is presented in Table 42.

Table 42 Screening Distances for Noise Assessments – Bus Transit Projects

Type of Project		Screening Distance (Feet)	
		Unobstructed	Intervening Buildings
Busway		500	250
BRT on Exclusive Roadway		200	100
Bus Facilities	Access Roads	100	50
	Transit Center	225	150
	Storage and Maintenance	350	225
	Park and Ride Lots with Buses	225	150

Source: Federal Transit Administration, Transit Noise and Vibration Impact Assessment, May 2006

Increased frequency of bus service along existing corridors would also increase noise exposure. However, the addition of local buses and shuttles is unlikely to increase noise by significant levels as

bus routes would be in urban areas with high ambient noise levels. In addition, the 2040 MTP/SCS also includes projects to replace older diesel buses with new compressed natural gas buses that produce less noise. Overall, however, sensitive land uses would be located within close proximity to new bus activity, and would potentially be exposed to noise levels that exceed acceptable standards, a significant impact.

Mitigation Measures

For transportation projects under their jurisdiction, TAMC, SBtCOG and SCCRTC shall implement, and transportation project sponsor agencies can and should implement, the following mitigation measure developed for the 2040 MTP/SCS program where applicable for transportation projects that result in significant mobile source noise levels. The measure below does not apply to land use projects. Project-specific environmental documents may adjust this mitigation measure as necessary to respond to site-specific conditions.

N-2 Noise Assessment and Control for Mobile and Point Sources

Sponsor agencies of 2040 MTP/SCS projects shall complete detailed noise assessments using applicable guidelines (e.g., FTA Transit Noise and Vibration Impact Assessment for rail and bus projects and the Caltrans Traffic Noise Analysis Protocol) for roadway projects that may impact noise sensitive receptors. The implementing agency shall ensure that a noise survey is conducted that, at minimum:

- Determines existing and projected noise levels
- Determines the amount of attenuation needed to reduce potential noise impacts to applicable State and local standards
- Identifies potential alternate alignments that allow greater distance from, or greater buffering of, noise-sensitive areas
- If warranted, recommends methods for mitigating noise impacts, including:
- Appropriate setbacks
- Sound attenuating building design, including retrofit of existing structures with sound attenuating building materials
- Use of sound barriers (earthen berms, sound walls, or some combination of the two)

Where new or expanded roadways, rail, or transit projects are found to expose receptors to noise exceeding normally acceptable levels, the implementing agency shall implement techniques as recommended in the project-specific noise assessment. The preferred methods for mitigating noise impacts will be the use of appropriate setbacks and sound attenuating building design, including retrofit of existing structures with sound attenuating building materials where feasible. In instances where use of these techniques is not feasible, the use of sound barriers (earthen berms, sound walls, or some combination of the two) shall be considered. Long expanses of walls or fences shall be interrupted with offsets and provided with accents to prevent monotony. Landscape pockets and pedestrian access through walls should be provided. Whenever possible, a combination of elements shall be used, including solid fences, walls and landscaped berms.

Implementing Agencies
Implementing agencies for transportation projects include RTPAs and transportation project sponsor agencies.

Significance After Mitigation

Implementation of the above mitigation measure would reduce noise from mobile sources. However, even with implementation of Mitigation Measure N-2, mobile source noise from buildout of the 2040 MTP/SCS may continue to impact nearby noise sensitive receptors and exceed acceptable standards. Impacts would remain significant and unavoidable. No additional mitigation measures to reduce this impact to less-than-significant levels are feasible.

Threshold 1:	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
Threshold 4:	A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project

Impact N-3 THE PROPOSED 2040 MTP/SCS LAND USE SCENARIO WOULD ENCOURAGE INFILL DEVELOPMENT NEAR TRANSIT AND OTHER TRANSPORTATION FACILITIES, WHICH MAY PLACE SENSITIVE RECEPTORS IN AREAS WITH UNACCEPTABLE NOISE LEVELS. IMPACTS WOULD BE SIGNIFICANT AND UNAVOIDABLE.

The 2040 MTP/SCS is based on a land use and transportation scenario which defines a pattern of future growth and transportation system investment for the region emphasizing an infill approach near transit and other transportation facilities such as bicycle networks. Population and job growth is allocated principally within existing urban areas near public transit and existing transit corridors. New noise-sensitive development in infill areas could be exposed to noise levels exceeding the 65 dBA Ldn standard for residential land uses. Potential sources of noise exposure include traffic, rail and/or bus operations, commercial activity and industrial activity. New development in infill areas near transit may also expose existing noise-sensitive uses to noise levels exceeding local noise thresholds. Impacts would be significant because applicable noise standards could be exceeded, or because infill project residents could be exposed to a substantial increase in ambient noise levels.

Mitigation Measures

Cities and counties in the AMBAG region can and should implement the following measures, where relevant to land use projects implementing the 2040 MTP/SCS. The mitigation measure outlined below does not apply to transportation projects. Project-specific environmental documents may adjust this mitigation measure as necessary to respond to site-specific conditions.

N-3 Noise Mitigation for Land Uses

If a 2040 MTP/SCS land use project is located in an area with exterior ambient noise levels above local noise standards, the implementing agency shall ensure that a noise study is conducted to determine the existing exterior noise levels in the vicinity of the project. If the project would be impacted by ambient noise levels, feasible attenuation measures shall be used to reduce operational noise to meet acceptable standards. In addition, noise insulation techniques shall be utilized to reduce indoor noise levels to thresholds set inapplicable State and/or local standards. Such measures may include, but are not limited to: dual-paned windows, solid core exterior doors with perimeter weather stripping, air conditioning system so that windows and doors may remain closed, and situating exterior doors away from roads. The noise study and determination of

appropriate mitigation measures shall be completed during the project's individual environmental review.

Implementing Agencies
Implementing agencies for land use projects include cities and counties.

Significance After Mitigation

Implementation of the above mitigation measure would reduce noise for sensitive land uses near transit. However, even with implementation of Mitigation Measure N-3 noise from buildout of the 2040 MTP/SCS may continue to impact nearby noise sensitive receptors and exceed acceptable standards. Impacts would remain significant and unavoidable. No additional mitigation measures to reduce this impact to less-than-significant levels are feasible.

Threshold 2:	Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels.

Impact N-4 THE PROPOSED 2040 MTP/SCS WOULD RESULT IN NEW TRUCK, BUS AND TRAIN TRAFFIC THAT COULD EXPOSE SENSITIVE RECEPTORS AND FRAGILE BUILDINGS TO EXCESSIVE VIBRATION LEVELS. IMPACTS WOULD BE SIGNIFICANT AND UNAVOIDABLE.

The primary vibration sources associated with transportation system operations include heavy truck and bus traffic along roadways and train traffic along rail lines. However, vehicle traffic, including heavy trucks traveling on a highway, rarely generate vibration amplitudes high enough to cause structural or cosmetic damage, except in rare cases (e.g., where heavy truck traffic passes near fragile older buildings). Heavy trucks traveling over potholes or other pavement irregularities can cause vibration high enough to result in complaints from nearby residents. These conditions are commonly addressed by smoothing the roadway surface. Based on vibration measurements throughout California by Caltrans, worst-case traffic vibrations were shown to drop below the threshold of perception at distances of 150 feet or greater (Caltrans 2013a). Given that sensitive receptors are located within 150 feet of transportation facilities within the AMBAG region, and that 2040 MTP/SCS transportation projects include roadway expansion and construction of new highways, significant impacts related to vibration associated with truck traffic could occur.

Rail activity is also a source of vibration. Caltrans conducted measurements of vibration levels associated with train activity throughout the State and found a peak vibration level of 0.36 inches per second PPV at ten feet from the track (Caltrans 2004). Based on this reference vibration level, vibrations from train activity drop below the threshold of perception at distances greater than 250 feet. The 2040 MTP/SCS includes the development of additional railway facilities along existing tracks, extension of existing railways and construction of new rail lines, as well as establishment of a new Amtrak rail route. This would potentially increase rail activity along existing lines and also introduce rail activity to new areas. These changes may expose nearby sensitive receptors and fragile buildings to a substantial increase in vibration levels relative to the existing condition. Impacts would be significant because excessive groundborne vibration or groundborne noise levels could be generated.

Mitigation Measures

For transportation projects under their jurisdiction, TAMC, SBtCOG and SCCRTC shall implement, and transportation project sponsor agencies can and should implement, the following mitigation

measures developed for the 2040 MTP/SCS program where applicable for transportation projects that could generate excessive vibration impacts. These measures can and should also be implemented for future infill projects near transit pursuant to the 2040 MTP/SCS that would result in vibration impacts. Project-specific environmental documents may adjust these mitigation measures as necessary to respond to site-specific conditions.

N-4 Vibration Mitigation for Transportation Projects

Implementing agencies of 2040 MTP/SCS projects shall comply with all applicable local vibration and groundborne noise standards, or in the absence of such local standards, comply with guidance provided by the FTA in *Transit Noise and Vibration Impact Assessment* (FTA 2006) to asses impacts to buildings and sensitive receptors and reduce vibration and groundborne noise. FTA recommended thresholds shall be used except in areas where local standards for groundborne noise and vibration have been established. Methods that can be implemented to reduce vibration and groundborne noise impacts include, but are not limited to:

- Rail Traffic
  - Maximizing the distance between tracks and sensitive uses
  - Conducting rail grinding on a regular basis to keep tracks smooth
  - Conducting wheel truing to re-contour wheels to provide a smooth running surface and removing wheel flats
  - Providing special track support systems such as floating slabs, resiliently supported ties, high-resilience fasteners and ballast mats;
  - Implementing operational changes such as limiting train speed and reducing nighttime operations.
- Bus and Truck Traffic
  - Constructing of noise barriers
  - Use noise reducing tires and wheel construction on bus wheels
  - Use vehicle skirts (i.e., a partial enclosure around each wheel with absorptive treatment) on freight vehicle wheels

Implementing Agencies
Implementing agencies for AMBAG transportation projects include RTPAs and transportation project sponsor agencies. Implementing agencies for land use projects include cities and counties.

Significance After Mitigation

Implementation of the above mitigation measure would reduce potential impacts to a less than significant level. However, even with implementation of Mitigation Measure N-4, vibration from buildout of the 2040 MTP/SCS may continue to be excessive. Impacts would remain significant and unavoidable. No additional mitigation measures to reduce this impact to less-than-significant levels are feasible.

c. Projects That May Result in Impacts

The 2040 MTP/SCS projects are listed in full in Appendix B. Some may create noise impacts, as discussed herein. Due to the large number of transportation projects that would result in noise impacts, Table 43 provides only a sample of specific projects that could result in noise or vibration impacts, such as auxiliary lane and rail projects.

Table 43 2040 MTP/SCS Projects that May Result in Noise/Vibration Impacts

AMBAG Project No.	Project	Location	Impact	Description of Impact
MON-CT011_CT	SR 68 – Commuter Investments	Monterey County	N-1, N-2, N-4	Potential impacts from construction and operational noise and vibration
MON-SOLO14-SO	SR 146 Bypass	Soledad	N-1, N-2, N-4	Potential impacts from construction and operational noise and vibration
MON-CT031-CT	U.S. Highway 101 – South County Frontage Roads	Monterey County	N-1, N-2, N-4	Potential impacts from construction and operational noise and vibration
MON-MST011-MST	Salinas Bus Rapid Transit	Salinas	N-1, N-2, N-4	Potential impacts from construction and operational noise and vibration
MON-TAMC003-TAMC	Rail Extension to Monterey County	Monterey County	N-1, N-2, N-4	Potential impacts from construction and operational noise and vibration
SB-CT-A44	Highway 25 4-Lane Widening, Phase I	San Benito County	N-1, N-2, N-4	Potential impacts from construction and operational noise and vibration
SB-COH-A11	Union Road (formally Crestview Drive) Construction	Hollister	N-1, N-2, N-4	Potential impacts from construction and operational noise and vibration
SB-COH-A19	Westside Boulevard Extension	Hollister	N-1, N-2, N-4	Potential impacts from construction and operational noise and vibration
SB-SJB-A07	Third Street Extension	San Juan Batista	N-1, N-2, N-4	Potential impacts from construction and operational noise and vibration
SB-SJB-A08	Lavagnino Drive Construction	San Juan Batista	N-1, N-2, N-4	Potential impacts from construction and operational noise and vibration
SB-SJB-A09	Connect Lang Street to the Alameda	San Juan Batista	N-1, N-2, N-4	Potential impacts from construction and operational noise and vibration
SC-RTC-24e-RTC	Highway 1: Auxiliary Lanes from Park Avenue to Bay Avenue/Porter Street	Santa Cruz	N-1, N-2, N-4	Potential impacts from construction and operational noise and vibration
SC-RTC-24f-RTC	Highway 1: Auxiliary Lanes from 41st Avenue to Soquel Avenue and Chanticleer Bike/Pedestrian Bridge	Santa Cruz	N-1, N-2, N-4	Potential impacts from construction and operational noise and vibration
SC-RTC24g-RTC	Highway 1: Auxiliary Lanes form State Park Drive to Park Avenue	Santa Cruz	N-1, N-2, N-4	Potential impacts from construction and operational noise and vibration
SC-MTD-P12-MTD	Highway 17 Express Service Restoration and Expansion	Santa Cruz County	N-1, N-2, N-4	Potential impacts from construction and operational noise and vibration
SC-MTD-P14-MTD	Local Transit Service Restoration and Expansion	Santa Cruz County	N-1, N-2, N-4	Potential impacts from construction and operational noise and vibration

d. Cumulative Analysis

Noise impacts are based on factors related to site-specific and project-specific characteristics and conditions, such as distance to noise sources and barriers between land uses and noise sources. Therefore, cumulative impacts related to construction, traffic and transit noise would be similar to 2040 MTP/SCS impacts discussed above and significant and unavoidable. The 2040 MTP/SCS is not expected to substantially increase inter-regional travel, because the 2040 MTP/SCS addresses accommodating projected growth. Therefore, the 2040 MTP/SCS related contributions to traffic noise outside the region are expected to be minimal; however, because 2040 MTP/SCS impacts would be significant the overall contribution to significant cumulative traffic noise impacts in adjoining counties would be cumulatively considerable. The 2040 MTP/SCS contribution would remain cumulatively considerable after mitigation because it cannot be guaranteed that all future project-level impacts can be mitigated to a less than significant level.