2.8

Noise

As in other Bay Area cities and counties, the primary source of environmental noise in Contra Costa County is from transportation – motor vehicles, transit systems, railroads, aircraft and boats. Automobile and truck traffic is the most prevalent noise source throughout the region's urban communities. Noise can have real effects on human health, including hearing loss and the psychological effects or irritability from lack of sleep. This section outlines how noise is described, measured, and regulated. It also describes the sources of transportation noise in Contra Costa County and evaluates the potential effect of transportation improvements under the proposed 2009 CTP on noise levels within the region.

Existing Setting

EXISTING NOISE SOURCES IN CONTRA COSTA COUNTY

Principal noise sources in Contra Costa County are freeways, arterial roadways, railroads and aircraft over flights from the county's airports. Additional noise generators include industrial manufacturing plants and construction sites. Noise levels vary considerably throughout Contra Costa County. The East Bay Hills and the hills of the Diablo Range are quiet, with the natural sounds of the wind and animals dominating. The residential areas are dominated by traffic sounds and other human activities such as lawn mowing, leaf blowing, and music. Along more major streets and freeways, the sound of traffic grows more intense. Some industrial uses generate high noise levels beyond their property lines although the most intense industrial sounds are usually within the industrial buildings. Airports and rail lines are also important sources of noise although they, like industrial uses, affect more limited areas.

Most noise (that is, unwanted sound) within Contra Costa County, however, results from automobile and truck traffic. In some locations railroad operations are also a significant noise source. This vehicular noise forms the background noise levels within urban – and some open space – areas of the county. This noise is most intense where traffic levels and speeds are higher, and where trucks make up a greater share of the traffic. Local collector streets are not considered to be a significant source of noise since traffic volume and speed are generally much lower than for freeways and arterial roadways.

Freeways and Major Arterial Roadways

Vehicle traffic background noise levels vary throughout the day based on the average density of noise sources in a given area. Traffic noise at a particular location depends upon the traffic volume on nearby roadways, the average vehicle speed, distance between the receptor and the roadway, intervening barriers between source and receiver, and the ratio of trucks (particularly heavy trucks) and buses to automobiles.

Several factors control how traffic noise levels affect nearby sensitive land uses. These include roadway elevation compared to grade; structures or terrain intervening between the roadway and the sensitive receptors; and the distance between the roadway and receptors. For example, measurements show that depressing a freeway by approximately 12 feet yields a reduction in traffic noise relative to an at-grade freeway of 7.0 to 10 dBA at all distances from the freeway (Beranek, 1988). Traffic noise from an elevated freeway is typically 2.0 to 10 dBA lower than an equivalent at-grade facility within 300 feet of the freeway. However, beyond 300 feet, the noise radiated by an elevated and at-grade freeway (assuming equal traffic volumes, truck mix, and vehicle speed) is the same (Beranek, 1988). Caltrans or other sponsors of freeway projects conduct detailed noise studies for their environmental documents when these projects are ready for implementation.

Major freeways connecting Contra Costa County with other parts of the Bay Area and the Central Valley are Interstate 80, Interstate 680, State Route 24, and State Route 4. The Noise Element of the Contra Costa County General Plan estimates noise levels along such freeways as Interstate 80 and 680 and State Route 24 to be approximately 80 DNL at a distance of 100 feet (Contra Costa County, 2005). Noise levels along State Route 4 were estimated to range from approximately 60 to 80 DNL at a distance of 100 feet.

Typical arterial roadways in the county have one or two lanes of traffic in each direction, with some containing as many as four lanes in each direction. Noise from these sources can be a significant environmental concern where buffers (e.g., buildings, landscaping, etc.) are inadequate or where the distance from centerline to sensitive uses is relatively small. Given typical daily traffic volumes of 10,000 to 40,000, noise levels along arterial roadways typically range from DNL 60 to 80 dBA at a distance of 100 feet from the roadway centerlines.

Noise levels along major arterials, such as Crow Canyon Road (between the Alameda County line and Bollinger Canyon Road) and Kirker Pass Road (between Concord Boulevard and Railroad Avenue), are approximately 70 DNL at 100 feet (Contra Costa County, 2005).

Railroad Operations

The two basic types of railroad operations are freight trains, and passenger rail operations, the latter consisting of commuter and intercity passenger trains as well as steel-wheel urban rail transit. Generally, freight operations occur at all hours of the day and night, while passenger rail operations are concentrated within the daytime and evening periods.

Trains can generate high, relatively brief, intermittent noise events. Train noise is an environmental concern for sensitive uses located along rail lines and in the vicinities of switching yards. Locomotive engines and the interaction of steel wheels and rails generate primary rail noise. The latter source creates three types of noise: 1) rolling noise due to continuous rolling contact; 2) impact noise when a wheel encounters a rail joint, turnout or crossover; and 3) squeal generated by friction on tight curves. For very high-speed rail vehicles, air turbulence can be a significant source of noise (U.S. Department of Transportation, 2006b).

Train air horns and crossing bell gates contribute to loud noise levels near grade crossings. Table 2.8-1 provides reference noise levels in terms of Sound Exposure Levels (SEL) for different types of rail operations.

Table 2.8-1: Reference Noise Levels for Various Rail Operations

Source/Type		Reference Conditions	Reference Noise Level (SEL)[1]
Commuter Rail, At-Grade (e.g., ACE, Amtrak)	Locomotives	Diesel-Electric, 3,000 horsepower, throttle 5	92
		Electric	90
	Cars	Ballast, welded rail	82
Rail Transit (e.g., BART)		At-grade, ballast, welded rail	82
Automated Guideway Transit	Steel wheel	Aerial, concrete, welded rail	80
	Rubber tire	Aerial, concrete guideway	78
Monorail		Aerial straddle beam	82
Maglev		Aerial, open guideway	72

Measured at 50 feet from track centerline with trains operating at 50 miles per hour.

Source: U.S. Department of Transportation, Federal Transit Administration, Transit Noise and Vibration Impact Assessment, 2006.

Freight Trains

Freight trains are a source of environmental noise particularly along the waterfront of Contra Costa County along the Union Pacific (UP) and Burlington Northern Santa Fe (BNSF) routes. Freight train noise consists of locomotive engine sound and rail car wheel-rail interaction. In addition to noise, freight trains also generate substantial ground-borne noise and vibration near the tracks. Ground-borne noise and vibration is a function of quality of the track and the operating speed of the vehicles. These lines also generate high noise levels during passbys and their trains are required to sound their whistles when crossing roadways at-grade. The Noise Element of the Contra Costa County General Plan estimates noise levels along these rail lines to be approximately 70 to 80 DNL at a distance of 100 feet (Contra Costa County, 2005).

Commuter and Intercity Passenger Trains

Two commuter and intercity passenger train services serve Contra Costa County. Amtrak operates sixteen daily round trips between Sacramento and Oakland as part of its Capitol Corridor service and six daily round trips between Oakland and Bakersfield as part of its San Joaquin service. The Capitol Corridor service extends along the northwestern edge of Contra Costa County and includes station stops at Richmond and Martinez. San Joaquin service extends along the entire northern edge of the County and includes station stops at Richmond, Martinez, and Antioch-Pittsburg. Noise levels along these lines would be expected to be similar to the UP and BNSF routes and range from 70 to 80 DNL at a distance of 100 feet.

The ACE train service extends from Stockton to San Jose and passes through the Tri-Valley area along the Union Pacific railroad line with station stops at Vasco, Livermore, and Pleasanton. Currently, ACE service includes four westbound trains in the morning and four eastbound trains in the evening (while the ACE train serves Contra Costa County travelers it does not run through Contra Costa County).

Both the ACE and Amtrak trains are diesel powered and noise is generated by the diesel engines and from sounding horns/whistles and gate bells as trains approach an intersection. Other components of noise include diesel exhaust, cooling fans, and wheel/rail interaction.

Heavy Rail Transit

Heavy rail is generally defined as electrified rapid transit trains with dedicated guideway, and light rail as electrified transit trains that do not require dedicated guideway. There are no light rail transit services serving Contra Costa County.

In general, noise increases with speed and train length, and is most problematic within 50 feet of the track. The Bay Area Rapid Transit (BART) is the core heavy-rail transit network serving the Bay Area with two routes (the Richmond line and the Pittsburg/Bay Point line) serving Contra Costa County. Dominant noise components from BART trains are the wheel/rail interaction and guideway amplification, propulsion system, brakes, auxiliary equipment and wheel squeal.

The trains of the BART system are a significant source of noise for land uses along the raised portions of their tracks. BART trains generate a DNL of approximately 70 dBA at 100 feet from its tracks (Contra Costa County, 2005). BART trains do not have at-grade crossings.

In Contra Costa County, the Richmond BART line runs through residential areas in El Cerrito and Richmond to its terminus in downtown Richmond. The Concord (Pittsburg/Bay Point) line runs in the center of Highway 24 to Walnut Creek. From there, it passes through commercial and residential areas in Concord to State Route 4 and along State Route 4 to its current terminus at Pittsburg/Bay Point. BART also operates a line that provides direct service between Daly City and Dublin/Pleasanton in the Tri-Valley area.

CONSTRUCTION NOISE SOURCES

Construction can be another significant, although typically short-term, source of noise. Construction is most significant when it takes place near sensitive land uses, and occurs at night or in early morning hours. Local governments typically regulate noise associated with 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. Table 2.8-2 shows typical exterior noise levels at various phases of commercial construction, and Table 2.8-3 shows typical noise levels associated with various types of construction equipment.

Table 2.8-2: Typical Construction Phase Noise Levels

Construction Phase	*Noise Level (dBA, Leq)*[1]
Ground Clearing	84
Excavation	89
Foundations	78
Erection	85
Finishing	89

[1] Average noise levels 50 feet from the noisiest source and 200 feet from the rest of the equipment associated with a given construction phase. Noise levels correspond to commercial projects in a typical urban ambient noise environment.

Source: Bolt, Beranek and Newman, U.S. EPA, Noise From Construction Equipment and Operations, Building Equipment, and Home Appliances, 1971.

TECHNICAL BACKGROUND

Noise Descriptors

Sound waves, traveling outward from a source, exert a sound pressure level (commonly called "sound level"), measured in decibels (dB). In general, people can perceive a two- to three-dB difference in noise levels; a difference of 10 dB is perceived as a doubling of loudness. "Noise" is often defined as unwanted sound. Environmental noise is usually measured in A-weighted decibels, a metric corrected for the variation in frequency response of the human ear. The A-weighted scale is used to describe all noise levels discussed in this section.

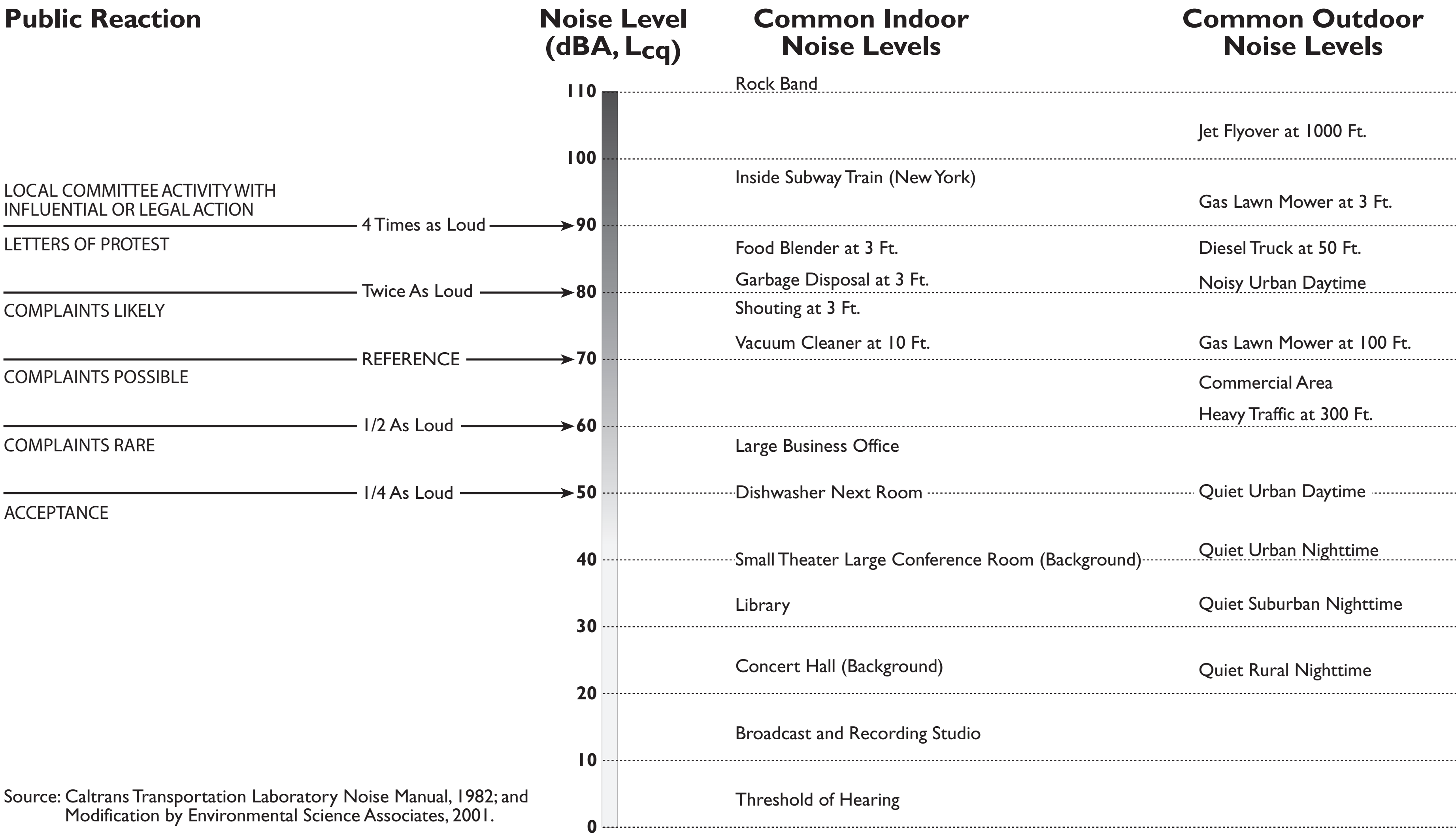
Environmental noise levels typically fluctuate over time; different types of noise descriptors are used to account for this variability. Some descriptors characterize cumulative noise over a given period, while others describe single noise events. Cumulative noise descriptors include the energy-equivalent noise level (Leq), Day-Night Average Noise Level (DNL), and Community Noise Equivalent Level (CNEL). The Leq is the actual time-averaged, equivalent steady-state sound level, which, in a stated period, contains the same acoustic energy as the time-varying sound level during the same period. Some representative noise sources and their corresponding A-weighted noise levels and the effects of those noise levels on people are shown in Figure 2.8-1.

Table 2.8-3: Typical Noise Levels from Construction Equipment

	Noise Levels (dBA at 50 feet)	
Construction Equipment	*Without Noise Control*	*With Feasible Noise Control*[1]
Earthmoving		
Front Loaders	79	75
Backhoes	85	75
Dozers	80	75
Tractors	80	75
Scrapers	88	80
Graders	85	75
Trucks	91	75
Pavers	89	80
Materials Handling		
Concrete Mixers	85	75
Concrete Pumps	82	75
Cranes	83	75
Derricks	88	75
Stationary		
Pumps	76	75
Generators	78	75
Compressors	81	75
Impact		
Pile Driver	101	95
Jack Hammers	88	75
Rock Drills	98	80
Pneumatic Tools	86	80
Other:		
Saws	78	75
Vibrators	76	75

[1] Feasible noise controls represent estimates obtained by using quieter procedures or equipment and noise control features that would require no major design or extreme cost. Quieted equipment can be designed with enclosures, mufflers, or noise-reduction features.

Source: Bolt, Beranek and Newman, U.S. EPA, Noise From Construction Equipment and Operations, Building Equipment, and Home Appliances, 1971.



Source: Caltrans Transportation Laboratory Noise Manual, 1982; and Modification by Environmental Science Associates, 2001.

Figure 2.8-1

Noise Effects on People

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DNL and CNEL values result from the averaging of Leq values (based on A-weighted decibels) over a 24-hour period, with weighting factors applied to different periods of the day to account for their greater relative annoyance. For DNL, noise that occurs during the nighttime period (10:00 p.m. to 7:00 a.m.) is penalized by 10 dBA. The CNEL descriptor is similar to DNL, except that it also includes a penalty of approximately 5 dBA for noise that occurs during the evening period (7:00 p.m. to 10:00 p.m.). The cumulative noise descriptors, DNL and CNEL, are well correlated with the likelihood of public annoyance from transportation noise sources.

Sound Propagation and Attenuation

Sound level naturally decreases as one moves farther away from the source. This basic attenuation rate is referred to as the geometric spreading loss. The basic rate of geometric spreading loss depends on whether a given noise source can be characterized as a point source or a line source. For a point source, such as an idling truck or jackhammer, the noise level decreases by about 6.0 dBA for each doubling of distance away from the source.

In many cases, noise attenuation from a point source increases by 1.5 dBA from 6.0 dBA to 7.5 dBA for each doubling of distance due to ground absorption and reflective wave canceling. These factors are collectively referred to as excess ground attenuation. The basic geometric spreading loss rate is used where the ground surface between a noise source and a receiver is reflective, such as parking lots or a smooth body of water. The excess ground attenuation rate (7.5 dBA per doubling of distance) is used where the ground surface is absorptive, such as soft dirt, grass, or scattered bushes and trees.

For a line source, such as a heavily traveled roadway, the noise level decreases by a nominal value of 3.0 dBA for each doubling of distance between the source and the receiver. If the ground surface between source and receiver is absorptive rather than reflective, the nominal rate increases by 1.5 dBA to 4.5 dBA for each doubling of distance. Atmospheric effects, such as wind and temperature gradients, can also influence noise attenuation rates from both line and point sources of noise. However, unlike ground attenuation, atmospheric effects are constantly changing and difficult to predict.

Trees and vegetation, buildings, and barriers reduce the noise level that would otherwise occur at a given receptor distance. A row of structures can shield more distant receivers depending upon the size and spacing of the intervening structures and site geometry. Generally, a noise barrier that breaks the line of sight between source and receiver will provide at least a 5 dBA-reduction in noise.

Effects of Noise

Human reaction to noise ranges from annoyance, to interference with various activities, to hearing loss and stress-related health problems. These effects of noise are discussed below:

- Potential hearing loss is commonly associated with occupational exposures in heavy industry or very noisy work environments. Noise levels in neighborhoods, even near very noisy airports, are not sufficiently loud to cause hearing loss.

- Speech interference is one of the primary concerns associated with environmental noise. Normal conversational speech is in the range of 60 to 65 dBA and any noise in this range or louder may interfere with speech. Depending upon the distance between the talker and the listener, background noise levels may require a raised voice in order to communicate. Transportation sources can easily interfere with conversation within a few hundred feet of the source.
- Sleep interference is a major noise concern related to traffic-generated noise. Sleep disturbance studies have identified interior noise levels attributed to traffic noise as a key factor of sleep disturbance. However, it should be noted that sleep disturbance does not necessarily mean awakening from sleep, but can refer to altering the pattern and stages of sleep. Train noise (especially horn soundings) is a major source of complaints.
- Physiological responses are those measurable noise effects on the human metabolism. They are ascertained as changes in pulse rate, blood pressure, etc. While such effects can be induced and observed, the extent to which these physiological responses cause harm or are a sign of harm is not known.
- Annoyance is the most difficult of all noise responses to describe. Annoyance is a very individual characteristic and can vary widely from person to person. What one person considers tolerable can be quite unbearable to another of equal hearing capability (for instance, some people like the sound of trains, while others do not). Figure 2.8-1 depicts some typical effects of noise on human receptors.

Sensitive Receptors

People in residences, motels and hotels, schools, libraries, churches, hospitals, nursing homes, auditoriums, natural areas, parks and outdoor recreation areas are generally more sensitive to noise than are people at commercial and industrial establishments. Consequently, the noise standards for sensitive land uses are more stringent than for those at less sensitive uses. Sensitive receptors of all types are located within Contra Costa County's travel corridors.

To protect various human activities in sensitive areas (e.g., residences, schools, and hospitals), lower noise levels are generally required. For example, a maximum outdoor noise level of 55 to 60 DNL is necessary for intelligible speech communication inside a typical home. Social surveys and case studies have shown that complaints and community annoyance in residential areas begin to occur when outdoor noise reaches 55 DNL (U.S. EPA, 1981). Sporadic complaints associated with the 55 to 60 DNL range give rise to widespread complaints within the 60 to 70 DNL range. At 70 DNL and above, residential community reaction typically involves threats of legal action and strong appeals to local officials to stop the noise.

REGULATORY SETTING

Federal, State, and local agencies regulate different aspects of environmental noise. Generally, the federal government sets noise standards for transportation-related noise sources closely linked to interstate commerce. These include aircraft, locomotives, and trucks. The State government sets noise standards for those transportation noise sources such as automobiles, light trucks, and motorcycles. Noise sources associated with industrial, commercial, and construction activities are generally subject to local control through noise ordinances and general plan policies. Local general plans identify general principles intended to guide and influence development plans, and noise ordinances set forth the specific standards and procedures for addressing particular noise sources and activities.

Federal Regulations

Federal regulations for railroad noise are contained in 40 CFR, Part 201 and 49 CFR, Part 210. Noise limits are implemented through regulatory controls on locomotive manufacturers. For locomotives manufactured during or after 1980, noise limits are as follows:

- Stationary locomotives (at idle throttle setting) are not to exceed 70 dBA at 15 meters (approximately 50 feet) from the track pathway centerline;
- Stationary locomotives (at all other throttle settings) are not to exceed 87 dBA at 15 meters; and
- Moving locomotives are not to exceed 90 dBA at 15 meters.

Sounding locomotive horns or whistles in advance of highway-rail grade crossings has been used as a safety precaution by railroads since the late 1880s. In response to a growing national trend towards restrictions on the use of locomotive horns under local ordinances and a related increase in collisions, Congress passed the Swift Rail Development Act of 1994, which directed the Federal Railroad Administration to develop rules addressing this issue. In June 2005, the Federal Railroad Administration's (FRA's) Rule on the Use of Locomotive Horns at Highway-Rail Grade Crossings took effect. The goal of the Federal Railroad Administration (FRA) in developing the train horn rule is to ensure safety for motorists at highway-rail grade crossings while allowing communities the opportunity to preserve or enhance quality of life for their residents by establishing areas/times in which train horns are silenced. The rule limits the maximum sound level for train horns to 110 dBA and for a period of no more than 15-20 seconds (U.S. Department of Transportation, 2006a).

The federal truck passby noise standard is 80 dBA at 15 meters from the vehicle pathway centerline (trucks more than 4.5 tons, gross vehicle weight rating, under 40 CFR, Part 205, Subpart B). This standard is implemented through regulatory controls on truck manufacturers. Under regulations established by the Federal Highway Administration, 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. Abatement is considered when the project would result in a substantial noise increase or when the predicted noise levels approach or exceed the Noise Abatement Criteria (23 CFR Part 772). Under these criteria, a substantial increase is defined as a 12 dBA increase in the Leq during the traffic peak hour. The Noise Abatement Criteria differ among various activity categories and between exterior spaces and interior spaces. For sensitive uses, such as residences, schools, churches, parks, and playgrounds, the Noise Abatement Criteria for interior and exterior spaces during the traffic peak hour is 57 and 67 Leq, respectively.

State Regulations

The State of California establishes noise limits for vehicles licensed to operate on public roads. For heavy trucks, the passby standard is consistent with the federal limit of 80 dBA. The State passby standard for light trucks and passenger cars (less than 4.5 tons, gross vehicle rating) is also 80 dBA at 15 meters from the centerline (California Vehicle Code, §23130 and 23130.5; 27150, et seq.; 27204 and 27206). These controls are implemented through controls on vehicle manufacturers and by legal sanction of vehicle operators by state and local law enforcement officials. Caltrans uses Federal Highway Administration (FHWA) Noise Abatement Criteria to evaluate noise impacts.

The State has also established noise insulation standards for new multi-family residential units, hotels, and motels that would be subject to relatively high levels of transportation-related noise. These requirements are collectively known as the California Noise Insulation Standards and are found in California Code of Regulations, Title 24. These standards set forth an interior standard of 45 DNL in any habitable room.

Local Regulations

Ground transportation noise from buses, trucks, motorcycles, and poorly muffled automobiles predominate over other types of noise as the most persistent cause for complaint. To address this issue, Section 6530 (g) of the California Government Code, requires all cities and counties to include a transportation noise element in their general plans. The General Plans of cities and counties within Contra Costa County contain objectives and policies to reduce or eliminate the effects of excessive noise in the community. The Noise Elements also establish performance standards for transportation and non-transportation noise sources. Individual projects under the 2009 CTP would be subject to the goals, policies and standards in the applicable general plan(s) at the time of implementation.

Criteria of Significance

For this noise analysis, which must be largely qualitative in nature, the following criteria are used to assess whether the proposed transportation improvements in the 2009 CTP will have a significant adverse effect on the community noise environment. Implementation of the 2009 CTP would have a potentially significant adverse impact if Plan projects would result in:

- **Criterion 1**: Construction noise levels or groundborne vibration that would lead to a violation of the standards contained within the General Plans and noise ordinances of applicable jurisdictions (cities and Contra Costa County).
- **Criterion 2**: Highway noise levels that approach or exceed the FHWA Noise Abatement Criteria or increase substantially above existing levels (a 3.0 dBA change would be considered noticeable). Generally, a 100 percent increase in traffic volume approximately results in a 3.0 dBA increase in noise.
- **Criterion 3**: Transit noise levels that increase by more than the allowable noise exposure permitted under the Federal Transit Administration (FTA) criteria, as shown in Table 2.8-4. These criteria are intended to apply to noise-sensitive uses, such as residences and schools, rather than commercial or industrial areas.

Table 2.8-4: Noise Impact Transit Criteria and Effect on Cumulative Noise Exposure

	Noise Level in DNL or Leq		
Existing Noise Exposure	*Allowable Project Noise Exposure*	*Allowable Combined Total Noise Exposure*	*Allowable Noise Exposure Increase*
45	51	52	7
50	53	55	5
55	55	58	3
60	57	62	2
65	60	66	1
70	64	71	1
75	65	75	0

Source: U.S. Department of Transportation, Federal Transit Administration, Transit Noise and Vibration Impact Assessment, May 2006, page 3-7.

Method of Analysis

Because noise is a highly localized impact, specific, detailed analyses are most appropriate at the project-level. Therefore, the method used to assess noise impacts of the 2009 CTP is to review the list of projects and assess the likelihood of significant noise impacts based on the type of project and proximity to sensitive noise receptors. Subsequent, project-specific EIRs would need to further analyze these proposed improvements to determine the magnitude of noise and vibration impacts and potential mitigations for each individual project.

The analysis in this section is based on the results of the modeling conducted using CCTA's travel demand forecast model for the traffic analysis. This model projects future traffic and transit volumes in Contra Costa County. The traffic modeling included several assumptions, which are discussed in more detail in the transportation section of this EIR (Section 2.1).

In addition, the noise analysis uses the percentage change in traffic volumes derived from peak hour screenline reports, as an indicator of relative changes in roadway noise levels. A doubling of traffic volume (i.e., 100 percent increase) results in a just noticeable increase in noise level of approximately a 3 dBA.

Summary of Impacts

Implementation of 2009 CTP projects could have short-term, long-term, and cumulative impacts. Short term noise construction impacts on surrounding land uses would be significant and unavoidable despite reduction of impacts through mitigation measures. This is largely due to the uncertainty regarding the level of construction activity and distances to sensitive receptors.

Transportation improvements proposed as part of the 2009 CTP could result in noise levels that approach or exceed the FHWA and FTA Noise Abatement Criteria or could cause noise levels to increase by 3 dBA or more when compared to existing conditions, though mitigation measures will reduce this impact to less than significant levels.

Finally, transportation improvements proposed as part of the 2009 CTP together with regional growth and development could contribute to cumulative noise levels that approach or exceed the FHWA and FTA Noise Abatement Criteria. This is a cumulatively significant impact, and while impacts from the 2009 CTP will vary throughout the county, this impact could be considerable in some areas.

Impacts and Mitigation Measures

IMPACT

2.8-1 Construction of the projects proposed in the 2009 CTP would have short-term noise impacts on surrounding areas. (*Significant, Unavoidable*)

Most of the improvements proposed in the 2009 CTP Update and Measure J Expenditure Plan, other than the transit operations, transportation demand management, and regional planning, potentially involve some construction activity, which could result in a localized increase in ambient noise levels in the areas surrounding those projects. Such impacts could include temporary annoyance to nearby residents and workers and violation of local noise standards. Construction noise would be most significant when it takes place near sensitive land uses, occurs at night, or in early morning hours. These noise impacts will be analyzed in more detail in subsequent project-specific CEQA and NEPA (if applicable) documents. These documents would also recommend mitigation measures to reduce any significant impacts of construction noise. However, due to the uncertainty of the level of construction activity and distances to sensitive receptors, noise from construction related activities is considered significant and unavoidable. The level of mitigation would be project and site dependent and would include noise mitigation normally required by Caltrans, as well as requirements under the General Plan Noise Elements and Noise Ordinances of the applicable jurisdictions. All construction activities would be subject to these requirements.

Construction noise mitigation normally required by Caltrans' Standard Specifications and Standard Special Provisions, as well as local city and county ordinances would be implemented for individual 2009 CTP projects that include physical construction activities. Construction standards generally limit construction activities to times when construction noise would have the least effect on adjacent land uses, and would require such measures as properly muffling equipment noise, locating equipment as far from sensitive receptors as possible, and turning off equipment when not in use. Some jurisdictions may also have property line or other noise level limits that must be adhered to during construction.

Though it is not expected that these standards would eliminate all construction-related noise since complete mitigation may not be possible for certain projects, implementation of existing construction noise standards should, in most situations, be sufficient to reduce the potential impact of construction noise to a level that is less than significant. However, in some cases, such as those that require pile driving and those in close proximity to sensitive receptors, the impact could still be significant.

MITIGATION MEASURES

Mitigation Measure 2.8-1

Where construction of the projects would have short-term noise impacts on surrounding areas, sponsors shall consider measures to minimize or eliminate impacts as part of the design of the project and its environmental review under CEQA and NEPA. Potential mitigation measures could be drawn from or be consistent with Caltrans' standards for construction, and shall be consistent with federal, state, regional and local regulatory requirements, as discussed in the Regulatory Setting above. Typical mitigation measures include:

- Requiring mufflers on heavy construction equipment;
- Specifying time restrictions consistent with local noise ordinances and with the activities of sensitive land uses in the vicinity. It is noted that limitations on allowable hours for construction could also result in significant adverse impacts on traffic movement if construction is limited to the daylight hours and prohibited during nighttime hours. Project level analysis will determine the level of mitigation;
- Using equipment and trucks for project construction with the best available noise control techniques (e.g., improved mufflers, equipment redesign, use of intake silencers, ducts, engine enclosures and acoustically-attenuating shields or shrouds, wherever feasible);
- Use of hydraulically or electrically powered impact tools (e.g., jack hammers, pavement breakers, and rock drills) for project construction wherever possible to avoid noise associated with compressed air exhaust from pneumatically powered tools. However, where use of pneumatic tools is unavoidable, an exhaust muffler on the compressed air exhaust shall be used; this muffler can lower noise levels from the exhaust by up to about 10 dBA. External jackets on the tools themselves shall be used where feasible, and this could achieve a reduction of 5 dBA. Quieter procedures shall be used, such as drills rather than impact equipment whenever feasible;

- Locating stationary noise sources as far from sensitive receptors as possible, and they shall: be muffled and enclosed within temporary sheds; incorporate insulation barriers; or apply other measures to the extent feasible;
- To reduce the potential for noise impacts from pile driving, use of alternate methods of driving, if feasible. Alternate measures may include pre-drilling of piles or the use of more than one pile driver to lessen the total time required for driving piles;
- Erect temporary plywood noise barriers around the entire construction site if necessary to buffer noise from sensitive land uses;
- Use noise control blankets on any structure as it is erected to reduce noise emission from the site where applicable;
- Evaluate the feasibility of noise control at the receivers (i.e., nearby sensitive receptors such as residences, schools, hospitals, etc.) by temporarily improving the noise reduction capability of adjacent buildings;
- Monitor the effectiveness of noise attenuation measures with noise measurements; and
- Establish a process for responding to and tracking complaints pertaining to construction noise with the following components:
    - A procedure for notifying local jurisdictions, sheriff and/or police department staff, and building division staff throughout Contra Costa;
    - A plan for posting signs on-site pertaining to permitted construction days and hours and complaint procedures and who to notify in the event of a problem;
    - A listing of telephone numbers (during regular construction hours and off-hours);
    - The designation of a construction complaint manger for the project; and
    - Notify neighbors within 300 feet of the project construction area at least 30 days in advance of pile-driving activities about the estimated duration of the activity.

SIGNIFICANCE AFTER MITIGATION

While these mitigation measures would likely reduce impacts, due to the uncertainty of the level of construction activity and distances to sensitive receptors, noise impacts related to construction activities are considered significant and unavoidable.

IMPACT

2.8-2 Transportation improvements proposed as part of the 2009 CTP could result in noise levels that approach or exceed the FHWA and FTA Noise Abatement Criteria or could cause noise levels to increase by 3 dBA or more when compared to existing conditions. (*Significant, but Mitigable*)

A number of transportation improvements in the 2009 CTP could have significant local noise impacts, either from vehicle travel or transit. Direct impacts could result from transit service expansions/enhancements and major new roadway capital projects that increase the speed and volume of traffic on these roadways or bring traffic closer to sensitive receptors.

For some projects, the potentially significant noise impacts would be appropriately described as a direct impact of the project; for others, the impact would be more appropriately described as a cumulative impact, as discussed in Impact 2.8-3.

Projects with the potential for potentially significant direct noise impacts include new roadways and roadway extensions, eBART and Capitol Corridor rail extensions, and road widenings that involve upgrading a facility from one type to another (e.g., expressway to freeway). Table 2.8-5 identifies the 2009 CTP projects that are considered to have potentially significant direct noise impacts that could approach or exceed the FHWA Noise Abatement Criteria, increase noise levels substantially above existing levels, or increase transit noise levels by more than the allowable noise exposure permitted under the Federal Transit Administration (FTA) criteria. Additional project-level analysis must be conducted for individual projects to determine the significance of impacts based on the project and the existing and projected noise levels. Project-level analysis may or may not find significant noise impacts. Noise mitigation for these new projects may have the additional benefit of reducing noise in communities that would otherwise continue to experience adverse noise impacts from existing and future traffic had the 2009 CTP improvements not occurred.

Table 2.8-5: Major 2009 CTP Projects with Potentially Significant Traffic and Transit Noise Impacts

Project Name	*Project Limits*	*Description*
Caldecott Tunnel Fourth Bore	At Caldecott Tunnel Complex	Construct a fourth (westbound) bore for the Caldecott Tunnel complex.
eBART	Pittsburg/Bay Point to Byron	Construction of rail extension eastward from the Pittsburg-Bay Point BART station to Byron with stations in Antioch. Proposed alignment would occupy the median of State Route 4. Service would be provided with diesel multiple-unit trains. Project includes mainline capacity improvements to BART to allow transfers from eBART.
SR 4 East (Loveridge Road to SR 160)	Loveridge Road to SR 160	Widening of existing eastern segment of SR 4 would provide four lanes, including one HOV lane, in each direction. Project includes construction of auxiliary lanes between each interchange with SR 4 and wide median to accommodate future mass transit. Project also includes new construction and reconstruction of interchanges.
Capitol Corridor: Martinez Intermodal Facility, Phase III	Martinez Intermodal Facility	Includes acquisition of any remaining site area, construction of parking lot providing an additional 440 parking spaces, construction of pedestrian overcrossing over the railroad tracks, construction of a vehicle bridge over creek, and complete connections along Bay Trail.
Capitol Corridor: Hercules Passenger Rail Station	Hercules Capitol Corridor Station	Construct new stop on Capitol Corridor line in Hercules or Rodeo including station building and off-site improvements; expand existing lot by adding 55 spaces.
Capitol Corridor: I-80 Rail Project	I-80 Corridor between Sacramento and Oakland	Further expand service on the Capitol Corridor consistent with Capitol Corridor Joint Powers Board Business Plan.
East County Corridor: Vasco Road Widening	Vasco Road from SR 4 Bypass to the Contra Costa/Alameda County line	Widen and construct a median barrier approximately two miles north of Contra Costa/Alameda County line to a point three miles north of the County line. Also construct along this stretch a southbound passing lane with necessary widening of Brushy Creek bridge. The project would also provide improvements for safety and operations.
East County Corridor: Byron Highway Improvements	SR 4 within Oakley, Brentwood, and Discovery Bay	Extend Byron Highway northward, from its current northern terminus at Delta Road, to the East Cypress Road/Bethel Island Road intersection. Refurbish the existing roadway, extend the life of the road, and reduce the long term maintenance costs. Widen the existing pavement along the frontage of the School District office and the Byron Elementary School and at the intersection with State Route 4.
SR 4 Bypass – SR 4 / SR 160 Interchange to Lone Tree Way	SR 4 Bypass – SR 4 / SR 160 Interchange to Lone Tree Way	Construction of the westbound to northbound and southbound to eastbound direct connectors at the State Route 4 Bypass/State Route 160 Interchange. In addition, mainline widening from four to six lanes.

Table 2.8-5: Major 2009 CTP Projects with Potentially Significant Traffic and Transit Noise Impacts

Project Name	*Project Limits*	*Description*
SR 4 Bypass – Lone Tree Way to Vasco Road	SR 4 Bypass – Lone Tree Way to Vasco Road	Widening of mainline roadway on State Route 4 Bypass to provide two lanes in each direction (4 lanes total) from Lone Tree Way to Vasco Road at Walnut Blvd. The project includes construction of freeway interchanges at: Sand Creek Road, Balfour Road, Marsh Creek Road, and Vasco Road at Walnut Blvd.
Interchange Improvements on I-680 and State Route 242	State Route 242 at Clayton Road and Concord Avenue; I-680 at Marina Vista	Construct new northbound on-ramp and southbound off-ramp at SR 242/Clayton Road interchange and second SB right turn lane at SR 242/Concord Avenue interchange. Partial reconstruction of western half of Marina Vista/I-680 interchange.
I-80 Carpool Lane Extension and Interchange	I-80 / Cutting Blvd Interchange to Carquinez Bridge	Improve and modify I-80/San Pablo Dam Road, /Cummings Skyway, and /Central Avenue interchanges. Construct direct connectors between westbound Interstate 80 and eastbound State Route 4. Construct eastbound HOV lane from Willow Ave to the Crockett interchange and westbound HOV lane from Cummings Skyway to Willow Ave. Construct direct-connecting freeway ramps from and to northbound I-80 to the Del Norte BART station for use by busses and car pools.
Richmond Parkway	From I-80 to I-580	Upgrade Richmond Parkway to principal arterial standards
I-680 / State Route 4 Interchange	I-680 / State Route 4 Interchange	Construct interchange improvements between SR 4 and I-680.
I-680 Carpool Lane Gap Closure/ Transit Corridor Improvements	I-680 between SR242 and Norris Canyon Road	The proposed project would provide an HOV lane in the northbound direction between Livorna and SR242, in the southbound direction between North Main and Livorna, and in both the northbound and southbound directions at the interchanges of I-680 and Norris Canyon in San Ramon and Sycamore Valley Rd in Danville.
Richmond-San Rafael Bridge: Seismic Retrofit (Contra Costa Co. portion)	Marin County to Contra Costa County shorelines	Strengthen existing structure.
Other Freeway, Expressway or Interchange	Various locations throughout the county	This program would provide funding for other freeway, expressway or interchange improvements throughout the county. Projects include new and modifications to freeways, expressways, and interchanges, road widenings, and a variety of other road and transportation improvements.
Arterial and Roadway Projects	Various locations throughout the county	This program would provide funding for arterial street and road improvements throughout the county. The most common type of project that would be funded is road widening; other types of projects include road extensions, overcrossings and bridges, road realignment, and a variety of other local road and transportation improvements.

Source: Environmental Science Associates, 2008; 2008 CTP, December 2008

New roadways and roadway extensions would likely result in significant increases in noise since they could potentially introduce a much higher level of traffic noise along a corridor in which traffic noise is currently negligible or distant. The impact of such extensions would depend upon the types and proximity of sensitive land uses (e.g., residences and schools) along the new roadway alignment and the effectiveness of noise mitigation features included in their design. By redistributing traffic on the existing roadway network, these projects may have significant adverse and/ or beneficial noise impacts in the project vicinity. Adverse noise impacts would occur along roads to which traffic would be diverted, and beneficial noise impacts would occur along roads from which traffic would be diverted.

BART or rail extensions would also introduce a new source of noise and groundborne vibration along their alignments. The 2009 CTP includes proposed eBART service between the Pittsburg/Bay Point station and Byron in east Contra Costa County, along State Route 4. Where eBART would run along or near State Route 4, which already has high existing noise levels from traffic on that highway, the incremental increase in noise from eBART would likely be less-than-significant.[1] Where the eBART right-of-way does not border State Route 4, as it would in Phase II, east of State Route 160, impacts could be significant. Since the FTA would almost certainly be involved in any BART extension, the criteria set forth in Table 2.8-4 would be used as a basis for determining whether mitigation must be considered in eBart project development.

The proposed 2009 CTP would include some roadway widenings that would involve upgrading a facility from one type to another or that would substantially change the character of the roadway. Such roadway widening projects would lead to significant increases in roadside noise levels by supporting higher average vehicle speeds, by bringing traffic closer to adjacent uses, and by accommodating increases in traffic volumes. Once again, the impact of the increase in noise would depend upon the type and proximity of sensitive uses and the extent to which noise mitigation measures would be included in the design of these projects.

Project sponsors are required to review and consider local land use policies (including noise ordinances and policies) in preparation of their project proposals and project-level EIRs, and local governments are responsible for long-term land use planning related to noise issues and considering the appropriate location of sensitive receptors in relation to existing transportation corridors. Therefore, all projects in the 2009 CTP would adhere to land use compatibility criteria included in the General Plans of the applicable jurisdictions. If federal funding is used for the project, mitigation measures should also conform to applicable FHWA and FTA noise abatement criteria, shown in Table 2.8-6. These commitments obligate project sponsors to implement measures that would minimize or eliminate any significant impacts. Noise mitigation for freeway widenings typically involves construction of soundwalls, and depending upon their height and length and the surrounding terrain, these soundwalls can

[1] This impact is also addressed in the recently published DEIR for Phase I of eBART. San Francisco Bay Area Rapid Transit District, East Contra Costa BART Extension (eBART) Draft Environmental Impact Report, September 2008. Available on the internet at: http://www.ebartproject.org/docs.php?ogid=1000001094.

reduce impacts of these projects to less-than-significant and can even reduce traffic noise levels to less-than-existing conditions.

Table 2.8-6: FHWA Noise Abatement Criteria

		Hourly A-Weighted Sound Level (dBA)[1]	
Activity Category	*Description of Activity Category*	*Leq(h)*	*L10(h)*
A	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.	57 (exterior)	60 (exterior)
B	Picnic areas, recreation areas, playgrounds, active sport areas, park, residences, motels, hotels, schools, churches, libraries and hospitals.	67 (exterior)	70 (exterior)
C	Developed lands, properties or activities not included in Categories A and B.	72 (exterior)	75 (exterior)
D	Undeveloped lands not included in Categories A, B or C.	None	None
E	The interior sound levels for residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals and auditoriums.	52 (interior)	55 (interior)

[2] The noise abatement assessment may use either Leq(h) or L10(h) criteria, but not both. Leq(h) and L10(h) refer to the noisiest hour of the day from motor vehicle traffic, which may or may not be the same as the peak hour of traffic, due to the slower speeds typically associated with peak traffic periods.

Source: Title 23, Code of Federal Regulations, Part 772.

A preliminary analysis at the plan level was conducted using the change in peak hour traffic volumes derived from the traffic screenline analysis along roadway segments throughout Contra Costa County as an indicator of change in associated noise levels. Land uses along roadway segments showing a greater than 100 percent increase in peak hour traffic would most likely experience significant noise increases when compared to existing conditions, based on their sensitivity to noise and their existing noise environment.

Tables 2.8-7 and 2.8-8 show the roadway segments in Contra Costa County that would experience the greatest change in traffic relative to existing conditions for a.m. and p.m. peak hour conditions, respectively. As discussed earlier, as a rule of thumb, a doubling of traffic volume approximately results in a 3.0 dBA increase in noise, which is the minimum change in noise level required for the change to be perceivable. Segments showing a less than 100 percent traffic increase would result in less-than-significant noise increases, while segments showing a greater than 100 percent increase in traffic would be expected to result in a significant increase in noise at land uses along those segments. Subsequent project-specific CEQA analysis would reevaluate these impacts in greater detail in addition to analyzing noise from changes in transit activity, which is best done at the project-level.

As reflected in Tables 2.8-7 and 2.8-8, despite increases from existing conditions, many of the roadway segments experience reductions in traffic when compared with the No Project, or increase traffic only by a small percentage when compared to the No Project. However, other roadways may experience substantially more traffic noise in the future with the proposed Project as compared with the No Project alternative. This indicates that the 2009 CTP could potentially make a considerable contribution to future traffic-generated noise in some areas, dependent on surrounding land uses and the locations of sensitive receptors.

Table 2.8-7: Roadway Segments Experiencing the Highest A.M Peak Hour Traffic Changes Over Existing Conditions

		Projected Change in Traffic Volume	
Roadway Segment	*Location*	*% Change from Existing to 2030 Project*	*% Change from No Project to 2030 Project*
State Route 4 Bypass, Eastbound	Wild Horse Road	722	36
Homestead	Ygnacio	377	-40
Camino Diablo	Springbrook Road	348	22
SR 4 Bypass Westbound	Wild Horse Road	321	-5
Oakley Road	SR 160	307	12
Happy Valley	Upper Happy Valley	295	-11
I-680 HOV	State Route 4	275	-2
Solano Way	Olivera	231	-24
State Route 4 HOV	Port Chicago	210	-6
Hillcrest	Lone Tree	201	37

Source: Peak Hour Screenline Report; DKS Associates; Environmental Science Associates, 2008.

MITIGATION MEASURES

Mitigation Measure 2.8-2

Where transportation improvements could result in noise levels that approach or exceed the FHWA and FTA Noise Abatement Criteria or could cause noise levels to increase by 3 dBA or more, sponsors shall consider measures to minimize or eliminate impacts as part of the design of the project and its environmental review under CEQA and NEPA. Potential mitigation measures could be drawn from or be consistent with Caltrans' standards for construction. Typical mitigation measures include:

- Adjustments to proposed roadway or transit alignments to reduce noise levels in noise sensitive areas;
- Construction of sound walls adjacent to new or modified roads or transit lines, especially when projects are located in the vicinity of sensitive receptors. Noise level increases could, in most cases, be mitigated to levels at or below existing levels if soundwalls were constructed along the rights-of-way. A determination of the specific heights, lengths and feasibility of soundwalls must be part of the project-level environmental assessment;
- Adjustments to proposed roadway or transit alignment to reduce noise levels in noise sensitive areas. Depressed roadway alignments are effective at mitigating roadside noise levels;
- Insulation of buildings or construction of noise barriers around sensitive receptors;
- Vibration isolation of track segments; and
- Adoption of policies and development standards by local jurisdictions that reduce the exposure of sensitive receptors to noise generated by new or expanded transportation facilities, if they have not already done so in their General Plan Noise Elements and implementing ordinances. Such policies and standards may include noise attenuation by design when residential, educational, and other sensitive uses are to be developed near major transportation facilities or corridors. Locally-adopted noise reduction standards should correspond with the best guidance available from Caltrans and other responsible agencies, without thwarting efforts to create transit-oriented and affordable development.

Table 2.8-8: Roadway Segments Experiencing the Highest P.M Peak Hour Traffic Changes Over Existing Conditions

		Projected Change in Traffic Volumes	
Roadway Segment	*Location*	*% Change from Existing to 2030 Project*	*% Change from No Project to 2030 Project*
State Route 4 Bypass Eastbound	Wild Horse Road	1371	45
Camino Diablo	Springbrook Road	910	-21
Wild Horse Road	State Route 4 Bypass	290	17
Imhoff Drive	Imhoff	284	48
Alhambra Valley Road	Castro Ranch Road	242	-13
Arnold Drive	Pacheco	202	6
Happy Valley	Upper Happy Valley	200	-12
O'Hara	Lone Tree	183	7
Norris Canyon	County Line	142	-7

Source: Peak Hour Screenline Report; DKS Associates; Environmental Science Associates, 2008.

SIGNIFICANCE AFTER MITIGATION

Implementation of the above mitigation measure would be anticipated to reduce impacts to a less-than-significant level.

CUMULATIVE IMPACT

2.8-3 Transportation improvements proposed as part of the 2009 CTP together with regional growth and development could contribute to cumulative noise levels. (*Cumulatively Significant, Project Contribution Cumulatively Considerable*)

Examples of the types of projects that could result in significant cumulative noise impacts include freeway widenings for HOV lanes and arterial roadway widenings from two to four lanes or four to six lanes. While these projects would bring traffic closer to adjacent uses and may result in higher vehicle speeds, the increase in roadside noise levels in most areas, over the CTP planning horizon, would be primarily due to increases in cumulative traffic volumes associated with area-wide growth and development rather than the physical changes in the roadways from the projects themselves.

Projected population and employment growth throughout the region will result in new noise sources that will require mitigation. These noise sources will come from a variety of land use types including, but not limited to: residential uses, commercial uses, industrial uses, public outdoor uses, and redevelopment of vacant or underutilized land. For the most part, this new development will adhere to stricter noise abatement standards and criteria than older development as noise ordinances and insulation standards improve over time. However, the project-level mitigation may be inadequate to fully address the cumulative noise environment. It is in this context that the impact of future transportation noise may become considerable.

In some cases increased noise from other nearby land uses, or from unanticipated changes in the use of the transportation facility, might not be mitigated. On the other hand, corridors with fewer sensitive receptors are less likely to produce experience significant impacts. For this program level analysis, however, the location of all sensitive receptors in relation to all proposed 2009 CTP cannot be determined with certainty. Therefore, it remains possible that the noise impact of the proposed Project could be cumulatively significant for certain locations and communities. As the transportation system is a major component of the noise environment, the contribution of the proposed Project to the overall cumulative noise impact could be considerable.

MITIGATION MEASURES

Mitigation measures 2.8-1 and 2.8-2, as listed above, would contribute to reducing the cumulative impact. However, these mitigation measures, are not assumed to fully reduce the potentially significant cumulative noise to a less-than-significant level due to the uncertainty of the cumulative future noise environment, the localized nature of noise impacts, and community perceptions of noise.

SIGNIFICANCE AFTER MITIGATION MEASURES

Due to uncertainty regarding the locations of sensitive receptors and future development of other noise sources, this impact remains potentially cumulatively significant. Further, because final design for many of the 2009 CTP projects, it is possible that despite implementation of feasible mitigation measures, the contribution of the proposed Project to this cumulative impact would be considerable for some locations.

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