Section 3.10
Noise

Summary

Table 3.10-1 below provides a summary of the potential environmental impacts of the Proposed Project related to noise. As shown in Table 3.10-1, with implementation of mitigation measures, the Proposed Project would have less than significant impacts related to noise and vibration in the project area.

Table 3.10-1. Summary of Potential Impacts to Noise and Vibration

Impact	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
Impact NOI-1: Exposure of New Land Uses to Exterior Transportation Noise Levels in Excess of City Standards	Significant	Mitigation Measure NOI -1: Employ Measures to Reduce Transportation Noise Levels to Comply with Applicable Noise Standards	Less than Significant
Impact NOI-2: Exposure of Persons to Excessive Groundborne Vibration Levels	Less than Significant	No mitigation is necessary.	Less than Significant
Impact NOI-3: Exposure of Off-site Noise Sensitive Land Uses to Increased Traffic Noise	Less than Significant	No mitigation is necessary.	Less than Significant
Impact NOI-4: Exposure of Off-site Noise Sensitive Land Uses to Short-term Construction Noise	Significant	Mitigation Measure NOI-4: Employ Measures to Reduce Construction Noise to Comply with Applicable Construction Noise Standards	Less than Significant

Introduction

This section describes the affected environment for noise and vibration (including existing noise conditions), background information on the fundamentals of environmental noise, the regulatory setting associated with noise and vibration, noise impacts that would result from the project, and mitigation measures that would reduce these impacts.

Fundamentals of Environmental Noise and Vibration

Environmental Noise

Noise is generally defined as *unwanted sound*. It may be loud, unpleasant, unexpected, or undesired sound typically associated with human activity that interferes with or disrupts normal noise-sensitive ongoing activities of others. Although exposure to high noise levels has been demonstrated to cause hearing loss, the principal human response to environmental noise is annoyance. The response of individuals to similar noise events is diverse and influenced by the type of noise, the perceived importance and suitability of the noise in a particular setting, the time of day and type of activity during which the noise occurs, and the sensitivity of the individual. The response to vibration is similar: First, the vibration needs to be of sufficient magnitude to be perceived, and, second, it typically would have to interfere with a desirable activity to cause annoyance.

Sound is a physical phenomenon consisting of minute vibrations that travel through a medium such as air that are sensed by the human ear. Sound is generally characterized by frequency and intensity. Frequency describes the sound's pitch and is measured in hertz (Hz); intensity describes the sound's level, volume, or loudness and is measured in decibels (dB). Sound frequency is a measure of how many times each second the crest of a sound pressure wave passes a fixed point. For example, when a drummer beats a drum, the skin of the drum vibrates at a certain number of times per second. Vibration of the drum skin at a rate of 100 times (or cycles) per second generates a sound pressure wave that is said to be oscillating at 100 Hz, and this pressure oscillation is perceived as a tonal pitch of 100 Hz. Sound frequencies between 20 Hz and 20,000 Hz are within the range of sensitivity of the best human ear.

Sound from a tuning fork contains a single frequency and may therefore be referred to as a *pure tone*. However, most sounds heard in the environment do not consist of a single frequency but rather a broad band of frequencies differing in individual sound levels. The method commonly used to quantify environmental sounds consists of evaluating all the frequencies of a sound according to a weighting system that reflects that human hearing is less sensitive at low frequencies and extremely high frequencies than at the mid-range frequencies. This frequency-dependent modification is called A-weighting, and the decibel level measured is called the A-weighted sound level (dBA). In practice, the level of a noise source is conveniently measured using a sound level meter that includes a filter corresponding to the dBA curve.

A sound level of 0 dBA is approximately the threshold of human hearing and is barely audible under extremely quiet listening conditions. Normal speech has a sound level of approximately 60 dBA. Sound levels above about 120 dBA begin to be felt inside the human ear as discomfort and eventually pain at still higher levels. In general, human sound perception in a community environment is such that a change in sound level of 3 dB is just noticeable, a change of 5 dB is clearly noticeable, and a change of 10 dB is perceived as doubling or halving sound level. Because of the logarithmic scale of the decibel unit, sound levels cannot be added or subtracted arithmetically. A simple rule of thumb is useful in dealing with sound levels: if a sound's physical intensity is doubled, the sound level increases by 3 dB, regardless of the initial sound level. For example, 60 dB plus 60 dB equals 63 dB, and 80 dB plus 80 dB equals 83 dB. As mentioned earlier, however, a perception of doubling of sound level requires about a 10-decibel increase.

Although the A-weighted sound level may adequately indicate the level of environmental noise at any instant in time, community noise levels vary continuously. Most environmental noise includes a mixture of noise from distant sources that create a relatively steady background noise in which no particular source is identifiable. A single descriptor called the L_{eq} (equivalent sound level) is used to describe the average acoustical energy in a time-varying sound. L_{eq} is the energy-mean A-weighted sound level present or predicted to occur during a specified interval. It is the "equivalent" constant sound level that a given source would need to produce to equal the fluctuating level of measured sound. It is often desirable to also know the range of acoustic levels of the noise source being measured. This is accomplished through the L_{max} and L_{min} noise descriptors. They represent the root-mean-square maximum and minimum obtainable noise levels measured during the monitoring interval. The L_{min} value obtained for a particular monitoring location represents the quietest moment occurring during the measurement period and is often called the *acoustic floor* for that location. Likewise, the loudest momentary sound during the measurement is represented by L_{max}.

To describe the time-varying character of environmental noise, the statistical noise descriptors L_{10}, L_{50}, and L_{90} (or other percentile values) may be used. They are the noise levels equaled or exceeded 10, 50, and 90 percent, respectively, of the time during the measured interval. The percentile descriptors are most commonly found in nuisance noise ordinances to allow for different noise levels for various portions of an hour. For example, the L_{50} value would represent 30 minutes of an hour period, the L_{25} would be associated with 15 minutes of an hour, and so on. Of particular interest in this analysis are other descriptors of noise that are commonly used to help determine noise/land use compatibility and to predict an average community reaction to adverse effects of environmental noise, including traffic-generated and industrial noise. One of the most universal descriptors is the Day-Night Average Sound Level (DNL or L_{dn}). The L_{dn} noise metric represents a 24-hour period and applies a time-weighted factor designed to penalize noise events that occur during nighttime hours, when relaxation and sleep disturbance is of more concern than during daytime hours. Noise occurring during the daytime hours between 7:00 a.m. and 10:00 p.m. receives no penalty. Noise occurring between 10:00 p.m. and 7:00 a.m. is penalized by adding 10 dB to the measured level. In California, the use of the Community Noise Equivalent Level (CNEL) descriptor is permitted. CNEL is identical to L_{dn} except CNEL adds a 5 dB penalty for noise occurring during evening hours between 7:00 p.m. and 10:00 p.m.

Ground-Borne Vibration

Vibration is an oscillatory motion that can be described in terms of displacement, velocity, or acceleration. The response of humans to vibration is very complex. However, the general consensus is that for the vibration frequencies generated by passenger trains, human response is best approximated by the vibration velocity level. Therefore, vibration velocity has been used in this study to describe train-generated vibration levels.

When evaluating human response, ground-borne vibration is usually expressed in terms of root mean square (RMS) vibration velocity. RMS is defined as the average of the squared amplitude of the vibration signal. To avoid confusion with sound decibels, the abbreviation VdB is used for vibration decibels.

Although there has been relatively little research into human and building response to ground-borne vibration, there is substantial experience with vibration from rail systems. In general, the collective experience indicates that:

- It is rare that ground-borne vibration from transit systems results in building damage, even minor cosmetic damage. The primary consideration therefore is whether vibration will be intrusive to building occupants or will interfere with interior activities or machinery.
- The threshold for human perception is approximately 65 VdB. Vibration levels in the range of 70 to 75 VdB are often noticeable but acceptable. Beyond 80 VdB, vibration levels are often considered unacceptable. (FTA 2006).
- For human annoyance, there is a relationship between the number of daily events and the degree of annoyance caused by ground-borne vibration. The FTA guidance manual includes an 8 VdB higher impact threshold at residential and institutional land uses if there are fewer than 70 trains per day (FTA 2006).

Regulatory Setting

The State of California and the City have each established plans and policies designed to limit noise exposure at noise sensitive land uses. These plans and policies are contained in the following documents: (1) the State CEQA Guidelines, Appendix G, (2) the California State Building Code (Title 24), (3) the City of Union City General Plan, and (4) the Union City Community Noise Ordinance.

State

California Building Code and Guidelines

Section 1207of the California Building Code specifies that interior noise levels attributable to exterior noise sources shall not exceed 45 dBA L_{dn} or CNEL in any habitable room of new multi-family dwellings (includes hotels). Residential structures proposed where the noise level exceeds 60 dBA L_{dn} or CNEL are required to have an acoustical analysis showing that the proposed design will limit exterior noise to the prescribed allowable interior level.

Local

Union City General Plan

The Union City General Plan considers single and multi-family residential, group homes, hospitals and extended medical facilities, schools and other learning institutions, libraries, and similar uses to be noise sensitive land uses (HS-C.1.1).

Based on the General Plan Policies (summarized from Table HS-2 in the General Plan), exterior noise levels of 60 dBA CNEL or less are considered to be normally acceptable for single and multi-family residences. For multi-family residences, exterior noise levels from 60 to 70 dBA CNEL are considered conditionally acceptable. Office, commercial, and professional uses are considered normally acceptable in areas where exterior noise levels are 65 dBA CNEL or less and conditionally acceptable in areas where exterior noise levels are 75 dBA CNEL or less. Where noise levels are considered conditionally acceptable, new construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed insulation features included in the design. For noise sensitive land uses, mitigation shall be included in structural design to reduce interior noise levels to a maximum of 45 dBA CNEL (HS-C.1.2).

For new development projects that are impacted by noise or cannot meet the standards specified in Table HS-2 (summarized above), the construction of barriers to mitigate sound emissions are required where necessary or where feasible (HS-C.1.6).

The Union City General Plan limits construction activities to between the hours of 8:00 a.m. and 8:00 p.m. on Monday through Friday, 9:00 a.m. and 8:00 p.m. on Saturdays, and Sundays and holidays, between 10:00 a.m. and 6:00 p.m. (HS-C.1.7).

Union City Community Noise Ordinance

Section 9.40.053 of the Union City Municipal Code addresses noise from construction. Construction operations that occur between the hours of 8:00 a.m. and 8:00 p.m. on Monday through Friday, 9:00 a.m. and 8:00 p.m. on Saturdays, and 10:00 a.m. and 6:00 p.m. on Sundays and holidays are exempt from the provisions of the Noise Ordinance, if they meet at least one of the following noise limitations:

A. No individual piece of equipment shall produce a noise level exceeding 83 dBA at a distance of 25 feet. If the device is housed within a structure on the property, the measurement shall be made outside the structure at a distance as close to 25 feet from the equipment as possible.

B. The noise level at any point outside the property plane of the project shall not exceed 86 dBA.

Groundborne Vibration

The City of Union City has not identified quantifiable vibration limits that can be used to evaluate the compatibility of land uses with the expected vibration environment. Although there are no local standards which control the allowable vibration in a new residential development, the U.S. Department of Transportation has developed vibration impact assessment criteria for evaluating vibration impacts associated with rapid transit projects. Vibration impact criteria, based on maximum overall levels for a single event, have been proposed by the Federal Transit Administration (FTA).

The FTA vibration criteria are based on the maximum ground vibration caused by a typical train passby. Unlike the FTA noise criteria, the vibration criteria do not incorporate any factor to account the number of trains per day with one exception. The exception is that for relatively infrequent service as is typical for commuter and intercity passenger rail systems, the FTA impact thresholds are 8 VdB higher than for frequent service. FTA defines “frequent” service to be more than 70 trains per day, and “infrequent” service to be less than 30 trains per day. The infrequent criteria are applicable to trains along the Oakland and Niles Subdivision tracks and the frequent criteria would be applicable to Union City BART (BART).

The FTA vibration criteria are based on three land use categories. Table 3.10-2 shows FTA criteria for ground-borne vibration from rail transit systems. For residential buildings (Category 2), the thresholds applicable to this project are 80 VdB for UPRR and 72 VdB for BART.

Table 3.10-2. Ground-Borne Vibration and Noise Impact Criteria

	Ground-Borne Vibration (VdB re 1 micro inch/sec)		
Land Use Category	**Frequent Events[1]**	**Occasional Events[2]**	**Infrequent Events[3]**
Category 1. Buildings where low ambient vibration is essential for interior operations.	65 VdB	65 VdB	65 VdB
Category 2. Residences and buildings where people normally sleep.	72 VdB	75 VdB	80 VdB
Category 3. Institutional land uses with primarily daytime use.	75 VdB	78 VdB	83 VdB

Notes:

1 “Frequent Events” is defined as more than 70 vibration events per day.

2 “Occasional Events” is defined as between 30 and 70 vibration events of the same source per day.

3 “Infrequent Events” is defined as less than 30 events per day.

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

Sleep Disturbance

The City's interior noise standard of 45 dBA CNEL for residential land uses is a weighted average of sound levels measured over a 24-hour period. While this standard is sufficient to achieve an acceptable interior noise environment with most environmental noise sources, very loud intermittent noise sources, such as train pass-bys, create maximum interior noise levels that are loud enough to cause sleep disturbance and annoyance within residences. Studies have shown that limiting maximum noise levels to 55 dBA within bedrooms during train pass-bys will limit the probability of waking future residents when trains pass the site to less than 5 percent per occurrence (Kryter, 1985). This criterion has been used for this analysis.

Environmental Setting

Land Uses

The project site is situated in Union City, south of Decoto Road between Mission Boulevard and Alvarado-Niles Road. To the southwest of the project site is the BART Station, two BART rail lines and the Union Pacific Railroad (UPRR) Oakland Subdivision line. The Niles Subdivision UPRR line is located to the northeast of the site. Residential land uses are located southeast of the site and commercial and residential land uses are located to the northwest.

Noise Monitoring Survey

A noise monitoring survey was performed from April 23rd to 25th, 2008 to establish baseline noise conditions and to identify noise sensitive receptors in the vicinity of the site and along the surrounding roadway network. Two long-term (24+ hour) and two short-term (10- minute) measurements were conducted (see Figure 3.10-1). Sound level measurements were made using Larson Davis Model 700 and 812 Sound Level Meters, set to slow time response and using A-Weighting (dBA). Traffic volume counts were conducted concurrent to short-term noise measurement ST-2, where the primary noise source was traffic along Decoto Road.

Long Term Measurements

Long-term measurement LT-1 was located about 40 feet from the UPRR Oakland Subdivision railroad tracks, which are located to the southwest of the site, and about 130 feet from the BART Station. BART is elevated by about 15 feet above the grade of the site at this location and the UPRR tracks are elevated by about 2 feet. The primary noise source at this location was BART trains, which pass by the site at regular intervals, about 1 train every 4 minutes during daytime hours. Occasional airplanes and freight trains also generate intermittent high noise levels. Based on the BART train schedule, a total of 266 BART trains pass by the site each weekday; with 188 trains during daytime hours (7:00 am to

7:00 pm), 28 trains during evening hours (7:00 pm to 10:00 pm), and 50 trains during nighttime hours (10:00 pm to 7:00 am). There are no BART trains scheduled between the hours of 1:15 am and 4:05 am.- Maximum noise levels generated during BART train passbys typically ranged from 65 to 70 dBA L_{max}. Aircraft generated lower noise levels, in the range of 50 to 60 dBA L_{max}. Based on review of the data, freight trains generate maximum noise levels in the range of 75 to 85 dBA L_{max} and pass by the site during late night hours. 24-hour average noise level of 61 dBA CNEL was calculated at this location. The hourly trend in noise levels at LT-1 is displayed graphically in Figure 3.10-2. Based on noise levels measured at LT-1, noise levels at a distance of 100 feet from the centerline of the Oakland Subdivision (and 165 feet from the centerline of the BART right-of-way) were estimated to be about 63 dBA CNEL, with a contribution of 62 dBA CNEL from BART.

Long term location LT-2 was situated about 50 feet from the UPRR Niles Subdivision tracks, which are located to the northwest of the site. Background noise levels at this location were generated by distant transportation noise sources, including traffic on Decoto Road, BART, and aircraft overflights. Freight trains typically generated maximum noise levels in the range of 70 to 90 dBA L_{max}, with maximum noise levels reaching 105 dBA during train horn soundings. Based on overview of the data, approximately 59 train operations occurred over the 49 hour monitoring period, including nighttime and early morning hours. The 24-hour average noise level at this location was calculated to be 71 dBA CNEL. The hourly trend in noise levels at LT-2 is displayed graphically in Figure 3.10-3.

Short Term Measurements

Two attended short-term measurements (ST-1 and ST-2) were conducted at locations representative of project setbacks on April 24th, 2008 between 11:00 am and 12:00 pm. Measurements were conducted at a height of 5 feet above the surrounding ground. Meteorological conditions during the short-term measurements consisted of partly cloudy skies with temperatures around 62^{o}F and winds speeds from 2 to 3 mph. The results of the sound level measurements are summarized in Table 3.10-3.

Table 3.10-3. Baseline Noise Measurements

Site ID	Measurement Location (Date, Start Time)	Primary Noise Source	Measurement Results (dBA)			
			L_{eq}	L_{90}	L_{50}	L_{10}
ST-1	Near location LT-2 (4/23/2008, 11:20 am)	Distant BART, traffic, and aircraft	50	43	46	54
ST-2	~95 feet from center of Decoto Road (4/23/2008, 11:50 am)	Traffic on Decoto Road	65	56	63	69

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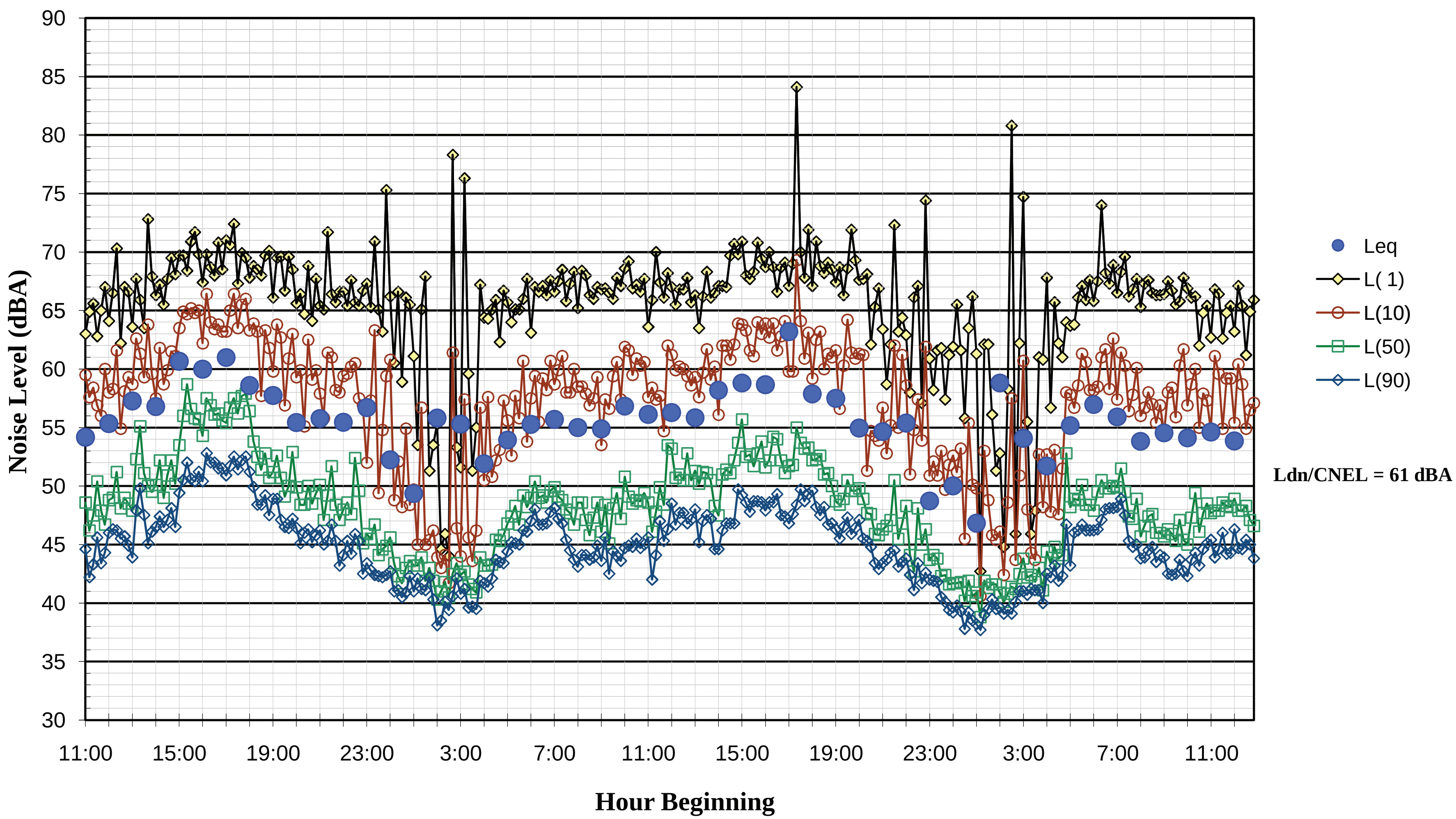
Figure 3.10-1
Noise Monitoring Locations



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ICF INTERNATIONAL

Figure 3.10-2
Noise Levels at LT-1, 130 Feet from BART, April 23-25, 2008

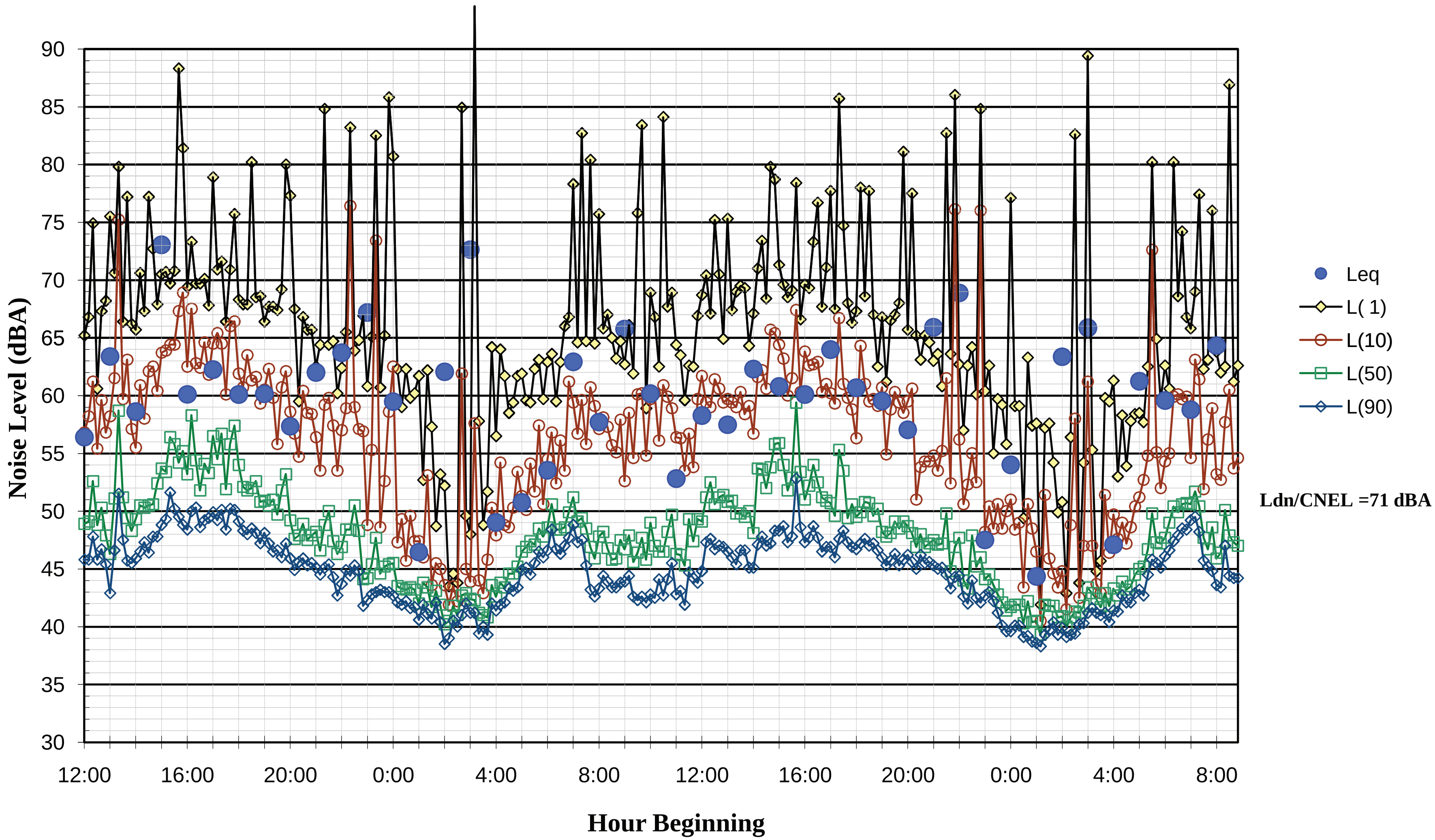

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Figure 3.10-3
Noise Levels at LT-2, 50 feet from Union Pacific Raliroad Line, Niles Subdivision
April 23-25, 2008

Impact Analysis

This section describes the impact analysis relating to noise for the Proposed Project. It describes the methods used to determine the impacts of the project and lists the thresholds used to conclude whether an impact would be significant. Measures to mitigate significant impacts accompany each impact discussion.

Methods

Vehicular Traffic Noise Levels

AM and PM peak hour traffic volumes supplied in 2008 by Fehr & Peers Transportation Consultants were used in this analysis. Traffic noise levels were calculated based on noise measurements made during the noise monitoring survey, traffic volumes supplied by Fehr & Peers Transportation Consultants, and traffic noise modeling using the Federal Highway Administration (FHWA) Traffic Noise Model (TNM).

Project generated noise increases are calculated by comparing project traffic conditions to no-project traffic conditions within the same time frame (i.e., project + existing vs. existing, 2035 cumulative with project vs. 2025 cumulative without project). In general, CNEL values are approximately equal to the L_{eq} peak hour under normal traffic conditions (Caltrans, 1998). For this assessment, PM Peak Hour L_{eq} and CNEL noise levels are considered to be equivalent.

Railroad Operations Noise Levels

Future noise levels generated by railroad operations were calculated based on noise measurements made during the noise monitoring survey and information supplied by the Union City Intermodal Station Passenger Rail Project Environmental Impact Report (EIR) (Union City, April 2005).

The Union City Passenger Rail Project would reroute current and future Capital Corridor trains from the Niles Subdivision to the Oakland Subdivision. The Capital Corridor currently operates 11 passenger trains per day on the Niles Subdivision and the operations are predicted to increase to 32 trains per day with 16 trains per day operating along each of the two subdivisions. Train service would be between 5:00 a.m. and 9:00 p.m. with an estimated average maximum speed of 50 mph adjacent to the project site. It is assumed that the trains would be evenly distributed between 5:00 a.m. and 9:00 p.m., which means that one train in each direction would pass between the nighttime hours of 5:00 a.m. and 7:00 a.m.

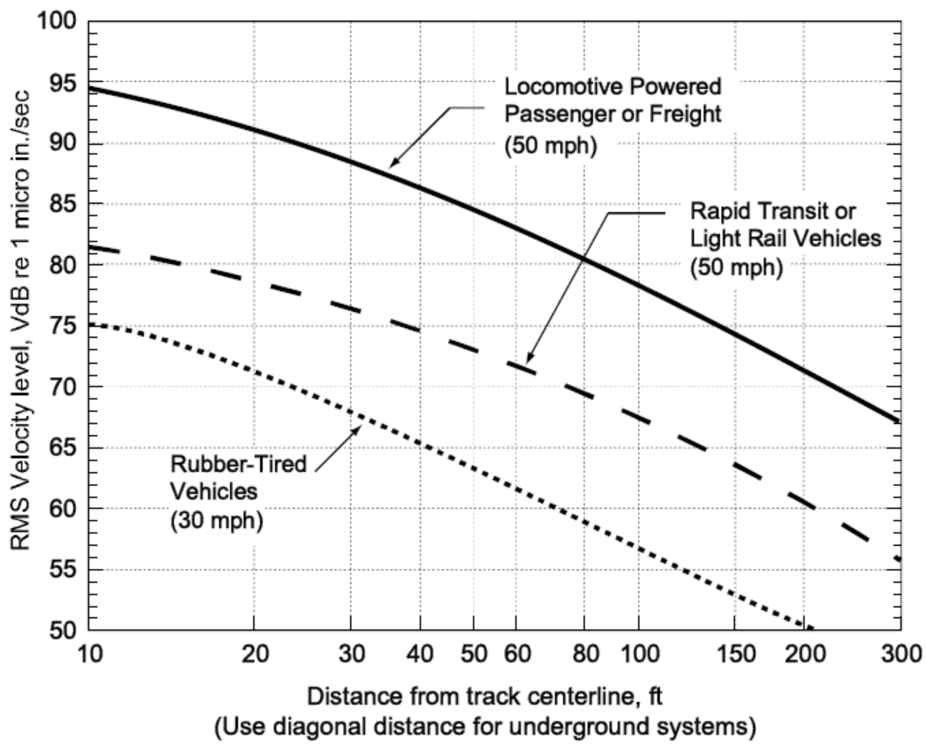
With 16 passenger trains per day operating at speeds of approximately 50 mph during daytime and nighttime hours, noise levels generated along the Oakland Subdivision are predicted to be about 67 dBA CNEL at 100 feet from the centerline of the tracks. The Union City Passenger Rail Project would actually reduce noise along the Niles Subdivision as a result of rerouting current trains.

As a conservative assumption, this analysis assumes that future noise levels along the Niles Subdivision would remain unchanged.

Railroad Vibration Levels

Predictions of future vibration levels from Capital Corridor and Dumbarton Rail trains on the Oakland subdivision were based on the procedures for a General Assessment given in the FTA Guidance Manual (FTA 2006). The basic approach is to use a curve of typical vibration level vs. distance to estimate the level of ground-borne vibration at each representative receptor. This vibration level is then adjusted to account for other factors.

Figure 3.10-4. Generalized Ground Surface Vibration Curves (FTA, 2006)



The top curve in Figure 3.10-4 shows typical vibration levels from locomotive-powered passenger or freight trains as a function of distance. This curve is for a train speed of 50 mph, which is the same as the estimated speed through the project area.

Thresholds of Significance

Thresholds of significance were determined based on Appendix G of the State CEQA Guidelines, the Union City noise standards, and by using professional judgment and standard practices. Impacts pertaining to noise were considered significant if it resulted in any of the following environmental effects.

- **Noise and Land Use Compatibility—Exterior:** A significant noise impact would occur if proposed land uses would be exposed to exterior noise levels exceeding 60 dBA CNEL for new single and multi-family residential uses, or 65 dBA CNEL for offices, commercial, and professional uses.
- **Noise and Land Use Compatibility—Interior:** A significant noise impact would occur if noise levels inside residences would be exposed to noise levels exceeding 45 dBA CNEL or if maximum noise levels within bedrooms during train pass-bys are anticipated to exceed 55 dBA L_{max}.
- **Groundborne Vibration:** The Proposed Project is considered to result in a significant groundborne vibration impact if project buildings would be exposed to vibration levels exceeding the FTA vibration impact thresholds (80 VdB for UPRR and 72 VdB for BART).
- **Project Generated Traffic Noise Increases:** Neither Union City nor the State of California identifies significance thresholds for increases in noise due to increases in traffic generated by a project. Accordingly, the following significance thresholds have been developed based on city noise standards and professional judgment. The Proposed Project is considered to result in a significant traffic noise impact at existing offsite noise residential uses if it would:
  - Result in a noise increase of 3 dBA or more where the resulting outdoor noise levels with project traffic would exceed the noise and land use compatibility thresholds; or
  - Result in a noise increase of 5 dBA or more where the resulting outdoor noise levels with project traffic would continue to meet the noise and land use compatibility thresholds.

  In both cases the increase in noise is based on comparing project and no project conditions within the same time frame.
- **Construction Noise:** A construction noise impact would be considered significant if noise generating construction activities would occur outside of the construction hours specified in the City of Union City noise ordinance (8:00 am to 8:00 pm Monday through Friday, 9:00 am to 8:00 pm Saturday, 10:00 am to 6:00 pm Sunday and Holidays).

Impacts and Mitigation Measures

The Proposed Project would develop up to 973 residential units, up to 37,500 square feet of retail and commercial uses, and up to 6,200 square feet of business condominiums. Noise sensitive uses proposed to be developed as part of the project would be exposed to noise from existing traffic, railroad, and aircraft operations. Development of the Proposed Project would increase traffic volumes on the local roadway network, which would result in increased traffic noise levels at existing off-site noise sensitive receptors located along these roadways.

Construction of the project would generate short term increases in noise at nearby noise sensitive receptors.

Noise and Land Use Compatibility

Impact NOI-1: Exposure of New Land Uses to Exterior Transportation Noise Levels in Excess of City Standards

The Proposed Project would develop residential and commercial uses adjacent to 11th Street and the UPRR Niles Subdivision railroad tracks. Other noise sources include traffic on Decoto Road and operations along the BART and UPRR Oakland Subdivision tracks.

Exterior Noise Levels

Cumulative 2035 with Project traffic noise levels along 11th Street and Decoto Road were calculated based on noise measurements made during the noise monitoring survey, traffic volumes (supplied in 2008 by Fehr & Peers Transportation Consultants), and traffic noise modeling using the FHWA TNM. Future noise levels generated by railroad operations were calculated based on noise measurements made during the noise monitoring survey and information supplied by the Union City Intermodal Station Passenger Rail Project EIR (Union City, April 2005).

The calculated distances to the 60, 65, and 70 dBA CNEL noise contours from the center of 11th Street, Decoto Road, the UPRR Niles Subdivision tracks, the UPRR Oakland subdivision tracks, and the BART tracks are summarized in Table 3.10-4 for the cumulative with project traffic condition and the future railroad operation estimates. Note that in areas that are exposed to more than one of these noise sources (this is especially of note for the UPRR Oakland Subdivision and the BART tracks), noise levels would result from a combination of noise source levels.

Table 3.10-4. Unshielded Distances to 60, 65, and 70 dBA CNEL Noise Contours under Cumulative with Project Traffic and Railroad Conditions

	Distance from center of Road/Tracks to Noise Contour		
Noise Source	**60 dBA CNEL**	**65 dBA CNEL**	**70 dBA CNEL**
11th Street	435 ft	200 ft	95 ft
Decoto Road	350 ft	165 ft	75 ft
UPRR Niles Subdivision	225 ft	125 ft	70 ft
UPRR Oakland Subdivision (including BART)	260 ft	145 ft	80 ft

The closest proposed noise sensitive receptors are located about 80 feet from the center of 11th Street, about 350 feet from the center of Decoto Road, about 100 feet from the UPRR Niles Subdivision, and about 350 feet from the UPRR

Oakland Subdivision (about 450 feet from the center of the BART tracks). With the acoustical shielding provided by project structures, the impact of these noise sources would be reduced in areas located away from and/or shielded from the noise source. As the remaining blocks are built out, the project uses would be further shielded from Decoto Road, the UPRR Oakland Subdivision, and BART.

Unshielded residences located adjacent to 11th Street are predicted to be exposed to a traffic noise level of 71 dBA CNEL, resulting primarily from traffic on 11th Street. Residences adjacent to the UPRR Niles Subdivision would be exposed to noise levels of about 67 dBA CNEL, resulting primarily from railroad operations. Based on the project plans, common exterior use areas would be located in courtyard areas, which would typically be well shielded from the surrounding noise sources by the project building structure. City noise guidelines are not typically applicable to small private uses such as upper level balconies. With the acoustical shielding provided by project structures, noise levels would be reduced in areas located away from and/or shielded from the adjacent noise sources. However, since the building plans are not yet finalized, it is possible that some noise sensitive exterior use areas could have partial or full exposure to 11th Street and/or the UPRR Niles Subdivision. As a result, this impact is considered to be significant.

Interior Noise Levels

Residences throughout the site would be exposed to exterior noise levels that exceed 60 dBA CNEL. Standard California residential construction typically provides about 15 dBA of exterior-to-interior noise reduction with windows partially open, and 20 to 25 dBA of exterior-to-interior noise reduction with windows closed. As a result, the interior noise standard of 45 dBA CNEL for residences would typically be met if the exterior noise levels do not exceed the exterior noise and land compatibility threshold of 60 dBA CNEL. The incorporation of forced air mechanical ventilation systems in residential units is considered sufficient to allow occupants the option of maintaining windows in the closed position.

Due to the shielding provided by the project structures, units would be exposed primarily to noise generated by the noise source that has a line-of-sight to the unit (i.e., units along 11th Street would be exposed primarily to traffic noise and units along the railroad would be exposed primarily to railroad noise). Taking into account the shielding provided by the project buildings, noise levels outside the façades of residences are predicted to be about 71 dBA CNEL at ground level units fronting 11th Street (assuming a distance of 80 feet from the centerline of the roadway), about 67 dBA CNEL in units fronting the Niles Subdivision (assuming a distance of 100 feet from tracks). In addition, instantaneous maximum noise levels generated by railroad operations would typically range from 75 to 90 dBA L_{max} during train passbys at the facades of adjacent units with maximum noise levels reaching 105 dBA during train horn soundings. Noise exposure at the 3rd and 4th story is often 2 to 4 dBA higher than that of the ground floor because noise reduction due to ground absorption and shielding is reduced. Above the 4th floor, noise levels tend to drop off slightly as the distance from the ground level noise sources increases.

Using ground floor noise exposure, noise levels inside units with façades fronting 11th Street are predicted to be about 56 dBA CNEL, assuming typical California construction methods with windows open, and about 46 to 51 dBA CNEL with windows in the closed position. Noise levels inside units with façades fronting the UPRR Niles Subdivision are predicted to be about 54 dBA CNEL with windows open and about 44 to 49 dBA CNEL with windows in the closed position. Instantaneous maximum noise levels generated by railroad operations inside adjacent units are predicted to be in the range of 60 to 75 dBA L_{max} during train passbys with windows open and in the range of 50 to 65 dBA L_{max} with windows closed. During train horn soundings, maximum noise levels are predicted to be about 15 dBA higher. The current development proposal and Design Guidelines assume that ground floor uses would be primarily commercial. As indicated above, noise levels would be 2 to 4 dBA higher at the 3rd and 4th story, where residences are proposed, and drop off above the 4th floor.

To meet the State standard (45 dBA CNEL), forced-air ventilation and sound rated construction would be required throughout the site. The exact specifications of window and wall systems cannot be accurately predicted at this time. These specifications can be made once final building elevations and floor plans are developed. Preliminary calculations estimated that to meet the 45 dBA CNEL interior criteria windows with STC ratings of 30 to 32 would be required for residential façades fronting 11th Street and windows with STC ratings of 28 to 30 would be required for residential façades fronting the UPRR Niles Subdivision.

To control interior maximum noise levels to minimize the potential for activity interference and sleep disturbance, noise insulation features such as stucco-sided walls with resilient furring elements and sound-rated windows and doors would be required for residences located near the adjacent railroad. To reduce sleep and indoor activity disturbance during train passbys, the noise control treatments should be designed to reduce typical maximum instantaneous noise levels from the railroad operations to 55 dBA inside bedrooms and other noise sensitive rooms. Again, noise insulation features to be included in the project's design will need to be developed once detailed plans are available. Preliminary calculations estimated that stucco siding with resilient channels and windows with Sound Transmission Class (STC) ratings of 38 to 43 would be required in units adjacent to the railroad to reduce maximum instantaneous noise levels during train passbys.[1] Additional noise insulation features would be needed to reduce maximum noise levels generated during train horn soundings. This impact is considered to be significant. Implementation of Mitigation Measure NOI-1 would reduce potential impacts from exposure of new land uses to exterior transportation noise levels in excess of City standards to less than significant.

Mitigation Measure NOI-1: Employ Measures to Reduce Transportation Noise Levels to Comply with Applicable Noise Standards

The Applicant shall employ measures to reduce transportation noise to levels that comply with applicable noise standards (i.e. 60 dBA CNEL for exterior areas of

[1] STC ratings are a way to measure the attenuation of sound. STC ratings are used for windows, doors, walls, and most building materials.

new single and multi-family residential uses, 65 dBA CNEL for exterior areas of offices, commercial, and professional uses, 45 dBA CNEL for interior areas of residential uses, and maximum noise levels within bedrooms during train pass-bys of 55 dBA L_{max}.) The Applicant shall retain a qualified acoustical consultant to prepare a report describing design level noise-reducing treatments to be implemented. The report shall be submitted to the City for review and approval prior to issuance of the project building permits.

Measures that can be implemented to achieve compliance with applicable noise standards include but are not limited to the following:

- Locate noise-sensitive outdoor use areas away from adjacent noise sources.
- Shield noise-sensitive spaces with building or noise barriers whenever possible (i.e. construct outdoor use areas as courtyard areas).
- Include the provision of forced-air mechanical ventilation for all units, so that windows could be kept closed at the occupant's discretion to control noise.
- Implement special building construction techniques at residential uses where necessary. These treatments include, but are not limited to, sound rated windows and doors, sound rated wall constructions, acoustical caulking, etc. The specific determination of what treatments are necessary shall be conducted on a unit-by-unit basis.

Groundborne Vibration

Impact NOI-2: Exposure of Persons to Excessive Groundborne Vibration Levels

Based on Figure 3.10-2, vibration levels are estimated to be 78 VdB re 1 micro in./sec at a distance of 100 feet from the either the Oakland or Niles Subdivisions and 67 VdB re 1 micro in./sec at a distance of 100 feet from BART. Vibration levels would be below the applicable FTA vibration impact thresholds (80 VdB for UPRR and 72 VdB for BART) at a distance of 80 feet or further from the Oakland or Niles Subdivision tracks and about 60 feet or further from the BART tracks. The closest proposed structures are located about 100 feet from the UPRR Niles Subdivision, about 350 feet from the UPRR Oakland Subdivision, and about 450 feet from BART. As a result, this impact is considered to be less-than-significant.

Project Generated Traffic Noise

Impact NOI-3: Exposure of Off-site Noise Sensitive Land Uses to Increased Traffic Noise

Development of the Proposed Project would increase traffic volumes on the local roadway network, which would result in increased traffic noise levels at noise sensitive receptors located along these roadways. Project generated noise increases are calculated by comparing project traffic conditions to no-project traffic conditions within the same time frame (i.e., project + existing vs. existing, 2035 cumulative with project vs. 2035 cumulative without project). Based on AM and PM peak hour traffic volumes supplied in 2008 by Fehr & Peers Transportation Consultants, the project would not result in any measureable increases in traffic noise above those generated without the project (i.e., traffic noise increases are calculated to be less than 1 dBA). Since the project would not result in traffic noise increases of 3 dBA or greater at any off-site noise sensitive uses, this impact is considered to be less than significant.

Construction Noise

Impact NOI-4: Exposure of Off-site Noise Sensitive Land Uses to Short-term Construction Noise

Construction of the project would occur in several phases over a period of about 10 years. Noise impacts resulting from construction depend on the noise generated by various pieces of construction equipment, the timing and duration of noise generating activities, and the distance and shielding between construction noise sources and noise sensitive areas. Construction noise impacts primarily result when construction activities occur during noise-sensitive times of the day (early morning, evening, or nighttime hours), the construction occurs in areas immediately adjoining noise sensitive land uses, or when construction lasts over extended periods of time. Detailed plans for construction of the project and the selection of construction equipment have not yet been determined. Table 3.10-5 summarizes noise levels produced by commonly used construction equipment.

Table 3.10-5. Construction Equipment Noise Emission Levels

Equipment	Typical Noise Level (dBA) 50 feet from Source
Grader	85
Bulldozers	85
Truck	88
Loader	85
Roller	74
Air Compressor	81
Backhoe	80
Pneumatic Tool	85
Paver	89
Concrete Pump	82
Source: Federal Transit Administration, 2006.	

Pile driving would not be employed as a construction method. Individual types of construction equipment are expected to generate noise levels ranging from 74 to 89 dBA at a distance of 50 feet. Noise generated by construction is anticipated to be the greatest during site grading activities and excavation for underground utilities. Noise generated during building construction would be lower. Hourly average construction noise levels are typically 75 dBA to 85 dBA L_{eq} measured at a distance of 50 feet from the center of the site during busy construction periods. Construction noise levels typically attenuate over distance at a rate of about 6 dBA per doubling of distance between the source and receptor. Shielding by buildings or terrain often result in much lower construction noise levels at distant receptors.

The closest noise sensitive receptors are townhome residences located adjacent to and southeast of the project site. Hourly average construction generated noise levels would be about 75 to 85 dBA at the closest townhomes to the southeast when construction in located in the southern portion of the site. Construction noise would be lower in acoustically shielded locations, at noise sensitive receivers located further from the project site, or when construction occurs on the northern portion of the site.

Hourly average construction noise levels could reach more than 10 to 20 dBA above ambient noise levels at townhomes to the southeast. The noise levels could be high enough to interfere with conversation in backyards and possibly inside homes. During other phases of construction and when activities are located to the north, noise levels would be lower but would still potentially interfere with indoor and outdoor activities.

Although any increase in the background noise level due to project construction would be temporary, construction could potentially occur outside of the hours specified in the City noise ordinance. This impact is therefore considered to be significant. However, implementation of Mitigation Measure NOI-4 would reduce potential impacts from exposure of off-site noise sensitive land uses to short-term construction noise to a less-than-significant level.

Mitigation Measure NOI-4: Employ Measures to Reduce Construction Noise to Comply with Applicable Construction Noise Standards

The construction contractor shall employ measures to reduce construction noise such that noise from construction activity does not violate applicable construction noise standards. Measures that can be implemented to reduce construction noise to acceptable levels include but are not limited to:

- Limiting all construction activities, including loading and unloading of materials and on-site truck movements, to the hours between 8:00 a.m. and 8:00 p.m., Monday through Friday, 9:00 am to 8:00 pm Saturday, 10:00 am to 6:00 pm Sunday and Holidays, and to the provisions listed in Section 9.40.053 of the Union City Municipal Code.
- Using available noise suppression devices and techniques, including:
    - Equipping all internal combustion engine-driven equipment with mufflers, air-inlet silencers, and any other shrouds, shields, or other noise-reducing features that are in good operating condition and appropriate for the equipment.

- Utilizing “quiet” models of air compressors and other stationary noise sources where such technology exists.
- Utilizing electrically powered equipment instead of pneumatic or internal combustion powered equipment, where feasible.
- Using of noise-producing signals, including horns, whistles, alarms, and bells, for safety warning purposes only.
- Locating stationary noise-generating equipment, construction parking, and maintenance areas as far as reasonable from sensitive receptors when sensitive receptors adjoin or are near the construction project area.
- Prohibiting unnecessary idling of internal combustion engines (i.e., in excess of five minutes).
- Placing temporary barriers or enclosure around stationary noise-generating equipment when located near noise sensitive areas.
- Ensuring that project-related public address or music systems are not audible at any adjacent receptor.
- Notifying adjacent residents in advance of construction work.

Cumulative Impacts

The State CEQA Guidelines require that projects be evaluated with respect to their contribution to the cumulative baseline conditions. This contribution with respect to air emissions would include both construction and operational emissions.

Cumulative impacts include impacts from closely related past, present, and reasonably foreseeable probable future projects which could, in combination with the impacts from the Proposed Project, result in cumulatively considerable impacts. Past, present, and probable projects have been identified in Chapter 4, Table 4-1 that may result in cumulative impacts within the project vicinity.

There are two different types of potential cumulative noise impacts relative to the Proposed Project:

- Contribution of traffic noise from the Proposed Project affecting off-site noise sensitive receptors in combination with cumulative noise sources
- Cumulative impacts of existing and future sources of noise on the new residents at the Proposed Project.

Project Traffic Noise Cumulative Contribution

The Proposed Project is considered to contribute to a significant cumulative noise impact at other noise sensitive locations where the project-related increase is at least 1 dBA and the predicted noise level exceeds the applicable noise land compatibility standards (60 dBA CNEL for residences). Based on AM and PM peak hour traffic volumes supplied in 2008 by Fehr & Peers Transportation

Consultants, the project would not result in any measureable increases in traffic noise above those generated without the project (i.e., traffic noise increases are calculated to be less than 1 dBA). Since the project would not result in traffic noise increases of 1 dBA or greater at any off-site noise sensitive uses, the Proposed Project would not contribute considerably to a significant cumulative traffic noise impact.

Cumulative Noise for New Residential Receptors

In addition to existing noise sources, which include traffic along Decoto Road and 11th avenue, existing passenger and freight rail operations, and BART, the following cumulative sources of noise would also affect the new project residents:

- Cumulative traffic along 11th Street and Decoto Road.
- The Dumbarton Rail Corridor (DRC) Project would add approximately 12 trains per day arriving at the Intermodal Station (HNTB 2006).
- The Union City Intermodal Station Passenger Rail project would relocate the Capitol Corridor service from the Niles Subdivision to the Oakland Subdivision and Capitol Corridor is planning to expand service in the future from 8 trains per day to 32 trains per day (see Jones & Stokes 2006).
- Construction of a new connection between the Niles Subdivision and Niles Junction is proposed in the Regional Rail Plan which would allow use of the Niles Subdivision to connect from Oakland to the Central Valley, resulting in potential relocation of freight traffic from the Coast Subdivision to the Niles Subdivision (Earthtech et al. 2007).

The summary result of the cumulative rail projects would be to have Capitol Corridor and Dumbarton Rail Corridor passenger trains (total of 56 trains) operating along the Oakland Subdivision 350 feet south of the project and for freight trains operating on the Niles Subdivision approximately 100 feet north of the nearest Proposed Project residence. In addition, BART would continue to operate approximately 450 feet south of the project.

A noise analysis was conducted as part of the EIR Union City Intermodal Passenger Rail Project (Jones & Stokes 2006). This evaluation is applicable to the current project for evaluation of cumulative noise for the new residents because it assessed both existing and cumulative passenger (including BART) and freight rail noise in the vicinity of the project. The prior noise analysis analyzed a residential location near the Intermodal Station (Brookstone/Site R3) that is closer than the Proposed Project to both BART and the Oakland Subdivision but further than the Proposed Project from the Niles Subdivision. In the cumulative condition, the modeled Site R3 location would be subject to more noise than the Proposed Project (due to closer proximity to more active rail and BART operations), although it would have a 8 dBA reduction due to an existing sound wall. Removing the effect of the soundwall, the modeled site R3 location would have cumulative noise levels of 67 to 68 dBA (= 59 to 60 dBA plus 8 dBA added to account for the existing soundwall) (Jones & Stokes 2006).

As noted above, the project analysis concluded that the Proposed Project would be subject to noise levels from cumulative traffic, BART, and rail (including Capitol Corridor and freight, but not the DRC project) of between 67 and 71 dBA. Adding in the DRC project trains would increase these levels slightly, but given the 350 feet separation from the Oakland subdivision, the contribution will be somewhat attenuated.

Since cumulative noise levels will exceed the outdoor noise level of 60 dBA, there would be a significant cumulative impact due to the placement of new residents at this location, cumulative traffic, and cumulative rail noise. This cumulative impact on the new residents can be mitigated to a less than significant level through the implementation of Mitigation Measure NOI-1, which is described above.