J. NOISE AND VIBRATION

1. Introduction

This section discusses the noise and vibration setting and existing conditions as they relate to the BART to Livermore Extension Project, describes the applicable regulations, and assesses the potential noise and vibration impacts from construction and operation of the Proposed Project and Alternatives.

Increases in noise and vibration resulting from the use of transit vehicles and other project-related activities (e.g., maintenance facility activities) are compared to thresholds adopted by the Federal Transit Administration (FTA) to identify adverse community response. FTA guidelines recommend screening distances to establish the study area for a noise and vibration assessment. The areas defined by the screening distances are meant to be sufficiently large to encompass all potentially impacted locations. These distances were determined by the FTA using relatively high-capacity scenarios (in terms of operational frequencies and number of cars) for a given project type.[1]

The maximum FTA screening distance for the BART to Livermore Extension Project is 1,600 feet, which is the screening distance for a commuter rail station, and therefore the classification applied to the DMU Alternative. All other screening distances for components of the BART to Livermore Extension Project are less than 1,600 feet, as follows:

- Maintenance facilities: 1,000 feet
- Rail mainline: 750 feet
- Busways: 500 feet
- Parking facilities: 125 feet[2]

Thus, for the purpose of analyzing the potential impacts, the study area conservatively comprises the maximum screening distance—a 1,600-foot radius around the collective footprint (i.e., the combined footprints of the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative). In addition, operation of the bus routes for the Enhanced Bus Alternative, as well as for the feeder buses for the Proposed Project and other Build Alternatives, which are anticipated to extend along existing streets, are addressed in this analysis.

[1] Federal Transit Administration (FTA), 2006. Transit Noise and Vibration Impact Assessment, Final Report FTA-VA-90-1003-06. May. Table 4-1. Screening Distances for Noise Assessments, page 4-3.
[2] Ibid.

The analysis presented in this section is based on a review of existing reports, multiple site reconnaissance surveys, long-term noise monitoring, and noise modeling, as well as FTA guidance.[3]

This section summarizes the basic concepts and terminology related to noise and vibration. Background (ambient) noise levels are described for representative segments of the Proposed Project and Build Alternatives, based on specific noise measurements and other studies conducted in the area. This information provides the context for the analysis of changes to the noise conditions resulting from implementation of the Proposed Project and Build Alternatives in the study area.

Comments pertaining to noise and vibration were received in response to the Notice of Preparation for this EIR or during the public scoping meeting held for this EIR. These comments focused on the following issues: (1) noise generated by trains near new stations along Interstate Highway (I-) 580; (2) cumulative noise impacts from trains and other transportation sources (as well as suggested mitigation strategies) along the proposed routes; and (3) noise from vehicles traveling to the proposed station. Scoping comments included a suggestion to provide a sound wall on I-580. Potential noise impacts of transit operations are addressed in **Impact NOI-3** of this section, while potential impacts of freeway noise resulting from the relocation of I-580 are addressed in **Impact NOI-5**, with required mitigations identified as appropriate.

2. Existing Conditions

This subsection describes the existing conditions for the characteristics of sound and noise, provides definitions and units of measurement for vibration, and then describes the local setting for existing noise and vibration sources, noise measurements, and sensitive receptors.

a. Characteristics of Sound and Noise

Sound is generated when an object vibrates and causes minute periodic fluctuations in atmospheric pressure. Human perception of sound depends on various factors, including frequency, magnitude, and duration. Frequency is the number of pressure variations per second (expressed in Hertz [Hz]). Humans can typically hear sound waves at frequencies of 20 to 20,000 Hz.

Because human hearing range is extensive, sound magnitude is measured in units of decibels (dB) on a logarithmic scale. The human ear does not perceive sound at the low

[3] Federal Transit Administration (FTA), 2006. Transit Noise and Vibration Impact Assessment, Final Report FTA-VA-90-1003-06. May.

and high frequencies as well as it perceives sound at the middle frequencies. To obtain a single number that better characterizes the noise level perceived by a human ear, a decibel scale called A-weighting (dBA) is typically used. On this scale, the low and high frequencies are given less weight than the middle frequencies.

Noise is the term generally given to the unwanted aspects of sound. Many factors influence how a sound is perceived and whether it is considered annoying to a listener. These factors include the physical characteristics of the sound (e.g., frequency, magnitude, duration) and non-acoustic factors (e.g., the acuity of a listener's hearing ability, the activity of the listener during exposure) that can influence the judgment of listeners on the sound's degree of undesirability. Excessive noise can negatively affect the physiological or psychological well-being of individuals and communities.

Many quantitative descriptors used in environmental noise assessments recognize the strong correlation between the high acoustical energy content of a sound (i.e., loudness and duration) and the disruptive effect it is likely to have as noise. Because environmental noise fluctuates over time, most descriptors average the sound level over the time of exposure, and some add penalties during the times of day when intrusive sounds would be more disruptive to listeners. The most commonly used descriptors are as follows:

- **Equivalent A-weighted noise level (L_{eq}).** The L_{eq} is an average or constant sound level over a given period that would have the same sound energy as the time-varying A-weighted sound over the same period. The period is typically taken over 1 hour and represented as L_{eq} (h).
- **Day-night average noise level (L_{dn}).** The L_{dn} is a 24-hour average sound level; however, for nighttime hours between 10:00 p.m. and 7:00 a.m., 10 dBA is added to the average. This additional 10 dBA accounts for increased human sensitivity to noise during the quieter nighttime hours.
- **Community noise equivalent level (CNEL).** The CNEL is similar to the L_{dn} except that, in addition to the 10-dBA penalty for noise between 10:00 p.m. and 7:00 a.m., a 5-dBA penalty is also applied to noise levels occurring from 7:00 p.m. to 10:00 p.m. Typically, the L_{dn} at a given location is within 1 dBA of the CNEL.
- **Maximum Sound Level (L_{max}).** The L_{max} is the maximum sound level during an event or test.

Figure 3.J-1 presents examples of typical noise levels from various transit and non-transit sources recognizable to most people. The figure shows that typical rail transit horns are louder than rail transit on aerial structures, which in turn are typically louder than rail transit at grade. In the case of noise for a railcar, one recent study measured the

maximum noise level from a BART railcar traveling 70 miles per hour (mph) as 70 dBA at 125 feet with no barrier present.[4]

b. Definition and Measurement of Vibration

While sound is the transmission of energy through the air, groundborne vibration is the transmission of energy through the ground or other solid medium, and is perceived by humans as motion (of the ground, floor, or building). Vibrations can also generate noise by transmitting energy through the air. Vibration magnitude as it affects humans is measured in vibration decibels (VdB). The typical vibration threshold for humans is 65 VdB or greater, with levels exceeding 75 VdB commonly considered annoying. Background vibration in residential areas is typically 50 VdB or lower (i.e., below the threshold). However, near rapid transit or light rail systems, vibration levels are usually 70 to 80 VdB.[5] Figure 3.J-1 also provides examples of typical vibration levels. Vibration events at a magnitude great enough to cause annoyance are not as common as noise that causes annoyance—e.g., vibrations do not generally cause an adverse reaction in people who are outdoors.

In addition to annoyance, extreme vibration levels can damage fragile structures. The potential for building damage from vibration is typically expressed in peak particle velocity (PPV), which is the maximum instantaneous peak of a vibration signal in inches per second (in/sec).

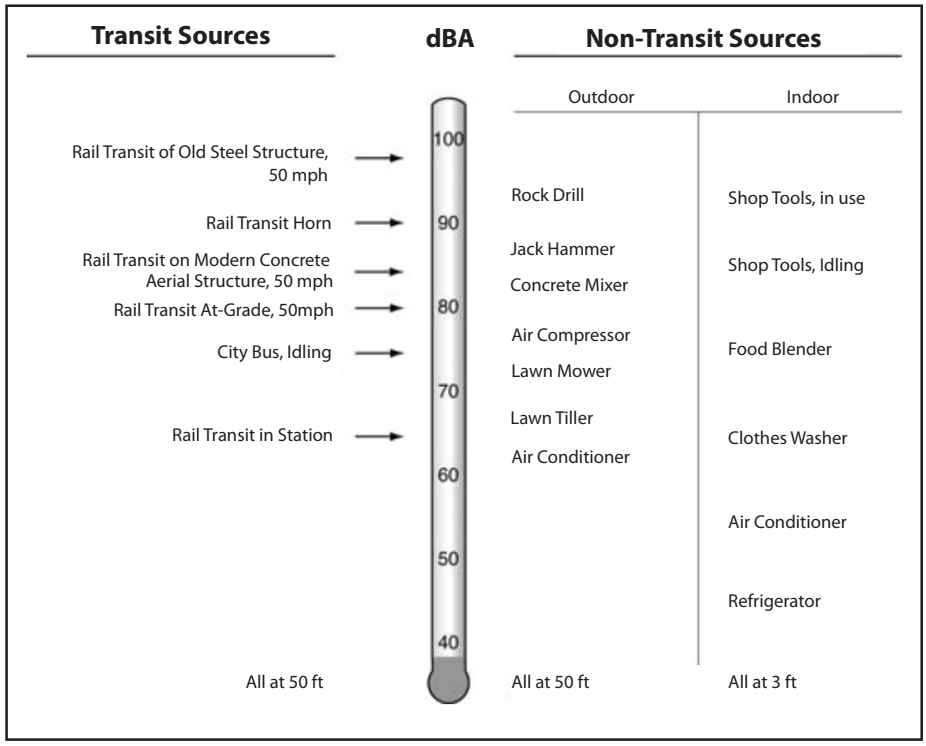
Vibration levels near transit systems are influenced by several factors, which may include the following:

- Vehicle design (e.g., suspension, wheel design)
- Guideway design (e.g., stiffness, type of joints)
- Geology (e.g., type and depth of soil)
- Receiving building design (e.g., wood, masonry)

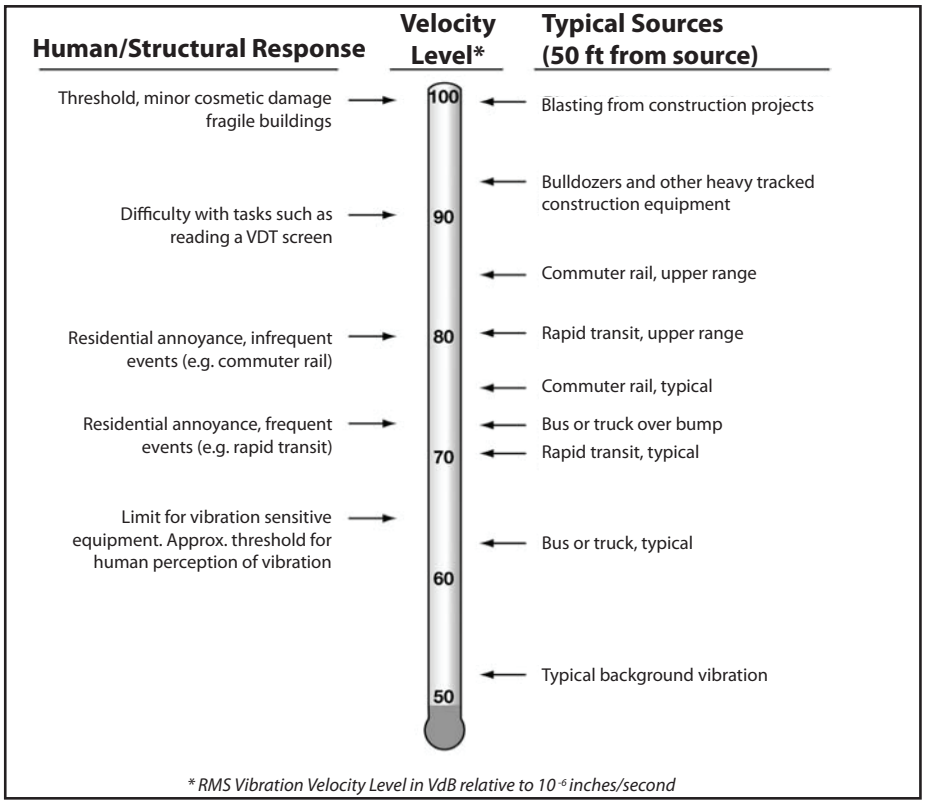
[4] Wilson Ihrig Associates (WIA), 2010. BART - Hayward Maintenance Complex Noise and Vibration Technical Report. May.

[5] Federal Transit Administration (FTA), 2006. Transit Noise and Vibration Impact Assessment, Final Report FTA-VA-90-1003-06. May.

Typical Noise Levels



Typical Vibration Levels



Notes: dBA = A-weighted decibels; VdB = Vibration decibels; RMS = Root mean square amplitude.

Source: FTA, 2006.

Figure 3.J-1
Noise and Vibration
Examples of Typical Noise and Vibration Levels

c. Local Setting

(1) Existing Noise and Vibration Sources

The dominant and consistent source of noise in the study area is on-road vehicle traffic. Sensitive receptors (i.e., land uses that are particularly sensitive to changes in the ambient noise environment, such as residential areas, schools, and hospitals) within the cities of Dublin, Pleasanton, and Livermore, and in Alameda County along the project corridor are exposed to noise originating from I-580 and local roadways. Aircraft activity at the Livermore Municipal Airport located near Airway Boulevard just south of I-580 also contributes to ambient noise levels in the vicinity.

Indoor vibration levels near traffic corridors are typically below 65 VdB (i.e., below the human perception threshold). Although poorly maintained, rough roads with heavy-duty vehicles can generate perceptible vibrations, such levels are more likely to be generated by construction equipment.

(2) Noise Measurements

Existing noise levels in the study area were measured with a sound level meter at the locations described in Table 3.J-1 and identified in Figure 3.J-2. These locations have noise levels representative of noise along the project corridor and are at or near sensitive receptors that would potentially be affected by the Proposed Project and Build Alternatives. A Metrosonics dB-308 sound level meter (Type II), calibrated on site, was used to take 24-hour measurements and short-term 20-minute measurements at these locations. The collected data include 1-hour L_{eq} and L_{max}, all quantified in dBA.

(3) Sensitive Receptors

The noise criteria used to determine the level of impact for transit projects were developed by the FTA and are specific to the type of land use that could be affected. Therefore, the discussion of existing conditions includes a description of land use types, with emphasis on those that include noise-sensitive receptors.

The FTA identifies three specific land use categories as sensitive receptors for assessing noise and vibration impacts for transit projects, as follows:

- Land use category 1 includes land where quiet is an essential element. This category includes land set aside for serenity and quiet, and land uses such as outdoor amphitheaters and concert pavilions, as well as National Historic Landmarks with significant outdoor use. Also included are recording studios and concert halls.

TABLE 3.J-1 SUMMARY OF AMBIENT NOISE MEASUREMENTS IN THE STUDY AREA

Location/Representative Project Element	Predominant Noise Source	Primary Land Use Category	Descriptor	Measured Value (dBA)
LT-1: 5200 Iron Horse Parkway, Dublin CA. Adjacent to an existing residential development (recently constructed). Nearest receptor to the existing Dublin/Pleasanton Station and proposed construction staging area. Due to security restrictions, long-term data were collected at a secure location approximately 600 feet to the east and then adjusted using short-term monitoring data for the receptor location, which has direct line-of-sight with the Dublin/Pleasanton Station. *This location is representative of area adjacent to the proposed platforms (DMU Alternative and Express Bus/BRT Alternative)*	I-580 and operations of the Dublin/Pleasanton Station	Mixed-Use Transit Village with Residential	24-hour L_{eq}	63
			Min. hourly L_{eq}	55
			L_{max}	78
			L_{dn}	66
			CNEL	67
LT-2: Pimlico Drive, Pleasanton, CA. Residential area approximately 170 feet south of I-580 centerline and approximately 1.5 miles east of the existing Dublin/Pleasanton Station. This location is protected from freeway noise by an existing sound wall. Noise reduction of the sound wall experienced by receptors in this area was captured by the monitor at this monitoring location. *This location is representative of area adjacent to the proposed rail extension (Proposed Project and DMU Alternative).*	Traffic from I-580	Residential	24-hour L_{eq}	59
			Min. hourly L_{eq}	52
			L_{max}	79
			L_{dn}	64
			CNEL	64
LT-3: Terminus of Gateway Avenue and Shea Center Drive, Livermore, CA. Representative of Shea Homes – Sage Project residential receptors and future potential residential neighborhood as identified in preliminary concept plans for the INP. *This location is representative of area north of the proposed rail extension and Isabel Station (Proposed Project and DMU Alternative).*	Traffic from Distant I-580	Residential	24-hour L_{eq}	56
			Min. hourly L_{eq}	48
			L_{max}	78
			L_{dn}	61
			CNEL	62
LT-4: Campus Hill Drive at Montage Neighborhood, Livermore, CA. Closest receptor to the access road for the proposed storage and maintenance facility (approximately 325 feet). *This location is representative of area north of the proposed rail extension and Isabel Station (Proposed Project and DMU Alternative).*	Traffic from I-580	Residential	24-hour L_{eq}	61
			Min. hourly L_{eq}	49
			L_{max}	97
			L_{dn}	64
			CNEL	65

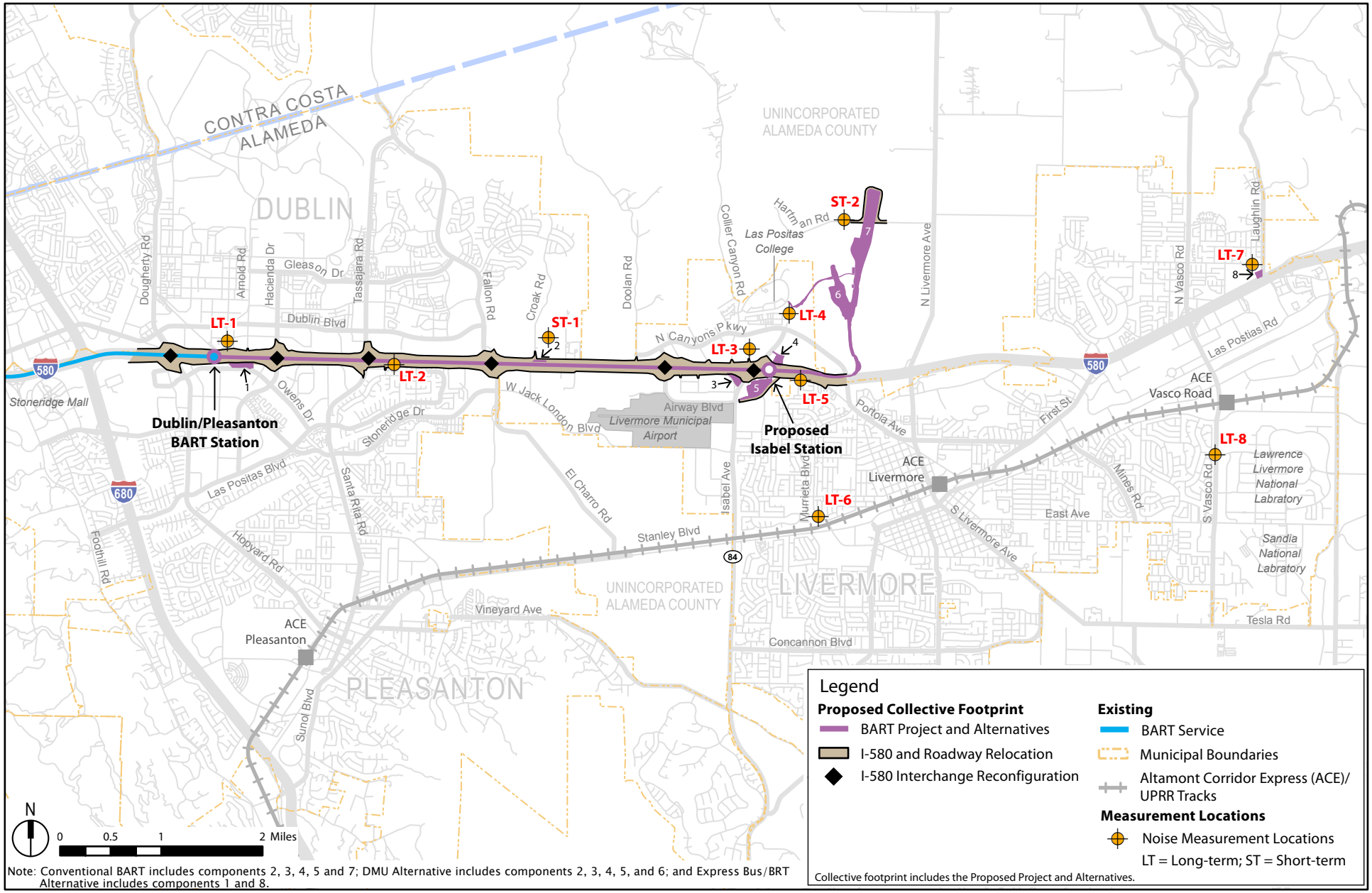
TABLE 3.J-1 SUMMARY OF AMBIENT NOISE MEASUREMENTS IN THE STUDY AREA

Location/Representative Project Element	Predominant Noise Source	Primary Land Use Category	Descriptor	Measured Value (dBA)
LT-5: Saddleback Circle and Sutter Street, Livermore, CA. Residential area closest to the proposed Isabel Station and parking structure (approximately 1,500 feet) and about 400 feet south of the I-580 centerline. This location is protected from freeway noise by an existing berm and partial sound wall, noise reductions from which were captured by the monitor. *This location is representative of area south of the proposed rail extension and Isabel Station (Proposed Project and DMU Alternative).*	Traffic from I-580	Residential	24-hour L_{eq}	62
			Min. hourly L_{eq}	55
			L_{max}	88
			L_{dn}	66
			CNEL	67
LT-6: Murrieta Boulevard South of Jack London Boulevard, Livermore, CA. Adjacent to LAVTA bus route 12. Adjacent receptors are protected from roadway noise by an existing sound wall, from which noise reductions were not captured by the monitor due to access restrictions. The sound wall is anticipated to reduce noise levels at adjacent receptors by at least an additional 5 dBA. *This location is representative of residences adjacent to roadways experiencing increased bus service (Proposed Project and Build Alternatives).*	Traffic from Murrieta Boulevard	Residential	24-hour L_{eq}	62
			Min. hourly L_{eq}	50
			L_{max}	97
			L_{dn}	66
			CNEL	66
LT-7: West of Laughlin Road, Livermore CA. Adjacent to existing residential development. *This location is representative of residences in the vicinity of the Laughlin parking lot (Express Bus/BRT Alternative).*	Traffic from Laughlin Road and Distant I-580	Residential	24-hour L_{eq}	57
			Min. hourly L_{eq}	53
			L_{max}	76
			L_{dn}	64
			CNEL	64
LT-8: South Vasco Road at Daphne Drive, Livermore, CA. Residential receptors adjacent to the proposed X-B Express Bus route. Adjacent receptors are protected from roadway noise by an existing sound wall, from which noise reductions were not captured by the monitor due to access restrictions. The sound wall is anticipated to reduce noise levels at adjacent receptors by at least an additional 5 dBA. *This location is representative of residences adjacent to roadways experiencing increased bus service (Proposed Project and Build Alternatives).*	Traffic from Vasco Road	Residential	24-hour L_{eq}	66
			Min. hourly L_{eq}	54
			L_{max}	95
			L_{dn}	69
			CNEL	70

TABLE 3.J-1 SUMMARY OF AMBIENT NOISE MEASUREMENTS IN THE STUDY AREA

Location/Representative Project Element	Predominant Noise Source	Primary Land Use Category	Descriptor	Measured Value (dBA)
ST-1: 3457 Croak Road, Dublin, CA. Lone unoccupied farmhouse approximately 680 feet from proposed BART crossover. *This location is representative of residences adjacent to proposed wayside facility (Proposed Project and DMU Alternative).*	Traffic from I-580	Residential and agricultural use	Peak hour L_{eq}/ Estimated L_{dn}	66/70
ST-2: Eastern Terminus of Hartman Road, Alameda County. Agricultural rural farmhouses approximately 600 feet west of proposed storage and maintenance facility. *This location is representative of residences adjacent to proposed storage and maintenance facility (Proposed Project).*	Livestock; Infrequent traffic on Hartman Road	Agricultural use with rural farmhouses	Daytime L_{eq}	50

Notes: LT = long-term (24-hour) noise measurement location; ST = short-term (20-minute) noise measurement location; dBA = A-weighted decibels; L_{eq} = average or constant sound level; L_{max} = maximum sound level; L_{dn} = day-night noise level; CNEL = Community noise equivalent level; I- = Interstate Highway; LAVTA = Livermore-Amador Valley Transit Authority.
Measurements were taken on the following dates: September 12, 2016 (for LT-1 and LT-2); September 14, 2016 (LT-3, LT-4, and LT-5); September 16, 2016 (LT-6, LT-7, and LT-8); February 15, 2017 (ST-1); and May 2, 2017 (ST-2).



Note: Conventional BART includes components 2, 3, 4, 5 and 7; DMU Alternative includes components 2, 3, 4, 5, and 6; and Express Bus/BRT Alternative includes components 1 and 8.

Source: Arup, 2017.

Figure 3.J-2
Noise and Vibration
Noise Measurement Locations

- Land use category 2 includes residences and buildings where people normally sleep. This category includes homes, hospitals, and hotels where nighttime sensitivity to noise is assumed to be of the utmost importance.
- Land use category 3 includes institutional land uses with primarily daytime and evening use. This category includes schools, libraries, theaters, and churches where it is important to avoid interference with activities such as speech, meditation, and reading. Meditation or study areas associated with cemeteries, monuments, museums, campgrounds, and recreational facilities are also within this category, as are some historical sites and parks.

Table 3.C-1 in Section 3.C, Land Use and Agricultural Resources, of this EIR identifies the land uses in the collective footprint and Table 3.C-2 shows the land use designations in the study area. Figures 3.C-1a and 3.C-1b show the key land uses along the project corridor.

Table 3.J-2 below also lists noise sensitive receptors near the Proposed Project and Build Alternatives. The receptors identified in this table may differ from those in other analysis sections because the FTA has established receptor types and screening distances that determine the study area for noise impact assessment. Parks used primarily for active recreation are not considered noise-sensitive. However, parks used for passive recreation such as reading, conversation, and meditation are generally considered to be noise-sensitive locations.

TABLE 3.J-2 REPRESENTATIVE SENSITIVE RECEPTORS WITHIN STUDY AREA

Sensitive Receptor Type	Name	Address	Land Use Category	Representative Noise Measurement Location
Multi-family Residential Complex	Avalon Condominiums	5200 Iron Horse Parkway, Dublin	Category 2	LT-1
Residential Neighborhood	Fairlands/Pleasanton Meadow Neighborhood	Santa Rita Road to Las Positas Drive, South of I-580, Pleasanton	Category 2	LT-2
School (Private)	Pleasanton Kindercare (pre-K)	3760 Brockton Drive, Pleasanton	Category 3	LT-2
Senior Residential Facility	Stoneridge Creek Retirement Community	3300 Stoneridge Creek Way, Pleasanton	Category 2	LT-2
Future Residential Neighborhood	Shea Homes – Sage Project	Shea Center Drive to Portola Avenue, Livermore	Category 2	LT-3
Residential Neighborhood	Montage Neighborhood	Between Las Positas College and Portola Avenue	Category 2	LT-4
Residential Neighborhood	Somerset Neighborhood	Sutter Street to Montecito Circle, Livermore	Category 2	LT-5
Residential Neighborhood	Summerset and Northside Neighborhoods	Both sides of Murietta Boulevard between E. Jack London and E. Stanley Boulevards, Livermore	Category 2	LT-6
Residential Neighborhood	Northeastern Residential Neighborhoods	Vasco Road to Laughlin Road, Livermore	Category 2	LT-7
Residential Neighborhood	Coventry and Stratford Park Neighborhoods	West of Vasco Road between Patterson Pass Road and East Avenue, Livermore	Category 2	LT-8
Single Family Residential	Rural Farmhouse	3457 Croak Road, Dublin, CA	Category 2	ST-1
Single family residential	Rural Agricultural Farmhouse Cluster	Western end of Hartman Road, unincorporated Alameda County	Category 2	ST-2

Notes: LT = Long-term (24-hour) noise measurement location; ST = short-term (20-minute) noise measurement location; I- = Interstate Highway.

3. Regulatory Framework

This subsection discusses the federal environmental laws and policies relevant to noise and vibration. Local regulations are not described here because BART is exempt from the requirements of city and county general plans, land use policies, and ordinances, per California Government Code Sections 53090 and 53091. In addition, FTA guidance recognizes that "Generally, local noise ordinances are not very useful in evaluating construction noise. They usually relate to nuisance and hours of allowed activity and sometimes specify limits in terms of maximum levels, but are generally not practical for assessing the impact of a construction project."

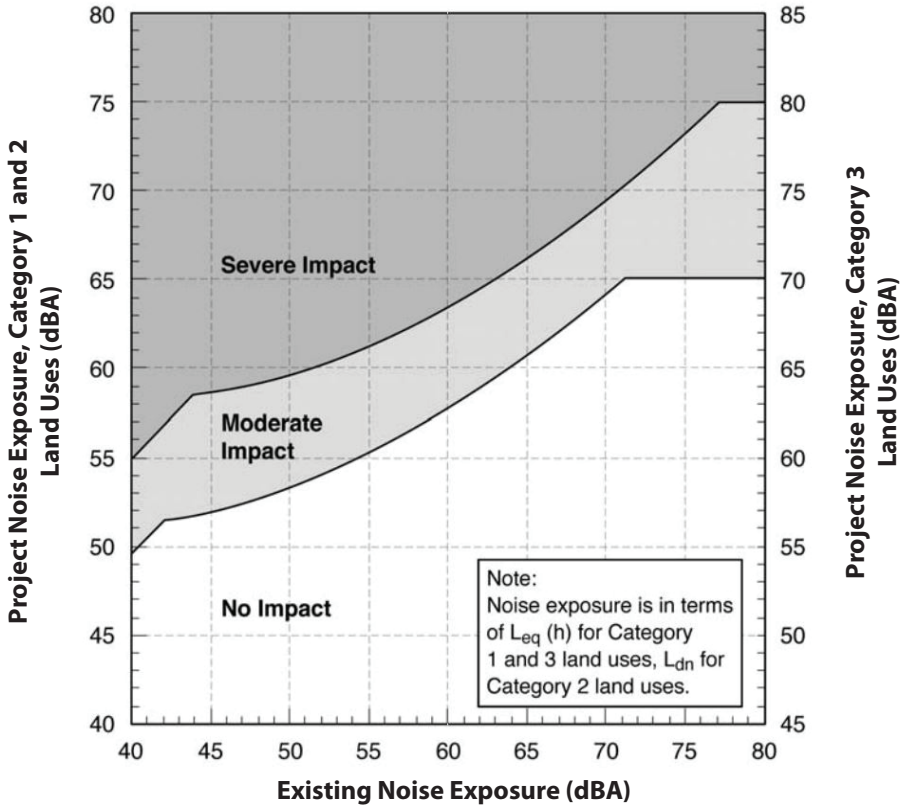
The FTA's Transit Noise and Vibration Impact Assessment is specifically developed for determining significant noise and vibration impacts for mass transit projects involving rail or bus facilities, and includes noise impact criteria, as shown in Figure 3.J-3.[6] BART has adopted the FTA construction and operational noise criteria as impact thresholds for the analysis of noise impacts. These thresholds—which are land-use-specific according to the categories discussed in the Sensitive Receptors subsection above—apply to all rail projects (e.g., rail rapid transit, light rail transit, commuter rail, automated guideway transit) as well as fixed facilities (e.g., storage and maintenance facilities, passenger stations and terminals, parking facilities, substations). The criteria may also be used for bus projects operating on local streets and separate roadways built exclusively for buses. The L_{dn} noise descriptor is used for Category 2, because it accounts for greater human sensitivity to nighttime noise, which would be most likely to disrupt sleep at the affected sensitive land uses. The criteria for Categories 1 and 3 are based on the hourly L_{eq} noise descriptor for the noisiest hour of transit-related activities, which could affect essential activities at the sensitive land uses.

The methodology of both the FTA and the Federal Interagency Committee on Noise[7] uses more stringent thresholds for environments that are already noise impacted. Consequently, for noise environments where the ambient noise level is 65 dBA day-night average sound level or less, the significance threshold applied is less than in noise environments where the ambient noise level exceeds 65 dBA day-night average sound level, as also shown in Figure 3.J-3.

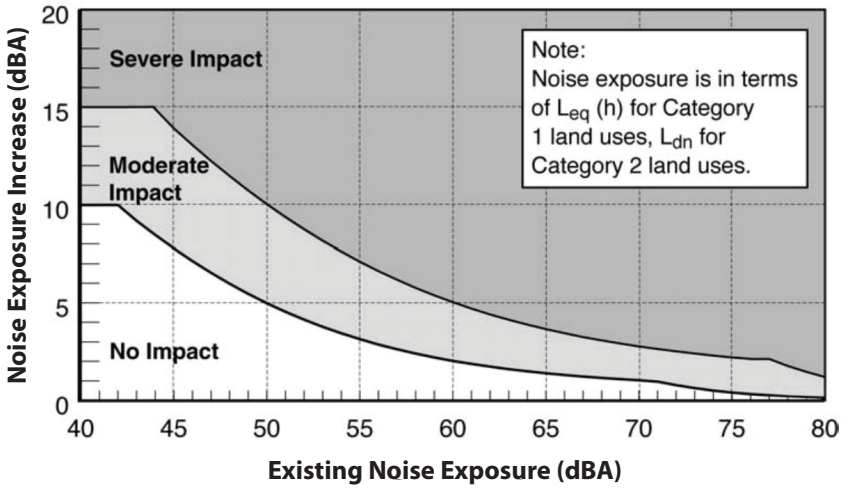
The FTA criteria for groundborne vibration and resulting groundborne noise impacts are identified in Table 3.J-3. Groundborne noise occurs when vibrations transmitted through the ground result in secondary radiation of noise. Groundborne noise is generally

[6] Ibid.
[7] Federal Interagency Committee on Noise, 1992. Federal Agency Review of Selected Airport Noise Analysis Issues. August.

Allowed Increase for Individual Projects



Allowed Increase in Cumulative Noise Levels



Source: FTA, 2006.

BART to Livermore Extension Project EIR

Figure 3.J-3
Noise and Vibration
FTA Noise Impact Criteria for Transit Projects

TABLE 3.J-3 GROUNDBORNE VIBRATION AND NOISE IMPACT CRITERIA

Land Use Category	Groundborne Vibration Impact Levels (VdB)			Groundborne Noise (dBA)
	Frequent Events[a]	Occasional Events[b]	Infrequent Events[c]	
Category 1: Buildings where vibration would interfere with interior operations (research facilities, hospitals with vibration sensitive equipment)	65 VdB[d]	65 VdB[d]	65 VdB[d]	N/A
Category 2: Residences and buildings where people normally sleep	72 VdB	75 VdB	80 VdB	35
Category 3: Institutional land uses with primarily daytime uses (schools, churches)	75 VdB	78 VdB	83 VdB	40

Notes: VdB = Vibration decibels, referenced to 1 microinch per second; N/A = not applicable.
[a] Frequent events are defined as more than 70 vibration events of the same source per day.
[b] Occasional events are defined as 30 to 70 vibration events of the same source per day.
[c] Infrequent events are defined as fewer than 30 vibration events of the same kind per day.
[d] This criterion limit is based on levels that are acceptable for most moderately sensitive equipment such as optical microscopes. Vibration-sensitive manufacturing or research requires detailed evaluation to define the acceptable vibration levels. Ensuring lower vibration levels in a building often requires special design of the heating, ventilation, and air conditioning systems and stiffened floors.
Source: Federal Transit Administration (FTA), 2006.

associated with transit trains through tunnels and underground blasting activities, neither of which is proposed as part of this project; therefore, this analysis focuses on groundborne vibration. Similar to the noise criteria, the criteria presented in Table 3.J-3 are based on type of land use. Category 1 land uses include hospitals and manufacturing facilities that have vibration-sensitive equipment. All types of residential land uses are considered Category 2. Category 3 land uses are institutional, with facilities used primarily during the day, such as schools and churches.

4. Impacts and Mitigation Measures

This subsection lists the standards of significance used to assess impacts, discusses the methodology used in the analysis, describes the analysis scenarios, summarizes the impacts, and then provides an in-depth analysis of the impacts with mitigation measures identified as appropriate.

a. Standards of Significance

For the purposes of this EIR, impacts associated with noise and vibration are considered significant if the Proposed Project or one of the Alternatives would result in any of the following:

- Expose persons to or generate noise levels in excess of standards established by the FTA
- Expose persons to or generate excessive groundborne vibration or groundborne noise levels
- Cause a substantial permanent increase in ambient noise or vibration levels in the project vicinity above levels existing without the project
- Cause a substantial temporary or periodic increase in ambient noise or vibration levels in the project vicinity above levels existing without the project
- If located within an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport, expose people residing or working in the project area to excessive noise levels
- If located within the vicinity of a private airstrip, expose people residing or working in the project area to excessive noise levels

b. Impact Methodology

The methodology used to evaluate the significance of noise and vibration impacts is described for construction, followed by operations, below. The EMU Option would result in the same impacts as the DMU Alternative; therefore, the analysis and conclusions for the DMU Alternative also apply to the EMU Option, except where specifically noted in the analysis below. In these cases, the impacts associated with the EMU Option are described immediately following the analysis of the DMU Alternative.

(1) Construction

Construction noise and vibration criteria are described below.

(a) Construction Noise

The FTA noise impact criteria used to assess construction impacts are identified in Table 3.J-4. These criteria are absolute contribution values from construction activity, and are independent of existing background noise levels.

Construction-related noise for the Proposed Project and Build Alternatives was assessed using the general assessment methodology of the FTA guidance.[8] The assumptions for a general assessment include full power operation for a 1-hour period for each piece of construction equipment. For the purposes of the analysis, construction equipment was assumed to be operated at the center of the project site (e.g., for construction of a station or storage and maintenance facility) or in the centerline of a railway alignment construction project. The analysis also assumed simultaneous operation of the two loudest pieces of construction equipment that could be used in each construction phase. Resultant noise levels were calculated for the nearest sensitive receptors, accounting for distance and intervening barriers.

If the FTA criteria (presented in Table 3.J-4) are exceeded, adverse noise impacts could occur.

TABLE 3.J-4 CONSTRUCTION NOISE IMPACT CRITERIA

	Maximum 1-Hour dBA L_{eq}	
Land Use	**Day**	**Night**
Residential	90	80
Commercial	100	100
Industrial	100	100

Notes: dBA = A-weighted decibels; L_{eq} = average or constant sound level;
Day = 7:00 a.m. to 10 p.m.; Night = 10 p.m. to 7:00 a.m.
Source: Federal Transit Administration (FTA), 2006.

(b) Construction Vibration

Vibration levels generated by construction activities exceeding those in Table 3.J-5 are considered significant for the purposes of assessing potential building damage. Additionally, vibration levels generated by construction activities exceeding those in Table 3.J-3 are considered significant for the purposes of assessing the potential for human annoyance. Pile driving is considered a "Frequent Event" due to the repetition of pile strikes. All other vibration-inducing construction equipment activity such as drilling or operation of dozers or roller compacters is considered an "Occasional Event."

[8] Federal Transit Administration (FTA), 2006. Transit Noise and Vibration Impact Assessment, Final Report FTA-VA-90-1003-06. May.

Construction-related vibration was also assessed using the general assessment methodology of the FTA guidance. For evaluating potential annoyance or interference with vibration-sensitive activities due to construction vibration, the criteria for General Assessment in Table 3.J-3 can be applied. In most cases, however, the primary concern regarding construction vibration relates to potential building damage effects. Vibration damage criteria identified by the FTA are presented in Table 3.J-5.

TABLE 3.J-5 CONSTRUCTION VIBRATION IMPACT CRITERIA FOR BUILDING DAMAGE

Building Category	PPV (in/sec)	VdB
I. Reinforced-concrete, steel, or timber (no plaster)	0.5	102
II. Engineered concrete and masonry (no plaster)	0.3	98
III. Non-engineered timber and masonry buildings	0.2	94
IV. Buildings extremely susceptible to vibration damage.	0.12	90

Notes: in/sec = inches per second; PPV = peak particle velocity; VdB = vibration decibels (referenced to 1 microinch per second).
Source: Federal Transit Administration (FTA), 2006.

(2) Operations

Operations-related noise and vibration criteria are described below.

(a) Operational Noise

The first step in analyzing potential noise impacts from transit projects is to establish the screening distances applicable to the proposed facilities. Table 3.J-6 presents the FTA-recommended screening distances for different transit facility types relevant to the Proposed Project and Build Alternatives. If it is determined that no sensitive land uses are within the distances noted in Table 3.J-4, no further noise analysis is required.[9]

Existing Noise Environment

To determine the applicable FTA significance threshold, the noise measurements presented in Table 3.J-1 were used to define existing noise levels at the receptors closest to the project alignment, which are as close as 170 feet away from proposed mainline tracks (for the Proposed Project, DMU Alternative, and EMU Option). These noise levels account for existing traffic and/or trains and the presence of sound walls, depending on

[9] Ibid.

the location. For example, some noise measurements were made immediately adjacent to I-580, and thus are dominated by freeway traffic noise.

TABLE 3.J-6 SCREENING DISTANCES FOR OPERATIONAL NOISE ASSESSMENT

		Screening Distance (feet)	
FTA Project Facility Type	**Applicable to Proposed Project or Alternative**	**Unobstructed**	**With Intervening Buildings**
Commuter Rail Mainline	DMU Alternative	750	375
Commuter Rail Station with horn blowing	DMU Alternative	1,600	1,200
Rail Rapid Transit	Proposed Project and EMU Option	700	350
Rail Rapid Transit Station	Proposed Project and EMU Option	200	100
Access Roads	Proposed Project, DMU Alternative, and EMU Option	100	50
Yards and Shops	Proposed Project, DMU Alternative, and EMU Option	1,000	650
Parking Facilities	Proposed Project, DMU Alternative, EMU Option, Express Bus/BRT Alternative	125	75
Power Substations	Proposed Project, DMU Alternative, and EMU Option	250	125
Busways	Enhanced Bus Alternative		
Bus Rapid Transit on Exclusive Roadway	Express Bus/BRT Alternative	200	100
Park & Ride Lot with Buses	Proposed Project, DMU Alternative, EMU Option, Express Bus/BRT Alternative	225	150

Note: Screening distances are measured from centerline of guideway/roadway for mobile sources and from center of noise-generating activity for stationary sources.
Source: Federal Transit Administration (FTA), 2006.

Future background noise levels are expected to intensify due to continued land use development in the surrounding area, which will likely generate increased traffic on I-580. Where background noise is low, noise sources from the Proposed Project and Build Alternatives would have a greater effect on total future noise levels. The criteria listed in Table 3.J-7 show that, in environments with existing low ambient noise levels, noise from

the Project and Build Alternatives would be more noticeable; thus, significant impacts on sensitive receptors would occur at correspondingly lower noise levels.

TABLE 3.J-7 OPERATIONAL NOISE IMPACT CRITERIA

Existing Noise Exposure, L_{eq} or L_{dn} (dBA)[a]	Project Noise Impact Exposure (Contribution), L_{eq} or L_{dn} (dBA)[a]					
	Category 1 or 2 Sites[b]			Category 3 Sites[b]		
	No Impact	Moderate Impact	Severe Impact	No Impact	Moderate Impact	Severe Impact
55	<56	56–61	>61	<61	61–66	>66
56	<56	56–62	>62	<61	61–67	>67
57	<57	57–62	>62	<62	62–67	>67
58	<57	57–62	>62	<62	62–67	>67
59	<58	58–63	>63	<63	63–68	>68
60	<58	58–63	>63	<63	63–68	>68
61	<59	59–64	>64	<64	64–69	>69
62	<59	59–64	>64	<64	64–69	>69
63	<60	60–65	>65	<65	65–70	>70
64	<61	61–65	>65	<66	66–70	>70
65	<61	61–66	>66	<66	66–71	>71
66	<62	62–67	>67	<67	67–72	>72
67	<63	63–67	>67	<68	68–72	>72
68	<63	63–68	>68	<68	68–73	>73
69	<64	64–69	>69	<69	69–74	>74
70	<65	65–69	>69	<70	70–74	>74
71	<66	66–70	>70	<71	71–75	>75

Notes: dBA = A-weighted decibels; L_{eq} = average or constant sound level; L_{dn} = Day-night noise level.
[a] L_{dn} is used for land use where nighttime sensitivity is a factor. L_{eq} (during the hour of maximum transit) noise exposure is used for land use involving only daytime activities. The values under Project Noise Impact Exposure refer to noise level contribution generated by the project only and do not include other sources of noise. Other existing noise sources are taken into account in the values listed under Existing Noise Exposure.
[b] Category 1 includes uses where quiet is an essential element in their intended purpose, such as indoor concert halls or outdoor concert pavilions or National Historic Landmarks where outdoor interpretation routinely takes place. Category 2 includes residences and buildings where people sleep. Category 3 includes institutional land uses with primarily daytime and evening use such as schools, places of worship and libraries.
Source: Federal Transit Administration (FTA), 2006.

For example, where the existing noise level is 60 dBA, a moderate impact would occur if a project contributes 58 dBA. However, where the existing noise level is 55 dBA, a moderate impact would occur if a project contributes 56 dBA. The overall effect is to permit a smaller increase in total noise levels in environments where the existing ambient noise levels are higher. When determining the significance of future impacts, background noise

was assumed to remain at existing levels to conservatively describe the effect of noise increases from the Proposed Project and Build Alternatives.

Impact Criteria

For operational impacts of transit operations—including rail operations, horns, yards, shops, parking facilities, and supporting ancillary equipment—noise criteria are based on the FTA guidelines.[10] Potential noise impacts from changes in motor vehicle traffic are assessed separately, as discussed below.

Noise levels resulting in Moderate Impact or Severe Impact, as defined by the FTA, are shown in Table 3.J-7 and Figure 3.J-3. Note that the impact exposure criteria in the right columns of Table 3.J-7 are defined by the FTA in terms of project contribution, not overall resultant noise level. Noise levels resulting in a Severe Impact under FTA criteria are considered, in all cases, to be significant under CEQA. Noise levels resulting in a Moderate Impact under FTA criteria are considered to be potentially significant under CEQA, although site-specific circumstances are further considered to judge whether such increases would result in a perceptible and substantial noise increase over existing conditions. Factors relevant to such judgment include ambient noise levels from existing sources; proximity, sensitivity, and number of noise-sensitive receptors; degree of increase over ambient noise levels; and other site-specific factors that could result in a perceptible and substantial noise increase over existing conditions.

Noise from the Proposed Project and Build Alternatives

Noise levels (L_{dn}) from rail operations (Proposed Project, DMU Alternative, and EMU Option, as well as the Express Bus/BRT Alternative) are calculated using the methods and equations contained in the FTA guidance. Table 3.J-8 summarizes the parameters used for calculating noise from the BART trains and DMU trains. As described in Chapter 2, Project Description, guideways for the Proposed Project and DMU Alternative would be constructed with ballast, which reduces noise levels by 3 dBA per FTA guidance, compared to concrete guideways. The ballast guideway is incorporated into this analysis for the DMU Alternative. Noise from EMU train operations is assumed to be equivalent to those of conventional light rail trains.

Noise from special trackwork such as a railroad switch is also considered in the analysis. When a train crosses special trackwork, the gap over the switch generates additional noise. For rail operations, the noise from such trackwork can be treated as a stationary source with a reference sound exposure level of 100 dBA per the FTA guidance.

[10] Ibid.

TABLE 3.J-8 SUMMARY OF KEY PARAMETERS FOR OPERATIONAL NOISE ANALYSIS OF BART AND DMU TRAINS

	2025		2040	
Parameter	**Conventional BART Project**	**DMU Alternative (same for EMU Option)**	**Conventional BART Project**	**DMU Alternative (same for EMU Option)**
Reference Sound Exposure Level dBA at 50 feet[a]	79	82	79	82
Number of cars per train during peak hour	10	8	10	8
Average number of cars per train during daytime (7:00 a.m. to 10:00 p.m.)	7.5	5.1	8.1	5.1
Average number of cars per train during nighttime (10:00 p.m. to 7:00 a.m.)	8.5	5.6	8.2	5.6
Peak hour volume of trains	8	8	10	10
Average hourly daytime volume of trains (7:00 a.m. to 10:00 p.m.)	7.6	7.6	7.9	7.9
Average hourly nighttime volume of trains (10:00 p.m. to 7:00 a.m.)	7.3	7.3	6.8	6.8
Maximum train speed	80 mph	75 mph	80 mph	75 mph
Train speed at switches	50 mph	50 mph	50 mph	50 mph
Track type (e.g., welded, jointed)	welded	welded	welded	welded

Notes: dBA = A-weighted decibels; mph = miles per hour.
[a] BART reference sound exposure level from HMMH, 2003, where L_{max} measured 84 dBA at 50 feet for a single BART car traveling at 80 mph. Frequency and speed based on data from ARUP. Parameters account for trains traveling in both directions. For DMU, reference sound exposure level from FTA for DMU's, incorporating a 3-dBA reduction for use of ballast instead of concrete.
Sources: Harris Miller & Hanson, Inc. (HMMH), 2003; Connetics Transportation Group, 2017.

Note that the FTA reference noise levels for diesel trains assume an air horn, which is louder than a transit vehicle horn (such as BART has). However, for the purpose of this analysis, the horn noise levels were determined empirically by measuring the sound exposure level during BART train arrivals at an existing BART station. This measurement level has been incorporated into the analysis for the Proposed Project as well as the DMU Alternative (including EMU Option).

In addition to noise from trains running on tracks, the Proposed Project and Build Alternatives would generate noise from other sources, including maintenance activities. Noise levels from these sources may be predicted using reference noise levels inventoried by the FTA. Further, the Proposed Project and DMU Alternative would have substations located along the corridor; these are assessed by first applying the screening distances presented in Table 3.J-6. If a receptor would be located within the screening distance of a proposed high voltage or traction power substation, reference noise levels are used to estimate the resultant noise contribution at that receptor, which would then be compared to the noise impact criteria in Table 3.J-7.

Noise from Increased Vehicle Traffic

The assessment of noise increases from vehicular traffic was conducted by modeling existing and project-generated noise along the roadways that would be most affected by the Proposed Project and Build Alternatives, predominantly roadways that would be used to access the proposed Isabel Station and its parking facility (Proposed Project and DMU Alternative [including EMU Option]) and other parking facilities (Express Bus/BRT Alternative). Roadway noise modeling was undertaken using the Federal Highway Administration's (FHWA) Traffic Noise Prediction Model (108 model). This modeling included impacts from the relocation of I-580 lanes, which would occur under the Proposed Project, the DMU Alternative (including EMU Option), and the Express Bus/BRT Alternative. In particular, the assessment compared the potential overall increases in noise from total traffic volumes along roadways adjacent to sensitive receptors using traffic volumes predicted in the transportation analysis. Ultimately, the level of impact was determined based on the existing noise levels and the increase in noise levels due to the Proposed Project and Build Alternatives. For this analysis, FTA noise impact criteria for allowable increases in noise are applied, as presented in Table 3.J-9.

(b) Operational Vibration

Vibration from the Proposed Project and Build Alternatives was evaluated using the general vibration assessment approach described in the FTA guidance, which focuses on public disturbance from vibration. The guidance provides information on typical groundborne vibration levels for rapid transit, light rail vehicles, and locomotives as a function of distance. The FTA guidance considers vibration from light rail vehicles and rapid transit vehicles (such as BART) to be similar, and vibration from DMUs to be somewhere between rapid transit vehicles and locomotive-powered passenger trains.

The FTA guidance includes adjustment factors for speed and special trackwork (e.g., switches). In particular, the guidance recommends adding 4 VdB for vehicles traveling at 80 mph and 10 VdB for special trackwork.

TABLE 3.J-9 TRAFFIC NOISE IMPACT CRITERIA

L_{dn} or L_{eq} (rounded to nearest whole decibel)	
Existing Noise Exposure	**Allowable Noise Exposure Increase**
45-46	7
47	6
48-50	5
51-53	4
54-57	3
58-61	2
62-74	1
75 or over	0

Notes: L_{eq} = average or constant sound level; L_{dn} = day-night noise level.
Source: Federal Transit Administration (FTA), 2006.

According to the FTA guidance, groundborne vibration levels can be converted to groundborne noise depending on peak frequency of ground vibration. Typically, groundborne noise from surface track and subways can be estimated by subtracting 50 VdB and 35 VdB, respectively, from the groundborne vibration levels.

Vibration from rail operations can also cause damage to buildings. However, this impact is typically only a concern if the building is adjacent to the tracks and constructed of materials that are susceptible to cracking. Given that tracks are in the middle of I-580, there would be no structures adjacent to the tracks, and vibration impacts related to structural damage would not occur.

The 1,600-foot distance used to establish the study area perimeter was developed based on worst-case noise impact screening distance established by the FTA. As a practical matter, vibration attenuates more rapidly with distance than noise, so using this study area for vibration assessment is conservative. As stated in the Introduction subsection above, the FTA has established vibration-specific screening distance criteria, which are used as a first step to establishing the potential for vibration impacts to sensitive land uses.[11] Table 3.J-10 presents the FTA-recommended screening distances for vibration impacts. If it is determined that no sensitive land uses are within the distances noted in Table 3.J-10, no further vibration analysis is needed.[12] Vibration levels exceeding those in Table 3.J-3 during operations are considered significant. Considering the expected

[11] Ibid.
[12] Ibid.

frequency of trains operating under the Proposed Project (about 183 train trips per weekday) and the DMU Alternative (including EMU Option), the criteria under Frequent Events would apply.

TABLE 3.J-10 SCREENING DISTANCES FOR OPERATIONAL VIBRATION ASSESSMENT

	Screening Distance (feet)		
Type of Project Facility	**Category 1**	**Category 2**	**Category 3**
Rail Rapid Transit (Proposed Project and EMU Option)	600	200	120
Conventional Commuter Railroad (DMU Alternative)	600	200	120

Notes:
Category 1: Buildings where vibration would interfere with interior operations (research facilities, hospitals with vibration sensitive equipment)
Category 2: Residences and buildings where people normally sleep
Category 3: Institutional land uses with primarily daytime uses (schools, churches)
Source: Federal Transit Administration (FTA), 2006.

(c) Exposure to Noise from Public Airports or Private Airstrips

To address noise exposure impact from aircraft operations included with criteria in Appendix G of the CEQA Guidelines, noise exposure is assessed relative to worker exposure at the proposed Isabel Station and storage and maintenance facility. Exposure is assessed relative to land use compatibility standards for commercial land uses identified by the State of California (State) Governor's Office of Planning and Research in the General Plan Guidelines.[13] Noise exposure levels are estimated using data available in the latest Airport Land Use Compatibility Plan.[14]

c. No Project Conditions

The impacts analysis evaluates two separate years: 2025 (corresponding to the project opening) and 2040 (corresponding to the project horizon year). While the FTA-developed operational noise impact criteria in Table 3.J-7 are based on existing monitored noise levels, impacts related to permanent increases in noise from traffic increase on local roadways are evaluated against the No Project Conditions. Thus, for roadway noise impacts the 2025 Project and Build Alternatives are evaluated against the 2025 No Project

[13] State of California Governor's Office of Planning and Research, 2003. General Plan Guidelines.
[14] Alameda County Airport Land Use Commission, 2012. Livermore Executive Airport: Airport Land Use Compatibility Plan. August.

Conditions and the 2040 Project and Build Alternatives are evaluated against the 2040 No Project Conditions.

(a) No Project 2025 Conditions

Under 2025 No Project Conditions, highway relocation would not occur and noise increases experienced at sensitive land uses near the freeway would solely be the result of growth-induced traffic volumes.

The 2025 No Project Conditions assume the growth-induced traffic volumes between existing conditions and 2025 as determined in the transportation modeling (see Section 3.B, Transportation). Traffic data indicate a worst-case I-580 volume increase of 14 percent between Dougherty Road/Hopyard Road and Hacienda Drive near long-term noise measurement location LT-1. Applying the most recent verified truck percentage (5 percent) and conservatively assuming travel at the posted speed limit, modeled noise levels during the morning peak hour at LT-1 would increase by 0.6 dBA (60.4 to 61.0 dBA).

In addition, BART operations are considered to be the same under 2025 No Project Conditions as under existing conditions in terms of frequency of train headways.

(b) No Project 2040 Conditions

Under 2040 No Project Conditions, highway relocation would not occur and noise increases experienced at sensitive land uses near the freeway would solely be the result of growth-induced traffic volumes.

The 2040 No Project Conditions assume the cumulative growth-induced traffic volumes between 2025 No Project Conditions and 2040 as determined in the transportation modeling (see Section 3.B, Transportation). Traffic data indicate a worst-case I-580 volume increase of 16 percent between Dougherty Road/Hopyard Road and Hacienda Drive near long-term noise measurement location LT-1. Applying the most recent verified truck percentage (5 percent) and conservatively assuming travel at the posted speed limit, modeled noise levels during the morning peak hour at LT-1 would increase by 0.7 dBA (60.4 to 61.1 dBA).

In addition, under 2040 No Project Conditions, BART headways would increase during the morning and evening peak hours from eight trains per hour to ten trains per hour, as shown in Table 3.J-8. This would result in a marginal increase in noise levels at LT-1. FTA modeling methodology indicates that this increase in train frequency per hour would not meaningfully increase noise levels at receptors near the Dublin/Pleasanton Station.

d. Summary of Impacts

Table 3.J-11 summarizes the impacts of the Proposed Project and Alternatives described in the analysis below.

TABLE 3.J-11 SUMMARY OF NOISE AND VIBRATION IMPACTS

	Significance Determinations[a]				
Impacts	**No Project Alternative**	**Conventional BART Project**	**DMU Alternative (with EMU Option)[b]**	**Express Bus/BRT Alternative**	**Enhanced Bus Alternative**
Construction					
Project Analysis					
Impact NOI-1: Expose persons to or generate noise or vibration levels in excess of standards during construction	NI	LSM	LSM	LSM	LS
Cumulative Analysis					
Impact NOI-2(CU): Expose persons to or generate noise or vibration levels in excess of standards during construction under Cumulative Conditions	NI	LS	LS	LS	LS
Operational					
Project Analysis (2025 and 2040)					
Impact NOI-3: Expose persons to or generate noise levels from transit facilities in excess of standards under 2025 Project Conditions	NI	LS	LS	LS	LS
Impact NOI-4: Expose persons to or generate noise levels from transit facilities in excess of standards under 2040 Project Conditions	NI	LS	LS	LS	LS
Impact NOI-5: Result in a substantial permanent increase in ambient noise levels from roadway relocation and traffic distribution in the project vicinity under 2025 Project Conditions	NI	LSM	LSM	LS	LS

TABLE 3.J-11 SUMMARY OF NOISE AND VIBRATION IMPACTS

	Significance Determinations[a]				
Impacts	**No Project Alternative**	**Conventional BART Project**	**DMU Alternative (with EMU Option)[b]**	**Express Bus/BRT Alternative**	**Enhanced Bus Alternative**
Impact NOI-6: Result in a substantial permanent increase in ambient noise levels from roadway relocation and traffic distribution in the project vicinity under 2040 Project Conditions	NI	LSM	LSM	LS	LS
Impact NOI-7: Expose persons to or generate excessive groundborne vibration or groundborne noise levels under 2025 and 2040 Project Conditions	NI	LS	LSM (LS)	LS	LS
Impact NOI-8: Expose people to excessive noise levels if located within 2 miles of a public airport or public use airport or within the vicinity of a private airstrip under 2025 and 2040 Project Conditions	NI	NI	NI	NI	NI
Impact NOI-9: Expose persons to or generate noise levels in excess of standards established by the FTA from combined project sources in 2025 under Project Conditions	NI	LS	LS	LS	LS
Impact NOI-10: Expose persons to or generate noise in excess of standards established by the FTA from combined project sources in 2040 under Project Conditions	NI	LS	LS	LS	LS
Cumulative Analysis (2025 and 2040)					
Impact NOI-11(CU): Result in a substantial permanent increase in ambient noise levels in the vicinity under 2025 Cumulative Conditions	NI	LS	LS	LS	LS
Impact NOI-12(CU): Result in a substantial permanent increase in ambient noise levels in the vicinity under 2040 Cumulative Conditions	NI	LS	LS	LS	LS

TABLE 3.J-11 SUMMARY OF NOISE AND VIBRATION IMPACTS

	Significance Determinations[a]				
Impacts	No Project Alternative	Conventional BART Project	DMU Alternative (with EMU Option)[b]	Express Bus/BRT Alternative	Enhanced Bus Alternative
Impact NOI-13(CU): Expose persons to or generate noise levels in excess of standards established by the FTA with cumulative development under 2025 and 2040 Cumulative Conditions	NI	LS	LS	LS	LS
Impact NOI-14(CU): Expose persons to or generate cumulative vibration levels in excess of standards established by the FTA under 2025 and 2040 Cumulative Conditions	NI	LS	LS	LS	LS

Notes: NI = no impact; LS = less-than-significant impact, no mitigation required; LSM = less-than-significant impact with mitigation; FTA = Federal Transit Administration.
[a] All significance determinations listed in the table assume incorporation of applicable mitigation measures.
[b] If EMU Option impacts differ from those of the DMU Alternative, they are indicated in parentheses.

e. Environmental Analysis

Impacts pertaining to project construction are described below, followed by operations-related impacts.

(1) Construction Impacts

Impacts pertaining to project construction are described below, followed by cumulative construction impacts.

(a) Construction – Project Analysis

Impact NOI-1: Expose persons to or generate noise or vibration levels in excess of standards established by the FTA during construction.

(No Project Alternative: NI; Conventional BART Project: LSM; DMU Alternative: LSM; Express Bus/BRT Alternative: LSM; Enhanced Bus Alternative: LS)

As described in Chapter 2, Project Description, construction of the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative would occur over approximately 5 years,

with several concurrent phases of construction along the project corridor. The Enhanced Bus Alternative would entail limited construction activities over approximately 2 months.

Working hours would vary depending on the activities being performed. In general, construction activities would occur primarily during weekdays, typically between 7:00 a.m. and 7:00 p.m. However, many activities associated with relocation of I-580—including lane relocation, surface frontage road relocation, and the westbound I-580 BART underpass for the tail tracks—would occur at night (10:00 p.m. to 7:00 a.m.) to reduce impacts on traffic. Once the freeway lanes are relocated, work would be conducted during the day for the BART extension and station facilities. Weekend work could be required, although the extent of such work is not currently known. Potential construction-related noise impacts are assessed relative to both daytime and nighttime criteria of the FTA.

Sensitive receptors within the maximum FTA screening distance (1,600 feet) for the collective footprint are as follows: (1) there are no Category 1 receptors; (2) there are several Category 2 receptors (residences and buildings where people normally sleep), as listed in the tables below; (3) and there is one Category 3 receptor (Pleasanton Kindercare) for the Proposed Project and DMU Alternative only.

Noise associated with the construction would result from the operation of a range of noise-generating equipment—including dump trucks, scrapers, water trucks, bulldozers, graders, truck-mounted cranes, loaders, excavators, rollers, concrete mix trucks, lubrication/fueling service trucks, concrete pumps, diesel generators, and compressed air units. Of the anticipated construction equipment, pile drivers typically generate the greatest noise. In addition, haul trucks would bring in sub-ballast and structural concrete.

The study area contains many developed areas, comprising residential, parks, institutional, commercial, and industrial uses. The most stringent FTA significance criteria for construction noise and vibration is for residential areas, as shown in Table 3.J-9. Therefore, this analysis conservatively uses residential significance criteria.

The analysis provides the predicted distance at which the construction noise significance criteria adopted by the FTA would be exceeded for the two noisiest equipment types operating simultaneously, consistent with the FTA's General Assessment Methodology for construction impacts, which could include a pile driver. Pile driving is anticipated to occur at the following alignment segments/locations: East Airway Boulevard to Isabel Station, at the Isabel Station, and the Isabel Station South parking facilities.

Even without pile driving, impacts could be significant if undertaken near noise-sensitive receptors such as residential areas. The degree of the impact would depend on the number and type of equipment used on each segment at any particular time. The most significant impacts would potentially occur at night near residential areas, when these land uses are most sensitive. Other construction activities involving non-impact

construction equipment, such as relocation of frontage roads, could occur as close as approximately 50 feet from some residential areas.

No Project Alternative. Under the No Project Alternative, the BART to Livermore Extension Project would not be implemented and there would be no physical changes in the environment associated with construction of the Proposed Project or any of the Build Alternatives. However, planned and programmed transportation improvements for segments of I-580, local roadways and intersections, and core transit service improvements for BART, Altamont Corridor Express (ACE), and the Livermore-Amador Valley Transit Authority (LAVTA) would be constructed. In addition, population and employment increases throughout Alameda County would result in continued land use development, both residential and commercial. Construction of these improvements and development projects could generate noise or vibration levels in excess of standards established by the FTA. However, the effects of the other projects associated with the No Project Alternative have been or will be addressed in environmental documents prepared for those projects before they are implemented, and the No Project Alternative would not result in new impacts as a consequence of the BART Board of Directors' decision not to adopt a project. Therefore, the No Project Alternative is considered to have no impacts related to noise and vibration levels during construction. **(NI)**

Conventional BART Project. The noise generated from construction of the Proposed Project is described for each construction activity type below.

- **Noise Generated by BART Rail Construction and Associated Highway and Roadway Relocation.** As shown in Table 3.J-12, all predicted construction noise levels for the Proposed Project would be below the significance criteria at each receptor for all alignment segments, except for the following two locations:
  - (1) The Tassajara Road/Santa Rita Road to Fallon Road/El Charro Road segment, had a predicted noise level of 81.4 dBA L_{eq} that would not exceed the 90-dBA daytime threshold, but would exceed the 80-dBA residential nighttime threshold.
  - (2) The eastern extent of the East Airway Boulevard realignment, had a predicted noise level of 92.0 dBA L_{eq} would exceed the 90-dBA daytime threshold and the 80-dBA residential nighttime threshold.

  Therefore, construction along these segments would result in a potentially significant noise impact.

TABLE 3.J-12 CONVENTIONAL BART PROJECT – PREDICTED CONSTRUCTION NOISE LEVELS AT REPRESENTATIVE SENSITIVE RECEPTORS

Alignment Segment	Monitoring Point ID	Nearest Representative Sensitive Receptor in Study Area	Distance to Receptor from Alignment (feet)	Construction Noise Level (dBA L_{eq}) at 50 feet	Construction Noise Level (dBA L_{eq}) at Receptor	Noise at Sensitive Receptors Exceeding 90 dBA L_{eq} Daytime Threshold?	Noise at Sensitive Receptors Exceeding 80 dBA L_{eq} Nighttime Threshold?
Dougherty Road/ Hopyard Road to Hacienda Drive	LT-1	Residential	370	92.0	74.6	No	No
Hacienda Drive to Tassajara Road/Santa Rita Road	--	No receptors	--	--	--	No	No
Tassajara Road/Santa Rita Road Interchange	LT-2	Residential	1,100	92.0	65.2	No	No
Tassajara Road/Santa Rita Road to Fallon Road/El Charro Road	LT-2	Residential	170	92.0	**81.4**	No	**Yes**
Fallon Road/El Charro Road Interchange	--	No receptors	--	--	--	No	No
Fallon Road /El Charro Road to East Airway Boulevard	--	No receptors	--	--	--	No	No
East Airway Boulevard Interchange	--	No receptors	--	--	--	No	No
East Airway Boulevard to Isabel Avenue	LT-3	Residential	1,000	101.3	75.3	No	No
Isabel Avenue Interchange	LT-3	Residential	1,100	92.0	65.2	No	No
Proposed Isabel Station	LT-3	Residential	1,200	101.3	73.7	No	No
Isabel Station South Parking Facility	LT-5	Residential	950	101.3	75.7	No	No

TABLE 3.J-12 CONVENTIONAL BART PROJECT – PREDICTED CONSTRUCTION NOISE LEVELS AT REPRESENTATIVE SENSITIVE RECEPTORS

Alignment Segment	Monitoring Point ID	Nearest Representative Sensitive Receptor in Study Area	Distance to Receptor from Alignment (feet)	Construction Noise Level (dBA L_{eq}) at 50 feet	Construction Noise Level (dBA L_{eq}) at Receptor	Noise at Sensitive Receptors Exceeding 90 dBA L_{eq} Daytime Threshold?	Noise at Sensitive Receptors Exceeding 80 dBA L_{eq} Nighttime Threshold?
Isabel Station to Storage and Maintenance Facility	LT-5	Residential	430	92.0	73.3	No	No
East Airway Boulevard Realignment	LT-5	Residential	50	92.0	**92.0**	**Yes**	**Yes**
Storage and Maintenance Facility	ST-2	Residential	430	92.0	73.3	No	No

Notes: -- = not applicable; dBA = A-weighted decibels; L_{eq} = equivalent (average) noise level; LT = long-term noise measurement location; ST = short-term noise measurement location.
Bold/gray text indicates noise levels exceeding threshold.
The study area is the maximum Federal Transit Authority screening distance (within 1,600 feet of project centerline).
Sensitive receptors listed above are Category 2 receptors (residences and buildings where people normally sleep). In addition, one Category 3 receptor (Pleasanton Kindercare), represented by LT-2, is over twice as far from construction activities as the Monitoring Location LT-2; therefore, resultant noise levels would be at least 6 dBA less than those reported for LT 2. There are no Category 1 receptors in the study area.

- **Noise Generated by the Construction of the Proposed Isabel Station.** Construction noise would be generated at the proposed Isabel Station. As shown in Table 3.J-12, the nearest receptor (residential) is located approximately 1,200 feet from construction activities, which would include pile driving. However, at this distance, the noise level would attenuate to 73.7 dBA L_{eq}, which would not exceed the daytime or nighttime residential thresholds of 90 and 80 dBA, respectively.
- **Noise Generated by the Construction Proposed Isabel Station South Parking Facility.** The nearest receptor to the proposed parking garage would be residences approximately 950 feet southeast of the proposed structure. The noisiest construction activity would involve pile driving for the foundation of the garage. However, at this distance, the noise level would attenuate to 75.7dBA L_{eq}, which would not exceed the daytime and nighttime residential thresholds of 90 and 80 dBA, respectively.
- **Vibration Generated by BART Rail Construction and Associated Highway and Roadway Relocation**. Vibration associated with construction of the BART rail extension along the proposed alignment would result from the operation of the range of vibration-generating equipment specified for construction, including pile drivers, which typically generate the highest vibration levels. As shown in Table 3.J-13, only the eastern extent of the East Airway Boulevard realignment could exceed structural damage and annoyance criteria, while all predicted construction vibration levels for all other segments of the Proposed Project would be below the significance criteria at each receptor. Therefore, construction along East Airway Boulevard would result in a potentially significant vibration impact.
- **Conclusion.** As described above, under the Proposed Project the realignment of the eastern extent of East Airway Boulevard could exceed the applicable FTA criteria for noise generated by construction during daytime and nighttime hours and could exceed applicable FTA criteria for vibration generated by construction while all other segments of construction of the Proposed Project would not exceed the daytime noise criteria or vibration criteria. Noise from the BART rail construction and associated highway relocation would exceed the nighttime FTA criteria along the Tassajara Road/Santa Rita Road to Fallon Road/El Charro Road segment. Therefore, impacts related to construction noise levels and construction vibration would be potentially significant. This impact would be reduced to a less-than-significant level with implementation of **Mitigation Measure NOI-1**, which restricts construction activities at potentially affected locations to daytime hours and provides for alternative construction methodologies. **(LSM)**

TABLE 3.J-13 CONVENTIONAL BART – PREDICTED CONSTRUCTION VIBRATION LEVELS AT REPRESENTATIVE SENSITIVE RECEPTORS

Alignment Segment	Monitoring Point ID	Nearest Representative Sensitive Receptor in Study Area	Distance to Receptor from Alignment (feet)	Construction Vibration Level (PPV, in/sec) at 25 feet	Construction Vibration Level (PPV, in/sec) at Receptor	Exceeds 0.12 PPV in/sec Structural Damage Threshold?	Construction Vibration Level (VdB) at 25 feet	Construction Vibration Level (VdB) at Receptor	Exceeds 72 VdB Residential Human Annoyance Threshold?
Dougherty Road/ Hopyard Road to Hacienda Drive	LT-1	Residential	370	0.21	0.0037	No	94	59	No
Hacienda Drive to Tassajara Road/Santa Rita Road	--	No receptors	--	--	--	No	--	--	No
Tassajara Road/Santa Rita Road Interchange	LT-2	Residential	1,100	0.21	0.0028	No	94	57	No
Tassajara Road /Santa Rita Road to Fallon Road /El Charro Road	LT-2	Residential	170	0.21	0.00072	No	94	45	No
Fallon Road/El Charro Road Interchange	--	No receptors	--	--	--	No	--	--	No
Fallon Road/El Charro Road to East Airway Boulevard	--	No receptors	--	--	--	No	0	--	No
East Airway Boulevard Interchange	--	No receptors	--	--	--	No	0	--	No
East Airway Boulevard to Isabel Avenue	LT-3	Residential	1,000	0.644	.0025	No	104	56	No
Isabel Avenue Interchange	LT-3	Residential	1,100	0.21	0.00072	No	94	45	No

TABLE 3.J-13 CONVENTIONAL BART – PREDICTED CONSTRUCTION VIBRATION LEVELS AT REPRESENTATIVE SENSITIVE RECEPTORS

Alignment Segment	Monitoring Point ID	Nearest Representative Sensitive Receptor in Study Area	Distance to Receptor from Alignment (feet)	Construction Vibration Level (PPV, in/sec) at 25 feet	Construction Vibration Level (PPV, in/sec) at Receptor	Exceeds 0.12 PPV in/sec Structural Damage Threshold?	Construction Vibration Level (VdB) at 25 feet	Construction Vibration Level (VdB) at Receptor	Exceeds 72 VdB Residential Human Annoyance Threshold?
Proposed Isabel Station	LT-3	Residential	1,200	0.644	0.00019	No	104	54	No
Isabel Station South Parking Facility	LT-5	Residential	1,400	0.644	0.0015	No	104	52	No
Isabel Station to Storage and Maintenance Facility	LT-5	Residential	430	0.21	0.0029	No	94	57	No
East Airway Boulevard Realignment	LT-5	Residential	50	0.21	0.21	**Yes**	94	**94**	**Yes**
Storage and Maintenance Facility	ST-2	Residential	430	0.21	0.0029	No	94	57	No

Notes: -- = not applicable; LT = long-term noise measurement location; ST = short-term noise measurement location; in/sec = inches per second; PPV = peak particle velocity; VdB = vibration decibels.
Bold/gray text indicates noise levels exceeding threshold.
The study area is the maximum Federal Transit Authority screening distance (within 1,600 feet of project centerline).
Sensitive receptors listed above are Category 2 receptors (residences and buildings where people normally sleep). In addition, one Category 3 receptor (Pleasanton Kindercare), represented by LT-2, is over twice as far from construction activities as the Monitoring Location LT-2.

DMU Alternative. The noise and vibration generated from implementation of the DMU Alternative is described for each construction activity type below.

- **Noise Generated by DMU Rail Construction and Associated Highway and Roadway Relocation.** The DMU Alternative alignment would be similar to the Proposed Project; therefore, the locations of sensitive receptors would be the same for most segments. However, unlike the Proposed Project, the DMU Alternative would require construction activities west of the Dublin/Pleasanton Station and west of Dougherty Road. In addition, construction of the DMU transfer platform at the Dublin/Pleasanton Station would require pile driving.

  As shown in Table 3.J-14, all predicted construction noise levels for the DMU Alternative would be below the significance criteria at each receptor for all alignment segments, except for the following three locations:

  1. At the Dublin/Pleasanton Station, nighttime noise levels were predicted to be 83.9 dBA L_{eq} at receptor LT-1 due to construction of the DMU transfer platform, which would exceed the 80-dBA nighttime noise criteria.
  2. The Tassajara Road/Santa Rita Road to Fallon Road/El Charro Road segment, had a predicted noise level of 81.4 dBA L_{eq}, exceeding the 80-dBA residential nighttime threshold.
  3. The eastern extent of the East Airway Boulevard realignment, had a predicted noise level of 92.0 dBA L_{eq} would exceed the 90-dBA daytime threshold and the 80-dBA residential nighttime threshold.

  Therefore, construction along these segments would result in a potentially significant noise impact.

- **Noise Generated by the Construction of the Proposed Isabel Station South Parking Facility.** The nearest receptor to the proposed garage would be residences approximately 950 feet to the southeast. The noisiest construction activity would involve pile driving for the foundation of the garage. However, at this distance, the noise level would attenuate to 75.7 dBA L_{eq}, which would not exceed the daytime and nighttime residential thresholds of 90 and 80 dBA, respectively.

  Vibration Generated by DMU Alternative Construction and Associated Highway and Roadway Relocation. Vibration associated with the construction of the DMU Alternative would result from the operation of the range of vibration-generating equipment specified for construction, including pile drivers, which typically generate the highest vibration levels. As shown in Table 3.J-15, only the eastern extent of the East Airway Boulevard realignment could exceed structural damage and annoyance criteria, while all predicted construction vibration levels for all other segments of the DMU alignment would be below the significance criteria at each receptor. Therefore, construction along East Airway Boulevard would result in a potentially significant vibration impact.

TABLE 3.J-14 DMU ALTERNATIVE – PREDICTED CONSTRUCTION NOISE LEVELS AT REPRESENTATIVE SENSITIVE RECEPTORS

Alignment Segment	Monitoring Point ID	Nearest Representative Sensitive Receptor in Study Area	Distance to Receptor from Alignment (feet)	Construction Noise Level (dBA L_{eq}) at 50 feet	Construction Noise Level (dBA L_{eq}) at Receptor	Noise at Sensitive Receptors Exceeding 90 dBA L_{eq} Daytime Threshold?	Noise at Sensitive Receptors Exceeding 80 dBA L_{eq} Nighttime Threshold?
West of Dougherty Road to Dublin/Pleasanton Station	LT-1	Residential	370	92.0	74.6	No	No
Dougherty Road/Hopyard Road to Hacienda Drive	LT-1	Residential	370	92.0	74.6	No	No
Dublin/Pleasanton Station DMU Transfer Platform	LT-1	Residential	370	101.3	**83.9**	No	**Yes**
Hacienda Drive Interchange	--	No receptors	--	--	--	No	No
Hacienda Drive to Tassajara Road/Santa Rita Road	--	No receptors	--	--	--	No	No
Tassajara Road/Santa Rita Road Interchange	LT-2	Residential	855	92.0	67.3	No	No
Tassajara Road/Santa Rita Road to Fallon Road/El Charro Road	LT-2	Residential	170	92.0	**81.4**	No	**Yes**
Fallon Road/El Charro Road Interchange	--	No receptors	--	--	--	No	No
Fallon Road/El Charro Road to East Airway Boulevard	--	No receptors	--	--	--	No	No

TABLE 3.J-14 DMU ALTERNATIVE – PREDICTED CONSTRUCTION NOISE LEVELS AT REPRESENTATIVE SENSITIVE RECEPTORS

Alignment Segment	Monitoring Point ID	Nearest Representative Sensitive Receptor in Study Area	Distance to Receptor from Alignment (feet)	Construction Noise Level (dBA L_{eq}) at 50 feet	Construction Noise Level (dBA L_{eq}) at Receptor	Noise at Sensitive Receptors Exceeding 90 dBA L_{eq} Daytime Threshold?	Noise at Sensitive Receptors Exceeding 80 dBA L_{eq} Nighttime Threshold?
East Airway Boulevard Interchange	--	No receptors	--	--	--	No	No
East Airway Boulevard to Isabel Avenue	LT-3	Residential	1,000	101.3	75.3	No	No
Isabel Avenue Interchange	LT-3	Residential	1,100	92.0	65.2	No	No
Proposed Isabel Station	LT-3	Residential	1,200	101.3	73.7	No	No
Isabel Station South Parking Facility	LT-5	Residential	950	101.3	75.7	No	No
Isabel Station to Storage and Maintenance Facility	LT-5	Residential	430	92.0	73.3	No	No
East Airway Boulevard Realignment	LT-5	Residential	50	92.0	**92.0**	**Yes**	**Yes**
Storage and Maintenance Facility	LT-4	Residential	1,900	92.0	60.4	No	No

Notes: -- = not applicable; dBA = A-weighted decibels; L_{eq} = equivalent (average) noise level; LT = long-term noise measurement location.
Bold/gray text indicates noise levels exceeding threshold.
The study area is the maximum Federal Transit Authority screening distance (within 1,600 feet of project centerline).
Sensitive receptors listed above are Category 2 receptors (residences and buildings where people normally sleep). In addition, one Category 3 receptor (Pleasanton Kindercare), represented by LT-2, is over twice as far from construction activities as the Monitoring Location LT-2; therefore, resultant noise levels would be at least 6 dBA less than those reported for LT 2. There are no Category 1 receptors in the study area.
Noise Generated by the Construction of the Proposed Isabel Station. Construction noise would be generated for the construction of the proposed Isabel Station. As shown in Table 3.J-14, the nearest receptor (residential) is located approximately 1,200 feet from construction activities, which include pile driving. However, at this distance, the noise level would attenuate to 73.7 dBA L_{eq}, which would not exceed the daytime and nighttime residential thresholds of 90 and 80 dBA, respectively.

TABLE 3.J-15 DMU ALTERNATIVE – PREDICTED CONSTRUCTION VIBRATION LEVELS AT REPRESENTATIVE SENSITIVE RECEPTORS

Alignment Segment	Monitoring Point ID	Nearest Representative Sensitive Receptor in Study Area	Distance to Receptor from Alignment (feet)	Construction Vibration Level (PPV, in/sec) at 25 feet	Construction Vibration Level (PPV, in/sec) at Receptor	Exceeds 0.12 PPV in/sec Structural Damage Threshold?	Construction Vibration Level (VdB) at 25 feet	Construction Vibration Level (VdB) at Receptor	Exceeds 72 VdB Human Annoyance threshold?
West of Dougherty Road to Dublin/Pleasanton Station	LT-1	Residential	370	0.21	0.0036	No	94	59	No
Dougherty Road/Hopyard Road to Hacienda Drive	LT-1	Residential	370	0.21	0.0037	No	94	59	No
Dublin/Pleasanton Station DMU Transfer Platform	LT-1	Residential	370	0.21	0.0037	No	94	59	No
Hacienda Drive Interchange	--	No receptors	--	0.21	--	No	--	--	No
Hacienda Drive to Tassajara Road/Santa Rita Road	--	No receptors	--	0.21	--	No	--	--	No
Tassajara Road/Santa Rita Road Interchange	LT-2	Residential	855	0.21	0.00072	No	94	45	No
Tassajara Road/Santa Rita Road to Fallon Road/El Charro Road	LT-2	Residential	100	0.21	0.012	No	94	69	No
Fallon Road/El Charro Road Interchange	--	No receptors	--	--	--	No	--	--	No
Fallon Road/El Charro Road to East Airway Boulevard	--	No receptors	--	--	--	No	--	--	No
East Airway Boulevard Interchange	--	No receptors	--	--	--	No	--	--	No
East Airway Boulevard to Isabel Avenue	LT-3	Residential	1,000	0.644	0.0025	No	104	56	No
Isabel Avenue Interchange	LT-3	Residential	1,100	0.21	0.00072	No	94	45	No

TABLE 3.J-15 DMU ALTERNATIVE – PREDICTED CONSTRUCTION VIBRATION LEVELS AT REPRESENTATIVE SENSITIVE RECEPTORS

Alignment Segment	Monitoring Point ID	Nearest Representative Sensitive Receptor in Study Area	Distance to Receptor from Alignment (feet)	Construction Vibration Level (PPV, in/sec) at 25 feet	Construction Vibration Level (PPV, in/sec) at Receptor	Exceeds 0.12 PPV in/sec Structural Damage Threshold?	Construction Vibration Level (VdB) at 25 feet	Construction Vibration Level (VdB) at Receptor	Exceeds 72 VdB Human Annoyance threshold?
Proposed Isabel Station	LT-3	Residential	1,200	0.644	0.000194	No	104	54	No
Isabel Station South Parking Facility	LT-5	Residential	1,400	0.644	0.001537	No	104	52	No
Isabel Station to Storage and Maintenance Facility	LT-5	Residential	430	0.21	0.002944	No	94	57	No
East Airway Boulevard Realignment	LT-5	Residential	50	0.21	0.21	**Yes**	94	**94**	**Yes**
Storage and Maintenance Facility	LT-4	Residential	1,900	0.21	0.000317	No	94	38	No

Notes: -- = not applicable; LT = long-term noise measurement location; in/sec = inches per second; PPV = peak particle velocity; VdB = vibration decibels.
Bold/gray text indicates noise levels exceeding threshold.
The study area is the maximum Federal Transit Authority screening distance (within 1,600 feet of project centerline).
Sensitive receptors listed above are Category 2 receptors (residences and buildings where people normally sleep). In addition, one Category 3 receptor (Pleasanton Kindercare), represented by LT-1, is over twice as far from construction activities as the Monitoring Location LT-2.

- **Conclusion.** As described above, under the DMU Alternative, the realignment of the eastern extent of East Airway Boulevard could exceed the applicable FTA criteria for noise generated by construction during daytime and nighttime hours and could exceed applicable FTA criteria for vibration generated by construction while all other segments of construction of the DMU Alternative would not exceed the daytime noise or vibration criteria. Noise from the DMU rail construction would exceed the nighttime FTA criteria at the Dublin/Pleasanton Station DMU transfer platform (from pile driving) and along the Tassajara Road/Santa Rita Road to Fallon Road/El Charro Road segment (from construction activities). Therefore, impacts related to construction noise levels and construction vibration would be potentially significant. This impact would be reduced to a less-than-significant level with implementation of **Mitigation Measure NOI-1**, which restricts pile driving activities at potentially impacted locations and other construction activities at these locations along the project corridor to daytime hours and provides for alternative construction methodologies. **(LSM)**

Express Bus/BRT Alternative. The noise and vibration generated from implementation of the Express Bus/BRT Alternative is described for each construction activity type below.

- **Noise Generated by Express Bus/BRT Alternative Construction.** Noise associated with construction of the Express Bus/BRT Alternative along the proposed alignment would result from the operation of a range of noise-generating equipment similar to those discussed for the Proposed Project, but would entail less pile driving activity. Construction for the Express Bus/BRT Alternative alignment would extend approximately from west of Dougherty Road to Tassajara Road/Santa Rita Road, and include the Laughlin Road Area (surface parking lot). Therefore, fewer sensitive receptors would be affected.

  As shown in Table 3.J-16, predicted construction noise levels for the Express Bus/BRT Alternative would be below the significance criteria at each receptor for all alignment segments, except at the Dublin/Pleasanton Station bus transfer platforms, which had a predicted noise level of 83.9 dBA L_{eq} that would exceed the 80-dBA residential nighttime threshold. Therefore, nighttime construction along this segment would result in a potentially significant impact.

- **Vibration Generated by Express Bus/BRT Alternative Construction.** Vibration associated with the construction of the Express Bus/BRT Alternative along the proposed alignment would result from the operation of the range of noise-generating equipment specified for construction, including pile drivers, which typically generate the highest vibration levels. As shown in Table 3.J-17, all predicted construction vibration levels for the Express Bus/BRT Alternative alignment would be below the significance criteria at each receptor for all alignment segments.

TABLE 3.J-16 EXPRESS BUS/BRT ALTERNATIVE – PREDICTED CONSTRUCTION NOISE LEVEL AT REPRESENTATIVE SENSITIVE RECEPTORS

Alignment Segment	Monitoring Point ID	Nearest Representative Sensitive Receptor in Study Area	Distance to Receptor from Alignment (feet)	Construction Noise Level (dBA L_{eq}) at 50 feet	Construction Noise Level (dBA L_{eq}) at Receptor	Noise at Sensitive Receptors Exceeding 90 dBA L_{eq} Daytime Threshold?	Noise at Sensitive Receptors Exceeding 80 dBA L_{eq} Nighttime Threshold?
West of Dougherty Road to Dougherty Road/ Hopyard Road	LT-1	Residential	370	92.0	74.6	No	No
Dougherty Road/Hopyard Road Interchange	LT-1	Residential	1,100	92.0	74.5	No	No
Dublin/Pleasanton Station Bus Transfer Platforms	LT-1	Residential	370	101	**83.9**	No	**Yes**
Dougherty Road/Hopyard Road to Hacienda Drive	LT-1	Residential	370	92.0	74.6	No	No
Hacienda Drive Interchange	LT-1	Residential	1,150	92.0	64.8	No	No
Hacienda Drive to Tassajara Road/ Santa Rita Road	--	No receptor	--	92.0	--	No	No
Laughlin Road Surface Parking Lot	LT-7	Residential	460	92.0	72.7	No	No

Notes: -- = not applicable; dBA = A-weighted decibels; L_{eq} = equivalent (average) noise level; LT = long-term noise measurement location.
Bold/gray text indicates noise levels exceeding threshold.
The study area is the maximum Federal Transit Authority screening distance (within 1,600 feet of project centerline).
Sensitive receptors listed above are Category 2 receptors (residences and buildings where people normally sleep). There are no Category 1 or Category 2 receptors in the study area.

TABLE 3.J-17 EXPRESS BUS/BRT ALTERNATIVE – PREDICTED CONSTRUCTION VIBRATION LEVEL AT REPRESENTATIVE SENSITIVE RECEPTORS

Alignment Segment	Monitoring Point ID	Nearest Representative Sensitive Receptor in Study Area	Distance to Receptor from Alignment (feet)	Construction Vibration Level (PPV, in/sec) at 25 feet	Construction Vibration Level (PPV, in/sec) at Receptor	Exceeds 0.12 PPV in/sec Structural Damage Threshold?	Construction Vibration Level (VdB) at 25 feet	Construction Vibration Level (VdB) at Receptor	Exceeds 72 VdB Human Annoyance Threshold?
West of Dougherty Road to Dougherty Road/ Hopyard Road	LT-1	Residential	370	0.21	0.0037	No	94	59	No
Dougherty Road/ Hopyard Road Interchange	LT-1	Residential	1,100	0.21	0.0007	No	94	45	No
Dublin/ Pleasanton Station Bus Transfer Platforms	LT-1	Residential	370	0.64	0.011	No	104	64	No
Dougherty Road/ Hopyard Road to Hacienda	LT-1	Residential	370	0.21	0.0037	No	94	59	No
Hacienda Drive Interchange	LT-1	Residential	1,150	0.21	0.0007	No	94	59	No
Hacienda Drive to Tassajara Road/ Santa Rita Road	--	No receptor	--	0.21	--	No	94	--	No
Laughlin Road Surface Parking Lot	LT-7	Residential	460	0.21	0.0027	No	94	56	No

Notes: -- = not applicable; LT = long-term noise measurement location; in/sec = inches per second; PPV = peak particle velocity; VdB = vibration decibels.
The study area is the maximum Federal Transit Authority screening distance (within 1,600 feet of project centerline).
Sensitive receptors listed above are Category 2 receptors (residences and buildings where people normally sleep). There are no Category 1 or Category 2 receptors in the study area.

- **Conclusion.** As described above, the Express Bus/BRT Alternative would not exceed the applicable FTA criteria for noise generated by construction during daytime hours, nor would it exceed applicable FTA criteria for vibration generated by construction. However, construction noise from pile driving at the Dublin/Pleasanton Station bus transfer platforms would exceed the nighttime FTA criteria and impacts related to construction noise levels would be potentially significant. This impact would be reduced to a less-than-significant level with implementation of **Mitigation Measure NOI-1**, which restricts pile driving activities to daytime hours and provides for alternative construction methodologies. **(LSM)**

Enhanced Bus Alternative. The Enhanced Bus Alternative would entail limited construction activities over approximately 2 months; activities would include installation of bus shelters, bus bulbs, and signage. Bus infrastructure improvements would involve standard construction methodologies and would not involve pile driving or other high-impact noise or vibration-generating activities. Additionally, these improvements would occur near arterial roadways and highways with moderate to high traffic volumes, where the ambient noise level is elevated. As such, temporary noise generated by standard construction equipment would not be expected to result in noise or vibration levels exceeding FTA standards for construction. Therefore, construction of the Enhanced Bus Alternative would have a less-than-significant impact from noise and vibration. **(LS)**

Mitigation Measures. Potentially significant construction-related impacts from noise and vibration described above for the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative would be reduced to a less-than-significant level with implementation of **Mitigation Measure NOI-1**, which restricts pile driving activities and other construction activities at potentially affected locations to daytime hours and provides for alternative construction methodologies.

As described above, the Enhanced Bus Alternative would not have significant impacts; therefore, no mitigation measures are required for this alternative.

Mitigation Measure NOI-1: Limit Construction Hours and Methods for Pile Driving and Other Construction Activities (Conventional BART Project, DMU Alternative/EMU Option, and Express Bus/BRT Alternative).

To reduce potential nighttime construction noise impacts, BART shall limit construction at affected locations to daytime hours or use alternative construction methods.

1. BART and its construction contractors shall restrict pile driving activities to daytime hours (between 7:00 a.m. and 7:00 p.m.) for construction at the following locations: (a) the DMU transfer platform (DMU Alternative) at the

Dublin/Pleasanton Station; or (b) the bus transfer platforms (Express Bus/BRT Alternative) at the Dublin/Pleasanton Station.

2. BART and its construction contractors shall restrict construction activities for the Proposed Project and DMU Alternative between (a) Tassajara Road/Santa Rita Road to Fallon Road/El Charro Road, and along (b) East Airway Boulevard east of Sutter Street to daytime hours only or, alternatively, employ moveable noise curtains or barriers along the southern side of the freeway sufficient to shield nighttime construction noise levels to 80 dBA or lower.

   This measure shall also apply to any other unforeseen pile-driving locations within 600 feet of residential uses or any other noise-sensitive land use. Alternative pile installation methods such as drill and cast-in-place may also be used to address noise impacts from pile-driving. Implementation of this measure will ensure that nighttime construction activities do not exceed FTA noise criteria for nighttime construction at residential uses (80 dBA L_{eq}).

To reduce potential daytime construction noise impacts to residential uses immediately south of the realignment of the eastern extent of East Airway Boulevard (Proposed Project and DMU Alternative), BART contractors shall employ moveable noise curtains or barriers along the southern side of East Airway Boulevard to shield daytime construction noise impacts to residential uses to the south. These temporary noise barriers shall be employed for construction along East Airway Boulevard, east of Sutter Street. Implementation of this measure will ensure that daytime construction activities do not exceed FTA noise criteria for daytime construction at residential uses (90 dBA L_{eq}).

To reduce potential vibration impacts to residential uses immediately south of the realignment of the eastern extent of East Airway Boulevard (Proposed Project and DMU Alternative), BART contractors shall use non-vibratory excavator-mounted compaction wheels and small smooth drum rollers for final compaction of asphalt base and asphalt concrete. If needed to meet compaction requirements, smaller vibratory rollers will be used to minimize vibration levels during repaving activities where needed to meet vibration standards. These methods shall be employed for construction along East Airway Boulevard, east of Sutter Street.

(b) Construction – Cumulative Analysis

The geographic study area for cumulative construction impacts is defined as a 500-foot radius around the collective footprint. This screening threshold distance was developed based on stationary source noise attenuation equations and the combined noise level generated by typical construction phases for a given project (assuming multiple pieces of

equipment) at a distance of 50 feet.[15] A maximum noise level of 89 dBA for non-pile-driving equipment would diminish to 69 dBA at 500 feet, which would be a typical noise levels near a freeway.

For the purposes of the noise analysis, a cumulative construction impact would occur if construction of the Proposed Project or Alternatives were undertaken concurrently with the construction of cumulative projects nearby, as described below.

Impact NOI-2(CU): Expose persons to or generate noise or vibration levels during construction in excess of standards established by the FTA under Cumulative Conditions

(No Project Alternative: NI; Conventional BART Project: LS; DMU Alternative: LS; Express Bus/BRT Alternative: LS; Enhanced Bus Alternative: LS)

No Project Alternative. As described in **Impact NOI-1** above, the No Project Alternative would have no impacts associated with the exposing persons to or generating noise or vibration levels in excess of standards established by the FTA during construction. Therefore, the No Project Alternative would not contribute to cumulative impacts. **(NI)**

Conventional BART Project and Build Alternatives. The potential for cumulative construction noise and vibration impacts would depend on the proximity of other projects to sensitive receptors that would also be near components of the Proposed Project and Build Alternatives.

- **Noise.** The closest cumulative project within the 500-foot screening distance for noise impacts from other cumulative projects would be the Dublin/Pleasanton Station Parking Expansion at the Dublin/Pleasanton Station. Pile driving is not anticipated for the garage expansion, and standard construction methods would not substantially contribute to pile driving noise for the Dublin/Pleasanton Station DMU transfer platform (DMU Alternative) or bus transfer platforms (Express Bus/BRT Alternative). Construction activity for the Dublin/Pleasanton Station Parking Expansion would occur approximately 360 feet from the receptors at LT-1. Resultant noise levels at this receptor from standard off-road construction equipment would be approximately 72 dBA. However, these receptors would be shielded by the intervening presence of the existing parking structure, which would provide a minimum noise attenuation of 5 dBA, thus resulting in a conservative estimated noise contribution of 67 dBA. When this contribution is added to the predicted 83.9 dBA noise level generated by the construction of the project components of the DMU Alternative and Express Bus/BRT

[15] United States Environmental Protection Agency (EPA), 1971. Noise from Construction Equipment and Operations, Building Equipment and Home Appliances, NTID300.1. December 31.

Alternative, the resultant noise level would be 84.0, which would be an increase of 0.1 dBA, and thus not a noticeable increase.

Construction activity for the Kaiser Dublin Medical Center would occur approximately 340 feet from the receptors at LT-1. Construction activities for the Kaiser Dublin Medical Center are not anticipated to involve pile driving activities.[16] Resultant noise levels at this receptor from standard off-road construction equipment would be approximately 73 dBA. When this contribution is added to the predicted 81.4 dBA noise level generated by the construction of the Proposed Project and DMU rail alignments, the resultant noise level would be 82.0, which would be an increase of 0.6 dBA, and thus not a noticeable increase. Some phases of the Isabel Neighborhood Plan (INP) may also be under construction simultaneous with the Proposed Project and the Build Alternatives. A review of the early phase INP project indicates that only business park developments 1c and 1d would be within the 500-foot screening distance for cumulative construction noise contributions. Both of these projects are located over 2,000 feet from any sensitive noise receptors and no cumulative construction noise impacts would occur from early phase INP development.

- **Vibration.** Construction-related vibration impacts are generally the result of pile driving activities or use of large compacting equipment very close to buildings. Vibration tends to dissipate quickly with distance; thus, the effects from other projects would not combine to result in cumulative impacts together with construction vibration from the Proposed Project and Build Alternatives. Consequently, cumulative construction vibration impacts would be less than significant.

Conclusion. As described under **Impact NOI-1**, the Proposed Project, DMU Alternative, and Express Bus Alternative would implement **Mitigation Measure NOI-1**, which would limit construction activities that would exceed FTA daytime or nighttime significance criteria and provide for alternative construction methods. With implementation of this measure, potential significant impacts of the Proposed Project, DMU Alternative, and Express Bus Alternative due to construction noise would be reduced. Construction activities associated with the Enhanced Bus Alternative would be limited and occur over a short duration (approximately 2 months). Furthermore, noise or vibration from other projects near the collective footprint (the Dublin/Pleasanton Station Parking Expansion or the Kaiser Dublin Medical Center) would not combine with the Proposed Project or Build Alternatives to result in significant cumulative noise or vibration impacts. Therefore, the Proposed Project and Build Alternatives in combination with cumulative projects would have less-than-significant cumulative impacts related to exposing persons to or generating noise or vibration levels during construction, and no mitigation measures are required. **(LS)**

[16] City of Dublin, 2016. Draft Environmental Impact Report for Kaiser Dublin Medical Center Project. Page 3.9-24. January 28.

Mitigation Measures. As described above, the Proposed Project and Alternatives in combination with past, present, or probable future projects would not result in significant cumulative impacts related to exposing persons to or generating noise or vibration levels during construction in excess of standards established by the FTA, and no mitigation measures are required.

(2) Operational Impacts

Potential impacts related to project operations are described below, followed by cumulative operations impacts.

(a) Operations – Project Analysis

Potential project operations impacts for opening year (2025) are described first, followed by impacts for the horizon year (2040).

As described in the Construction Impacts subsection above, sensitive receptors within the maximum FTA screening distance (1,600 feet) for the collective footprint are as follows: (1) there are no Category 1 receptors; (2) there are several Category 2 receptors (residences and buildings where people normally sleep), as listed in the tables below; and (3) there is one Category 3 receptor (Pleasanton Kindercare) for the Proposed Project and DMU Alternative only. Impacts to these representative sensitive receptors are described in the analysis below.

Impact NOI-3: Expose persons to or generate noise levels from transit facilities in excess of standards established by the FTA under 2025 Project Conditions.

(No Project Alternative: NI; Conventional BART Project: LS; DMU Alternative: LS; EMU Option: LS; Express Bus/BRT Alternative: LS; Enhanced Bus Alternative: LS)

Operational noise impacts from the Proposed Project and Build Alternatives are described below for each noise source as follows:

- Operational noise associated with proposed mobile sources (rail or bus service)
- Operational noise associated with proposed stationary sources such as stations, storage and maintenance facilities, wayside facilities, bus transfer facility, and parking lots.

Stationary sources are assessed separately from operational mobile sources, as FTA guidance establishes separate screening distances for such sources, and because different receptors are closer to such stationary sources and the noise sources closest to the receptor dominate the noise environment.

Noise increases associated with roadway traffic volumes and the relocation of I-580 and surface roadways are addressed in **Impact NOI-5**.

No Project Alternative. Under the No Project Alternative, the BART to Livermore Extension Project would not be implemented. However, planned and programmed transportation improvements for segments of I-580, local roadways and intersections, and core transit service improvements for BART, ACE, and LAVTA would be constructed. In addition, population and employment increases throughout Alameda County would result in continued land use development, including residential and commercial construction. These improvements and development projects could result in potential impacts to exposing persons to or generating excessive noise levels in excess of FTA standards. However, the effects of the other projects associated with the No Project Alternative have been or will be addressed in environmental documents prepared for those projects before they are implemented, and the No Project Alternative would not result in new impacts as a consequence of the BART Board of Directors' decision not to adopt a project. Therefore, the 2025 No Project Alternative is considered to have no impact to exposing persons to or generating excessive noise. **(NI)**

Conventional BART Project. The noise generated from operation of the Proposed Project in 2025 is described below for each operational noise source.

- **Noise Generated by BART Train Operations.** Noise associated with operation of trains under the Proposed Project would result from wheel and track interactions, wheel and rail switch interaction, and horns. Noise from sounding of horns only occurs when trains enter a station. This noise is an existing condition at the Dublin/Pleasanton Station and would only be a new noise source for trains entering the proposed Isabel Station. Wheel and track interactions would occur over the entirety of the approximately 5.5-mile rail extension, as well as along the tail tracks (approximately 1.9 miles) connecting from the Isabel Station in the I-580 median, through an underpass to north of I-580, and then to the storage and maintenance facility.

  Switches allow trains to cross from one track to another, and as BART trains travels over these rail switches, the gaps in the rail (at locations called frogs) can result in higher noise levels than in rail segments with no gaps. Wheel and rail switch interactions would occur at the following three locations, as listed in Table 3.J-18:

  - Along the BART mainline extension in the I-580 median, approximately 2,100 feet east of the interchange of I-580 with Fallon Road/El Charro Road
  - Along the BART mainline extension in the I-580 median, approximately 600 feet west of the I-580/Isabel Avenue interchange

- At the storage and maintenance facility, approximately 3,400 feet northeast of the intersection of Campus Hill Drive

TABLE 3.J-18 CONVENTIONAL BART PROJECT – LOCATION OF SWITCHES

Switch Location	Nearest Receptor	Distance to Receptor (feet)
East of I-580/Fallon Road/El Charro Road interchange	Rural Farmhouse on Croak Road (ST-1)	680
West of the I-580/Isabel Avenue interchange	Shea Homes – Sage Project (LT-3)	2,800
East of Campus Hill Drive and Campus Loop intersection	Montage Neighborhood (LT-4)	3,400
	Hartman Rural Residences (ST-2)	3,400

Notes: LT = long-term noise measurement location; ST = short-term noise measurement location; I- = Interstate Highway.
Source: Arup and Anil Verma Associates, Inc., 2017.

The switch near the Fallon Road/El Charro Road interchange would be located approximately 680 feet from a single farmhouse to the north of I-580. The other switch locations would be over 2,000 feet away from any sensitive receptors and well outside the FTA screening distances for any type of rail project or ancillary facilities and would have no noise impacts.

As shown in Table 3.J-19, all predicted noise levels would be below the significance criteria at each receptor. For example, at the closest receptors (170 feet from tracks between Tassajara Road/Santa Rita Road and Fallon Road/El Charro Road) the existing L_{dn} was measured at 64 dBA. At this existing noise level, the acceptable L_{dn} contribution from BART trains is less than 61 dBA (exclusive of existing noise levels). The L_{dn} contribution from BART trains at this receptor would be 59 dBA, which would result in a net increase of 1.2 dBA when considering existing noise levels. The L_{dn} contribution from BART trains at this receptor of 54 dBA would not exceed the FTA threshold at this receptor of 61 dBA. This predicted noise level contribution to the L_{dn} assumes a conservative 5 dBA of shielding from the existing sound wall.

TABLE 3.J-19 CONVENTIONAL BART PROJECT – PREDICTED DAY-NIGHT NOISE LEVELS FROM BART TRAINS IN 2025

Segment	Monitoring Point ID	Nearest Representative Sensitive Receptor in Study Area	Existing Noise Level (dBA L_{dn})	Threshold for Acceptable Noise Contribution (L_{dn})[a]	Noise Level Generated by Proposed Project at Receptor (L_{dn}) (with horn noise in parenthesis)	Noise at Sensitive Receptors Exceeding Threshold?
Hacienda Drive to Tassajara Road/Santa Rita Road	--	No receptors	--	--	--	--
Tassajara Road/Santa Rita Road Interchange	LT-2	Residential receptor: 1,100 feet southeast of alignment	64	<61	46	No
Santa Rita Road to El Charro Road	LT-2	Residential receptor: 170 feet south of alignment	64	<61	54	No
Fallon Road/El Charro Road to East Airway Boulevard	ST-1	Single unoccupied farmhouse 680 feet north of switch	70	<65	61[b]	No
East Airway Boulevard to Isabel Avenue	LT-3	Residential receptor: 1,000 feet north of alignment	61	<59	56 (56)	No
Isabel Station to Storage and Maintenance Facility	LT-5	Residential receptor: 370 feet south of alignment of tail tracks	66	<62	55	No

Notes: -- = not applicable; dBA = A-weighted decibels; LT = long-term noise measurement location; ST = short-term noise measurement location; L_{dn} = day-night noise level; FTA = Federal Transit Authority.
When noise shielding such as a sound barrier, existing buildings, or natural berm is present, assumed predicted noise level is conservatively reduced by 5 dBA. In some cases (LT-2), where a noise barrier currently exists, the predicted noise level is conservatively reduced by 10 dBA as demonstrated by noise monitoring and modeling.
[a] This is the contribution threshold from train operations for each specific receptor and is based on the existing noise environment for each receptor consistent with FTA guidance for moderate impact. See Table 3.J-5 for definition of Moderate Impact.
[b] This value includes switch noise considered as a stationary source per FTA Guidance.
The study area is the maximum FTA screening distance (within 1,600 feet of project centerline).
Sensitive receptors listed above are Category 2 receptors (residences and buildings where people normally sleep). In addition, one Category 3 receptor (Pleasanton Kindercare), represented by LT-2, is over twice as far from construction activities as the Monitoring Location LT-2; therefore, resultant noise levels would be at least 3 dBA less than those reported for LT 2. There are no Category 1 receptors in the study area.

- **Noise Generated by the Proposed Isabel Station.** Noise could be generated near the Isabel Station as BART trains travel over switches and/or sound their horns as they enter the station. As discussed previously, the switch near the Isabel Station would be approximately 600 feet west of the I-580/Isabel Avenue interchange overcrossing center and over 2,000 feet from the nearest receptor, which is well beyond the FTA screening distance for any type of rail project or ancillary facilities. These facilities would have a less-than-significant noise impact.

  The noise from the BART trains near Isabel Station would be from tracks and horns. The nearest existing residence at Saddleback Circle and Sutter Street, represented by monitoring location LT-5 is about 1,500 feet from the station. However, there are homes currently under construction (Shea Homes – Sage Project on Tranquility Circle) that may be completed and occupied by 2025. These residences would be as close as 1,000 feet from the proposed Isabel Station (represented by monitoring location LT-6). At this existing noise level, the acceptable L_{dn} contribution from BART trains is less than 59 dBA (exclusive of existing noise levels). The L_{dn} contribution from BART trains at this receptor would be 56 dBA. The L_{dn} contribution from BART trains inclusive of noise from horns as trains enter the station would not exceed the FTA threshold of 59 dBA at this closest receptor.

  BART operations facilities within and near the Isabel Station would include the train control room, traction power substation, a 34.5-kilovolt (kV) switching station, and a 115/34.5-kV high-voltage substation. A permanent emergency generator would be located at the Isabel Station north pedestrian touchdown structure and a permanent standby generator at the north pedestrian touchdown structure. The standby generator would be operated for 2 hours per month during daytime for maintenance purposes and would not be a significant noise source. Wayside facilities would include a traction power substation (TPSS), and high-voltage substation with a 34.5-kV alternating current house and a 1,000-volt direct current house on Kitty Hawk Road on the northwest corner of the intersection of Kitty Hawk Road and Isabel Avenue. There would be no sensitive receptors located within the FTA-recommended screening distance of 250 feet from the power substations. The noise impacts from these sources would be less than significant.

- **Noise Generated by Bus Operations at the Proposed Isabel Station Bus Transfer Facility**. The proposed bus transfer facility would be accessible from a new loop road and provide turnout for buses servicing the proposed Isabel Station north of I-580. Up to 18 bus arrivals could occur during the peak operating hours from five different service lines. The nearest sensitive receptor to the proposed bus transfer facility would be the homes currently under construction (Shea Homes – Sage Project on Tranquility Circle) that will be completed and occupied by 2025. These future residences would be as close as 600 feet from the proposed bus transfer facility (represented by monitoring location LT-3.

Using the FHWA Traffic Noise Prediction Model the noise contribution of bus operations during the peak hour would be 50.1 dBA L_{eq}. The existing 24-hour L_{eq} at these future receptors is 56 dBA (see Table 3.J-1), where the threshold for a moderate impact is 56 dBA. At this existing noise level, the acceptable L_{eq} contribution from bus operations is less than 56 dBA. The noise impacts from bus operations at the bus transfer facility would be less than significant.

- **Noise Generated by the Proposed Isabel Station Parking Facility.** Parking facilities would be provided south of the Isabel Station, along East Airway Boulevard, just east of Isabel Avenue. Approximately 3,412 parking spaces would be provided as follows: a seven-level parking structure would provide approximately 2,835 parking spaces and two surface parking lots would provide 577 parking spaces.

  FTA guidance identifies a screening distance of 125 feet from proposed parking facilities, beyond which noise impacts would be less than significant. The nearest receptor to the proposed garage would be residences on Modoc Place (see Somerset Neighborhood, Table 3.J-2), 900 feet southeast of the proposed structure. Because all receptors would be beyond the FTA screening distance for parking facilities and separated by intervening structures, operation of the proposed parking structure would have a less-than-significant operational noise impact.

- **Noise Generated by the Storage and Maintenance Facility.** A storage and storage and maintenance facility would be constructed for the storage of approximately 172 BART cars and a maintenance facility would be designed to accommodate the servicing and periodic maintenance of BART trains vehicles. Vehicle cleaning, washing, and routine light vehicle maintenance activities would be carried out at this facility. The facility would have approximately nine tracks for the storage of BART trains, as well as a train control tower; a train control room; a TPSS; a building for cleaning supplies, equipment, and waste; a vehicle cleaning platform; and a blowdown. FTA guidance identifies a screening distance of 1,000 feet from proposed storage yards and shops, beyond which noise impacts would be less than significant. The nearest receptors to the proposed storage and maintenance facility would be several ranch houses located on Hartman Road, approximately 600 feet to the west. All other receptors would be beyond the 1,000-foot screening distance.

  FTA reference noise levels for yards and shops were used to determine an hourly L_{eq} at 50 feet of 76 dBA, conservatively assuming five trains into the yard in an hour. This would attenuate to 49 dBA at the nearest receptors on Hartman Road. Existing monitored daytime noise levels at these residences was monitored at 50 dBA (ST-2, Table 3.J-1), where the threshold for a moderate impact is 54 dBA. At this existing noise level, the acceptable L_{eq} contribution from train operations is less than 54 dBA. Thus, the noise impacts from operations of the storage and maintenance facility would be less than significant. Perimeter walls or building enclosures may further reduce these predicted noise levels.

- **Noise Generated by Wayside System Facilities.** Wayside facilities would be constructed along the proposed BART alignment to provide power and communications support for the project. Noise sources associated with typical wayside facilities for the BART alignment include substations and permanent standby generators that would be operated approximately 2 hours per month for maintenance purposes.

  A TPSS would be constructed north of I-580 with access from Croak Road, and a TPSS with a Pacific Gas and Electric Company power switching station would be constructed south of I-580 at the east off-ramp at Kitty Hawk Road and Isabel Avenue. FTA guidance identifies a screening distance of 250 feet from proposed substations, beyond which noise impacts would be less than significant.

  The nearest receptor to the Croak Road wayside facility would be an isolated ranch house approximately 440 feet north of the proposed wayside facility (see 3457 Croak Road, Table 3.J-2). The nearest receptor to the Kitty Hawk Road wayside facility would be residences on Modoc Place (see Somerset Neighborhood, Table 3.J-2), 2,200 feet southeast of the proposed wayside facility. All receptors would be beyond the FTA-recommended screening distance for substations.

- **Conclusion.** As described above, in 2025, noise from operation of the Proposed Project—specifically the BART train operations, the Isabel Station, the Isabel Station bus transfer facility, the Isabel Station parking facility, the storage and maintenance facility, and wayside system facilities—would be below the established FTA standards; therefore, impacts would be less than significant. **(LS)**

DMU Alternative. The noise generated from operation of the DMU Alternative in 2025 is described below for each operational noise source.

- **Noise Generated by DMU Train Operations.** Noise associated with operation of DMU trains along the proposed alignment would result from wheel and track interactions, wheel and rail switch interaction, and horns. Wheel and track interactions would occur over the approximately 5.5-mile rail extension, as well as along the tail tracks (approximately 1.8 miles) connecting from the Isabel Station in the I-580 median, through an underpass to the north of I-580, and then to the storage and maintenance facility.

  As previously described, as trains travel over rail switches, the gaps in the rail can result in higher noise levels than in rail segments with no gaps. Wheel and rail switch interactions would occur at the following six locations:

  - Along the DMU extension in the I-580 median, approximately 780 feet west of the Hacienda Drive/I-580 overcrossing, just east of the Dublin/Pleasanton Station
  - Along the DMU extension in the I-580 median, approximately 1,240 feet east of the Hacienda Drive/I-580 overcrossing

- Along the DMU extension in the I-580 median, approximately 2,000 feet east of the I-580/Fallon Road/El Charro Road interchange
- Along the DMU extension in the I-580 median, approximately 600 feet west of the I-580/Isabel Avenue interchange
- Along the DMU extension in the I-580 median, approximately 600 feet east of the I-580/Isabel Avenue interchange, just east of the proposed Isabel Station
- At the storage and maintenance facility, approximately 3,000 feet due east of the intersection of Campus Hill Drive with Campus Loop

The locations of sensitive receptors with respect to these six switch locations are presented in Table 3.J-20. The switch near the Fallon Road/El Charro Road interchange would be located approximately 680 feet from a single farmhouse to the north of I-580. The other switch locations are over 1,700 feet away from the nearest sensitive receptor and outside the FTA screening distances for any type of rail project or ancillary facilities and would have no noise impacts.

TABLE 3.J-20 DMU ALTERNATIVE – LOCATION OF SWITCHES

Switch Location	Nearest Receptor	Distance to Receptor (feet)
West of Hacienda Drive	Multi-family residences at Martinelli Way and Campus Hill Drive	1,800
East of Hacienda Drive	Single family residences north of Dublin Boulevard	1,800
East of Fallon Road/El Charro Road	Farm house on Croak Road (ST-1)	680
West of Isabel Avenue	Montage neighborhood north of Portola Avenue (LT-4)	2,400
East of Isabel Avenue	Single-family homes on Saddle Back Circle (LT-5)	1,700
East of Campus Hill Drive	Montage neighborhood north of Portola Avenue (LT-4)	3,000

Notes: LT = long-term noise measurement location; ST = short-term noise measurement location.
Source: Arup and Anil Verma Associates, Inc., 2017.

As shown in Table 3.J-21, all predicted noise levels for 2025 would be below the significance criteria.

TABLE 3.J-21 DMU ALTERNATIVE – PREDICTED DAY-NIGHT NOISE LEVELS FROM DMU TRAINS IN 2025

Segment	Monitoring Point ID	Nearest Representative Sensitive Receptor in Study Area	Existing Noise Level (dBA L_{dn})	Threshold for Acceptable Noise Contribution (L_{dn}) (see Table 3.J.5)[a]	Noise Level Generated by DMU Alternative at Receptor (L_{dn}) (Train with horn noise in parenthesis)	Noise at Sensitive Receptors Exceeding Threshold?
Dougherty Road/ Hopyard Road to Hacienda Drive	LT-1	5200 Iron Horse Parkway: 370 feet north of alignment	66	<62	57	No
Dublin/Pleasanton Station DMU Transfer Platform	LT-1	5200 Iron Horse Parkway: 320 feet North of station	66	<62	58	No
Hacienda Drive to Tassajara Road/Santa Rita Road	--	No receptors within 1,600 feet	--	--	--	--
Tassajara Road/Santa Rita Interchange	LT-2	Residential uses: 1,100 feet south of alignment	64	<61	48	No
Tassajara Road/Santa Rita Road to Fallon Road/El Charro Road	LT-2	Residential receptor: 170 feet south of alignment	64	<61	56	No
Fallon Road/El Charro Road to East Airway Boulevard	ST-1	Single unoccupied farmhouse 680 feet north of switch	70	<65	62[b]	No
East Airway Boulevard to Isabel Avenue	LT-3	Residential receptor: 1,000 feet from alignment	61	<59	58 (58)	No (No)
Isabel Station to Storage and Maintenance Facility	LT-5	Residential receptor: 370 feet south of alignment of tail tracks	66	<62	57	No

Notes: -- = Not applicable; LT = long-term noise measurement location; ST = short-term noise measurement location; dBA = A-weighted decibels; L_{dn} = day-night noise level; FTA = Federal Transit Authority.
Table does not include the contribution from switches, which are assessed separately.
When noise shielding such as a sound barrier, existing buildings, or natural berm is present, assumed predicted noise level is conservatively reduced by 5 dBA. In some cases (LT-2), where a noise barrier currently exists, the predicted noise level is conservatively reduced by 10 dBA as demonstrated by noise monitoring and modeling.
[a] This is the contribution threshold from train operations for each specific receptors and is based on the existing noise environment for each receptors consistent with FTA guidance.
[b] This value includes switch noise considered as a stationary source per FTA Guidance.

- **Noise Generated by the Proposed Isabel Station.** Noise could be generated near the Isabel Station as DMU trains travel over switches and/or sound their horns as they enter a station. As discussed previously, the switches near the Isabel Station would be approximately 600 feet on either side of the I-580/Isabel Avenue interchange overcrossing center and over 1,600 feet from the nearest receptor, which is beyond the FTA screening distance for any type of rail project or ancillary facilities. This would be a less-than-significant noise impact.

  Noise from DMU trains near this station would be due to tracks and horns. The nearest existing residence (LT-5) is about 1,500 feet from the station. However, there are homes currently under construction (Shea Homes – Sage Project on Tranquility Circle) as well as homes proposed for the INP that may be completed and occupied by 2025. These residences would be as close as 1,000 feet from the proposed Isabel Station (represented by monitoring location LT-3). At this existing noise level, the acceptable L_{dn} contribution from DMU trains of less than 59 dBA (exclusive of existing noise levels). The L_{dn} contribution from DMU trains and horns at this receptor would be 58 dBA. The L_{dn} contribution from DMU trains inclusive of noise from horns as trains enter the station would not exceed the FTA threshold at this closest receptor.

  DMU operations facilities within and near the proposed Isabel Station would include the train control room and a permanent standby generator at the North Isabel touchdown area. The standby generator would be operated once a week for 2 hours per month during daytime hours for maintenance purposes, and would not be a significant noise source. Wayside facilities would include a 34.5-kV switching station, and a 115/34.5-kV high-voltage substation on Kitty Hawk Road on the northwest corner of the intersection of Kitty Hawk Road and Isabel Avenue. No sensitive receptors would be located within the FTA-recommended screening distance of 250 feet from the power substations, and noise impacts from these sources would be less than significant.

- **Noise Generated by Bus Operations at the Proposed Isabel Station Bus Transfer Facility.** The proposed bus transfer facility would be in the same location and have the same number of peak bus headways as described for the Proposed Project. Consequently, like the Proposed Project, the noise contribution of bus operations during the peak hour would be 50.1 dBA L_{eq}, which is below the acceptable L_{eq} contribution from bus operations of 56 dBA. The noise impacts from bus operations at the bus transfer facility would be less than significant.

- **Noise Generated by the Proposed Isabel Station Parking Facility.** Parking facilities would be provided south of the Isabel Station, along East Airway Boulevard, similar to the Proposed Project. A six-level parking structure with approximately 2,428 parking spaces would be constructed. FTA guidance identifies a screening distance of 125 feet from proposed parking facilities, beyond which noise impacts would be less than significant. The nearest receptor to the proposed garage would be residences on

Modoc Place (see Somerset Neighborhood, Table 3.J-2), 800 feet southeast of the proposed structure. All receptors would be beyond the FTA screening distance for parking facilities and separated from the parking garage by intervening structures.

- **Noise Generated by the Storage and Maintenance Facility.** A storage and maintenance facility would be designed to accommodate the servicing and periodic maintenance of DMU vehicles. Fueling, vehicle cleaning, washing, and routine light vehicle maintenance activities would be carried out at this facility. In addition, the storage tracks at the storage and maintenance facility would accommodate the storage of approximately three DMU trains (12 vehicles). A train control tower and train control room would be constructed to support the storage and maintenance facility. FTA guidance identifies a screening distance of 1,000 feet from proposed storage yards and shops, beyond which noise impacts would be less than significant. The nearest receptors to the proposed storage and maintenance facility would be several ranch houses on Hartman Road, approximately 1,800 feet to the north and residences on Selby Lane, 3,000 feet to the southwest of the proposed storage and maintenance facility. All receptors would be beyond the FTA screening distance for parking facilities and separated by intervening hills (which provide an acoustic and visual buffer).
- **Noise Generated by Wayside System Facilities.** Wayside facilities would be constructed along the proposed DMU alignment to provide power and communications support for the project. Noise sources associated with typical wayside facilities for the DMU Alternative primarily consist of substations. Wayside facilities would be in the same locations as for the Proposed Project. All receptors would be beyond the FTA screening distance for substations.
- **Conclusion.** As described above, in 2025, noise from DMU train operations, the Isabel Station, the Isabel Station bus transfer facility, the Isabel Station parking facility, the storage and maintenance facility, and wayside system facilities would be below the established FTA standards and would be less than significant. **(LS)**

EMU Option. The EMU Option (electronically powered) would be quieter than the DMU Alternative (powered by a diesel engine). Consequently, with respect to noise from train operations along the alignment, the noise impacts of the EMU Option would be less than the DMU Alternative and would be similar to the Proposed Project, as shown in Table 3.J-19. In 2025, the EMU Option would have less-than-significant operational noise impacts. **(LS)**

Express Bus/BRT Alternative. The noise generated from implementation of the Express Bus/BRT Alternative in 2025 is described for each operational noise source below.

- **Noise Generated by Express Bus Operations.** Noise associated with operation of express buses along the proposed alignment would result from engine noise and

wheel friction of additional buses traveling in the express lanes of I-580. Hybrid buses operating at 30 miles per hour are 3 dBA quieter than conventional diesel buses and predicted noise levels were adjusted to account for LAVTA buses being hybrid-diesel by 2025.[17, 18] As shown in Table 3.J-22, all predicted noise levels for 2025 would be below the significance criteria at all receptors. Consequently, noise from increased bus operations under this alternative would be less than significant.

No new station would be constructed under the Express Bus/BRT Alternative at Isabel Avenue; thus, there would be no operational station noise impacts and no need for wayside facilities or a storage and maintenance facility.

- **Noise Generated by the Dublin/Pleasanton Station Replacement Parking Lot (or Garage).** The proposed bus transfer platforms and I-580 relocation would result in the loss of approximately 210 parking spaces at the Dublin/Pleasanton Station. To replace these spaces, a new surface lot or garage would be constructed south of I-580. A new surface parking lot with approximately 210 parking spaces would be constructed, if adjacent land can be acquired by BART; if the land is not available, BART would construct a three-level parking garage on a portion of the existing parking lot south of I-580. This new lot or garage would have access on Owens Drive.

  FTA guidance identifies a screening distance of 125 feet from proposed parking facilities, beyond which noise impacts would be less than significant. The nearest receptor to the proposed replacement parking lot would be multifamily residences currently being completed across Owens drive to the south, approximately 750 feet away. If the parking garage option is selected, then the nearest receptor to the structure would be multifamily residences across Owens drive to the south, approximately 540 feet away. All receptors would be beyond the FTA screening distance for parking facilities.

[17] Ross, Jason and Michael Staiano, 2007. A Comparison of Green and Conventional Diesel Bus Noise Levels. October 24.

[18] Livermore-Amador Valley Transportation Authority (LAVTA), 2016. LAVTA Short Range Transit Plan, FY 2016 2025. April. Figures 77 and 78. Available at: http://www.wheelsbus.com/wp content/uploads/2015/08/FINAL SRTP.pdf, accessed March 27, 2017.

TABLE 3.J-22 EXPRESS BUS/BRT ALTERNATIVE – PREDICTED DAY-NIGHT NOISE LEVELS FROM BUSES IN 2025

Segment	Monitoring Point ID	Nearest Representative Sensitive Receptor in Study Area	Existing Noise Level (dBA L_{dn})	Threshold for Acceptable Noise Contribution (L_{dn}) (see Table 3.J.5)	Noise Level Generated by Alternative at Receptor (L_{dn})	Noise at Sensitive Receptors Exceeding Threshold?
Dougherty Road / Hopyard Road Interchange	--	No receptors within 500 feet	--	--	--	--
Dublin/Pleasanton Station Bus Transfer Platforms	LT-1	5200 Iron Horse Parkway: 320 feet north of bus line	66	<62	47	No
Dougherty Road / Hopyard Road to Hacienda Drive	LT-1	5200 Iron Horse Parkway: 370 feet north of station	66	<62	46	No
Hacienda Drive Interchange	--	No receptors within 500 feet	--	--	--	--
Hacienda Drive to Tassajara Road/Santa Rita Road	--	No receptors within 1,600 feet	--	--	--	--
Isabel Avenue to North Livermore Avenue	LT-5	Residential uses: 400 feet south of bus line	66	<62	51	No
Campus Hill Drive	LT-4	Residential uses: 100 feet north of bus line	64	<61	57	No

Note: -- = not applicable; LT = long-term noise measurement location; dBA = A-weighted decibels; L_{dn} = day-night noise level (L_{dn}).
The study area for BRT operations is the FTA screening distance for busways (within 500 feet of project centerline).
Hybrid buses operating at 30 miles per hour are 3 dBA quieter than conventional diesel buses. When noise shielding such as a sound barrier, existing buildings, or natural berm is present, assumed predicted noise level conservatively reduced by 5 dBA. In some cases (LT-1, LT-7), a noise barrier currently exists.
Sensitive receptors listed above are Category 2 receptors (residences and buildings where people normally sleep). There are no Category 1 or 3 receptors in the study area.

- **Noise Generated by the Laughlin Parking Lot.** Under this alternative, a new surface parking lot would be constructed at Laughlin Road to provide additional parking. The parking lot would have approximately 230 parking spaces. Regular bus service from this parking lot to the Dublin/Pleasanton Station would be provided during peak hours.

  FTA guidance identifies a screening distance of 125 feet from proposed parking facilities, beyond which noise impacts would be less than significant. The nearest receptors to the proposed Laughlin parking lot would be residences on Saddleview Court, 475 feet northwest of the proposed lot. All receptors would be beyond the FTA screening distance for parking facilities.

  Vehicles accessing the Laughlin parking lot would increase vehicle traffic along Northfront Road during the morning and evening peak hours. Modeled noise levels along Northfront Drive with and without the Express Bus/BRT Alternative using the FHWA Traffic Noise Prediction Model indicated no quantifiable increase in peak hour average noise levels along this roadway. Therefore, potential operational noise impacts of the Laughlin parking lot to residences to the northwest under the Express Bus/BRT Alternative would be less than significant.

Conclusion. As described above, in 2025, noise from operations of the Express Bus/BRT Alternative would be below the established FTA standards for all receptors; therefore, impacts would be less than significant and no mitigation measures are required. **(LS)**

Enhanced Bus Alternative. In 2025, the proposed bus operations plan for this alternative would include an additional rapid route (R-B) and one express route (X-A). The existing local Route 12 would be modified, and the existing rapid route and 20X route would be eliminated to avoid redundancy and ensure an efficient spread of transit service to all key areas. Thus, the Enhanced Bus Alternative would not establish a new rail line or dedicated busway or BRT exclusive roadway, and it would have less-than-significant impacts related to transit noise resulting from structural improvements. **(LS)**

Noise associated with operation of Enhanced Bus Alternative would occur due to new and modified bus routes. Noise impacts associated with the changes in traffic volumes on local roadways due to increased bus service are analyzed in **Impact NOI-5**, below.

Mitigation Measures. As described above, the operation of the transit facilities under the Proposed Project and Build Alternatives would not result in significant impacts related to exposing persons to or generating noise levels in excess of standards established by the FTA in 2025, and no mitigation measures are required.

Impact NOI-4: Expose persons to or generate noise levels from transit facilities in excess of standards established by the FTA under 2040 Project Conditions.

(No Project Alternative: NI; Conventional BART Project: LS; DMU Alternative: LS; EMU Option: LS; Express Bus/BRT Alternative: LS; Enhanced Bus Alternative: LS)

No Project Alternative. Under the 2040 No Project Alternative, the BART to Livermore Extension Project would not be implemented and there would be no physical changes to the environment associated with operation of the Proposed Project or any of the Build Alternatives. However, planned and programmed transportation improvements for segments of I-580, local roadways and intersections, and core transit service improvements for BART, ACE, and LAVTA would be constructed. In addition, population and employment increases throughout Alameda County would result in continued land use development, both residential and commercial. These improvements and development projects could result in potential impacts to exposing persons to or generating excessive noise. However, the effects of the other projects associated with the No Project Alternative have been or will be addressed in environmental documents prepared for those projects before they are implemented, and the No Project Alternative would not result in new impacts as a consequence of the BART Board of Directors' decision not to adopt a project. Therefore, the 2040 No Project Alternative is considered to have no impact to exposing persons to or generating excessive noise. **(NI)**

Conventional BART Project. The noise generated from operation of the Proposed Project in 2040 is described for each operational noise source below.

- **Noise Generated by BART Train Operations.** Noise associated with operation of BART trains along the proposed alignment in 2040 was analyzed using the same methodology as described previously for the 2025 analysis. Although there would be changes to the operational characteristics to train headways (two additional trains per hour) in 2040 compared to 2025, as indicated in Table 3.J-8, predicted noise levels using FTA methodology resulted in the same values for 2040 as presented in Table 3.J-19 for 2025 and the impact would be less than significant.
- **Noise Generated by the Proposed Isabel Station**. Operation of the proposed Isabel Station would be the same as under the 2025 analysis. BART facilities within the Isabel Station would be the same as those described for 2025. With noise from the station estimated at 56 dBA, the predicted noise levels from the station would be less than significant. No sensitive receptors would be located within the FTA-recommended screening distance of 250 feet from the power substations, and the noise impacts from these sources would be less than significant. The standby generator would be operated for 2 hours per month during daytime hours for maintenance purposes and would not be a significant noise source.

- **Noise Generated by Bus Operations in the Proposed Isabel Station Bus Transfer Facility**. Operation of the proposed bus transfer facility would be the same as under the 2025 analysis and would remain a less-than-significant impact.
- **Noise Generated by the Isabel Station South Parking Facility.** Operation of the proposed parking facility would be the same as under the 2025 analysis. All receptors would be beyond the FTA screening distance for parking facilities and separated by intervening structures.
- **Noise Generated by the Storage and Maintenance Facility.** Operation of the proposed storage and maintenance facility would be the same as under the 2025 analysis. Predicted noise levels from operations of the proposed storage and maintenance facility would be 49 dBA at the nearest receptors on Hartman Road. Existing monitored daytime noise levels at these residences was monitored at 50 dBA (see Table 3.J-1), where the threshold for a moderate impact is 54 dBA. At this existing noise level, the acceptable L_{eq} contribution from operation of the maintenance facility is less than 54 dBA. The noise impacts from operations of the storage and maintenance facility would be less than significant.
- **Noise Generated by Wayside System Facilities.** Operation of the proposed wayside facilities would be the same as under the 2025 analysis. The nearest receptor to the Kitty Hawk Road wayside facility would be residences on Modoc Place (see Somerset Neighborhood, Table 3.J-2), located 2,200 feet southeast of the proposed wayside facility. All receptors would be beyond the FTA screening distance for substations.
- **Conclusion.** As described above, in 2040, noise from BART train operations, the Isabel Station, the Isabel Station bus transfer facility, the Isabel Station parking facility, the storage and maintenance facility, and wayside system facilities under the Proposed Project would be below the established FTA standards; therefore, impacts would be less than significant. **(LS)**

DMU Alternative. The noise generated from operation of the DMU Alternative in 2040 is described for each operational noise source below.

Noise Generated by DMU Train Operations. Noise associated with operation of DMU trains along the proposed alignment in 2040 was analyzed using the same methodology as described previously for the 2025 analysis. Although there would be changes to the operational characteristics to train headways (two additional trains per hour) in 2040 compared to 2025, predicted noise levels using FTA methodology resulted in the same values for 2040 as presented in Table 3.J-21 for 2025. Predicted 2040 noise levels would be less than significant for all receptors

- **Noise Generated by the Isabel Station.** Operation of the proposed Isabel Station would be the same as under the 2025 analysis. As discussed previously, noise from the DMU trains near this station would be due to tracks and horns. The nearest

sensitive receptor is about 1,200 feet from the station (Shea Homes residences, LT-3). At this location, the existing L_{dn} is 61 dBA, which would mean an acceptable L_{dn} contribution from DMU trains of less than 59 dBA (with horn). The L_{dn} contribution from DMU trains and horns at this receptor would be 58 dBA, which would be below the applicable threshold, a less-than-significant impact, similar to 2025.

DMU operational facilities within the Isabel Station would include the train control room. No sensitive receptors would be located within the FTA-recommended screening distance of 250 feet from the power substations, and the noise impacts from these sources would be less than significant.

- **Noise Generated by Bus Operations at the Proposed Isabel Station Bus Transfer Facility.** Operation of the proposed bus transfer facility would be the same as under the 2025 analysis and would remain a less-than-significant impact.
- **Noise Generated by the Proposed Isabel Station Parking Facility.** Operation of the proposed parking garage would be the same as under the 2025 analysis. All receptors would be beyond the FTA screening distance for parking facilities and separated by intervening structures.
- **Noise Generated by the Storage and Maintenance Facility.** Operation of the proposed storage and maintenance facility would be the same as under the 2025 analysis. All receptors would be beyond the 1,000-foot FTA screening distance for yards and shops and separated by intervening hills, which provide an acoustic and visual buffer.
- **Noise Generated by Wayside System Facilities.** Operation of the proposed wayside facilities would be the same as under the 2025 analysis. All receptors would be beyond the FTA screening distance for substations.
- **Conclusion.** As described above, in 2040, noise from DMU train operations, the Isabel Station, the Isabel Station bus transfer facility, the Isabel Station parking facility, the storage and maintenance facility, and wayside system facilities would be below the established FTA standards and would be less than significant. **(LS)**

EMU Option. The EMU Option (electrically powered) would be quieter than the DMU Alternative (powered by a diesel engine). Consequently, with respect to noise from train operations along the alignment, the noise impacts of the EMU Option would be less than the DMU Alternative and similar to the Proposed Project as presented in Table 3.J-19. Therefore, in 2040, noise from the EMU Option operations would be less than significant. **(LS)**

Express Bus/BRT Alternative. The noise generated from operation of the Express Bus/BRT Alternative in 2040 is described for each operational noise source below.

- **Noise Generated by Express Bus Operations.** Noise associated with operation of express buses along the proposed alignment would result from engine noise and wheel friction of additional buses traveling in the express lanes of I-580. While there would be a marginal increase in headways to the operational characteristics of the express buses in 2040 compared to 2025, the noise levels would remain as presented in Table 3.J-22 for 2025 and, similar to operations in 2025 noise-related impacts would be less than significant.
- **Noise Generated by the Dublin/Pleasanton Station Replacement Parking Lot (or Garage).** Conditions in 2040 would be similar to those described above for 2025 and potential noise-related impacts would be less than significant.
- **Noise Generated by the Laughlin Parking Lot.** Conditions in 2040 would be similar to those described above for 2025 and potential noise-related impacts would be less than significant.
- **Conclusion.** As described above, in 2040, the noise from express bus operations under the Express Bus/BRT Alternative would not exceed the established FTA standards for any receptors noise-related impacts would be less than significant. **(LS)**

Enhanced Bus Alternative. In 2040, noise associated with operation of the Enhanced Bus Alternative would be similar to that described in 2025 and impacts would be less than significant. **(LS)**

Mitigation Measures. As described above, the operation of the transit facilities under the Proposed Project and Build Alternatives would not result in significant impacts related to exposing persons to or generating noise levels in excess of standards established by the FTA in 2040, and no mitigation measures are required.

Impact NOI-5: Result in a substantial permanent increase in ambient noise levels from roadway relocation and traffic distribution in the project vicinity above levels existing without the Proposed Project or Alternative under 2025 Project Conditions.

(No Project Alternative: NI; Conventional BART Project: LSM; DMU Alternative: LSM; Express Bus/BRT Alternative: LS; Enhanced Bus Alternative: LS)

The Proposed Project, DMU Alternative, and Express Bus/BRT Alternative would result in the relocation of portions of the I-580 lanes within the study area. This relocation, along with the increased future traffic volumes on I-580, could result in a noticeable increase in noise levels at sensitive receptors located along I-580.

Noise levels along the highway segments were estimated for this analysis using the FHWA Traffic Noise Prediction Model based on No Project Conditions and future traffic projections developed as part of the transportation analysis (see Section 3.B,

Transportation). Weekday traffic noise level estimates were modeled for the nearest receptors along the following three segments of I-580:

- Dougherty Road/Hopyard Road to Hacienda Drive at LT-1
- Tassajara Road/Santa Rita Road to Fallon Road/El Charro Road at LT-2
- Isabel Avenue to North Livermore Avenue at LT-5

Along all other segments of I-580 in the study area, the nearest receptors are located at least 500 feet away from I-580; at this distance noise from local roadways would predominate to the degree that there would be marginal, if any, quantifiable noise increase from freeway lane adjustments on I-580.

Predicted noise levels at these receptors reflect the peak hour conditions that have the greatest freeway volumes (AM peak hour conditions for the segment from Dougherty Road/Hopyard Road to Hacienda Drive, and PM peak hour conditions for Tassajara Road/Santa Rita Road to Fallon Road/El Charro Road and Isabel Avenue to North Livermore Avenue). The predicted future noise levels are presented in Table 3.J-23.

In addition, new parking facilities at Isabel Avenue and the operation of the Isabel Station (under the Proposed Project and DMU Alternative) and new parking facilities at the Dublin/Pleasanton Station and Laughlin Road (under the Express Bus/BRT Alternative) would result in increased vehicle volumes on local roadways, which could result in a noticeable increase in noise levels at sensitive receptors located along these roadways. Additionally, increased bus service under the Proposed Project and Build Alternatives would also increase roadside noise levels that could impact sensitive receptors located along the bus routes.

Seven representative roadway segments were selected for analysis. Three of the seven roadway segments were selected due to their proximity to the existing Dublin/Pleasanton Station (Owens Drive from Willow Road to Hacienda Drive, Martinelli Way from Hacienda Drive to the BART Parking Structure, and Dublin Boulevard from Hacienda Drive to the Iron Horse Parkway). In the vicinity of the proposed Isabel Station, sensitive receptors are located south of East Airway Boulevard, which would be used by vehicles accessing the parking facilities, and thus this roadway segment was included in the analysis (East Airway Boulevard from Portola Avenue to Sutter Street). No sensitive receptors are located along the other roadways that would be used to access the Isabel Station parking facilities—including Isabel Avenue south of I-580, Kitty Hawk Road, and East Airway Boulevard to Rutan Drive. Additionally, the storage and maintenance facility would generate worker trips that would use Campus Hill Drive (Campus Hill Drive from Portola Avenue to Storage and Maintenance Facility Access Road). Two roadway segments were selected due to the proposed increase in local bus service that would occur along these arterial roadways, which are adjacent to residential uses (Murietta Boulevard from Jack London Boulevard to

TABLE 3.J-23 MODELED I-580 NOISE LEVELS IN 2025

	Peak Hour Noise Levels (dBA)								
	No Project Alternative	Conventional BART Project		DMU Alternative		Express Bus/BRT Alternative		Enhanced Bus Alternative	
Roadway Segment	Noise Level	Noise Level	Change	Noise Level	Change	Noise Level	Change	Noise Level	Change
Dougherty Road/Hopyard Road to Hacienda Drive (LT-1)	61.0	61.0	0.0	61.7	0.7	61.8	0.8	60.8	-0.2
Tassajara Road/Santa Rita Road to Fallon Road/El Charro Road (LT-2)	60.6	61.0	0.4	61.1	0.5	60.6	0.0	60.6	0.0
Isabel Avenue to North Livermore Avenue (LT-5)	65.2	65.3	0.1	65.3	0.1	65.1	-0.1	65.1	-0.1

Notes: dBA = A-weighted decibels; LT = long-term noise measurement location; I- = Interstate Highway.
Peak hour conditions with the greatest freeway volumes are shown above: AM peak hour conditions for the segment from Dougherty Road/Hopyard Road to Hacienda Drive; and PM peak hour conditions Tassajara Road/Santa Rita Road to Fallon Road/El Charro Road and Isabel Avenue to North Livermore Avenue.
The change in noise levels is the difference between the No Project Conditions and the Project Conditions. Positive values represent an increase in noise levels and negative values represent a decrease in noise levels.

Stanley Boulevard and Vasco Road from Patterson Pass Road to East Avenue). Modeled weekday traffic noise level estimates these for seven roadway segments are presented in Table 3.J-24, for a distance of 50 feet from the roadway center.

For these analyses, an increase in noise levels exceeding those presented in Table 3.J-9 would be considered a significant impact. These criteria are based on the existing noise exposure levels at the sensitive receptors.

No Project Alternative. Under the No Project Alternative, the BART to Livermore Extension Project would not be implemented. However, planned and programmed transportation improvements for segments of I-580, local roadways and intersections, and core transit service improvements for BART, ACE, and LAVTA would be constructed. In addition, population and employment increases throughout Alameda County would result in continued land use development, including residential and commercial construction. These improvements and development projects could result in potential impacts to exposing persons to or excessive generating noise. However, the effects of the other projects associated with the No Project Alternative have been or will be addressed in environmental documents prepared for those projects before they are implemented, and the No Project Alternative would not result in new impacts as a consequence of the BART Board of Directors' decision not to adopt a project. Therefore, the 2025 No Project Alternative is considered to have no impact to exposing persons to or generating excessive noise. **(NI)**

Conventional BART Project. In 2025, the change in ambient noise levels under the Proposed Project is described below for highway relocation and traffic redistribution.

- **Noise Levels Associated with Highway Relocation.** Under the Proposed Project, the BART right-of-way (ROW) would be extended approximately 5.6 miles within the I-580 median, requiring relocation of the existing median on both the north and south of I-580 by up to 46 feet along the majority of the extension. The total width of the BART ROW would be up to 46 feet, similar to the standard BART ROW. At the proposed Isabel Station, the BART ROW would be 67 feet wide, to accommodate the station platform.

  As shown in Table 3.J-23, under the Proposed Project, highway noise at the nearest receptors would increase by up to 0.4 dBA during the peak hour. This would represent less than a 1-dBA increase at a receptor where existing noise levels are less than 74 L_{eq}, an allowable noise exposure increase per Table 3.J-9, and thus would be less than significant.

TABLE 3.J-24 MODELED NOISE LEVELS ON LOCAL ROADWAYS IN 2025

	No Project Alternative	Conventional BART Project		DMU Alternative		Express Bus/BRT Alternative		Enhanced Bus Alternative	
Roadway Segment	**Noise Level**	**Noise Level**	**Change**	**Noise Level**	**Change**	**Noise Level**	**Change**	**Noise Level**	**Change**
AM Peak Hour L_{eq} (dBA)									
Owens Drive From Willow Road to Hacienda Drive	68.9	68.6	-0.3	68.6	-0.3	68.8	-0.1	68.8	-0.1
Martinelli Way from Hacienda Drive to the BART Parking Structure	65.7	65.6	-0.1	65.7	0.0	65.6	-0.1	65.7	0.0
Dublin Boulevard from Hacienda Drive to the Iron Horse Parkway	71.6	71.6	0.0	71.6	0.0	71.6	0.0	71.6	0.0
Campus Hill Drive from Portola Avenue to Storage and Maintenance Facility Access Road	65.7	65.7	0.0	65.8	+0.1	65.7	0.0	65.7	0.0
Murietta Boulevard from Jack London Boulevard to Stanley Boulevard	67.6	67.6	0.0	67.6	0.0	67.6	0.0	67.6	0.0
Vasco Road from Patterson Pass Road to East Avenue	70.1	69.8	-0.3	70.1	0.0	70.1	0.0	70.1	0.0
East Airway Boulevard from Portola Avenue to Sutter Street	62.6	66.4	**+3.8**	65.3	**+2.7**	62.6	0.0	62.6	0.0
PM Peak Hour L_{eq} (dBA)									
Owens Drive From Willow Road to Hacienda Drive	70.8	70.7	-0.1	70.8	0.0	70.7	-0.1	70.8	0.0
Martinelli Way from Hacienda Drive to the BART Parking Structure	68.7	67.9	-0.8	68.2	-0.5	68.6	-0.1	68.6	-0.1

TABLE 3.J-24 MODELED NOISE LEVELS ON LOCAL ROADWAYS IN 2025

	No Project Alternative	Conventional BART Project		DMU Alternative		Express Bus/BRT Alternative		Enhanced Bus Alternative	
Roadway Segment	**Noise Level**	**Noise Level**	**Change**	**Noise Level**	**Change**	**Noise Level**	**Change**	**Noise Level**	**Change**
Dublin Boulevard from Hacienda Drive to the Iron Horse Parkway	72.9	72.9	0.0	72.9	0.0	72.9	0.0	72.9	0.0
Campus Hill Drive from Portola Avenue to Storage and Maintenance Facility Access Road	67.0	67.0	0.0	67.0	0.0	66.9	-0.1	67.0	0.0
Murietta Boulevard from Jack London Boulevard to Stanley Boulevard	68.7	69.0	+0.3	68.9	+0.2	68.6	-0.1	68.7	0.0
Vasco Road from Patterson Pass Road to East Avenue	71.3	71.3	0.0	71.2	-0.1	71.4	+0.1	71.3	0.0
East Airway Boulevard from Portola Avenue to Sutter Street	66.0	68.1	**+2.1**	67.3	**+1.3**	66.0	0.0	66.0	0.0

Notes: dBA = A-weighted decibels; L_{eq} = hourly equivalent (average) noise level. **Bold**/gray text indicates noise levels exceeding threshold.
Change in noise levels are the change between the No Project Conditions and the Project Conditions. Positive values represent an increase in noise levels and negative values represent a decrease in noise levels.

- **Noise Levels Associated with Traffic Redistribution on Local Roadways.** The Proposed Project would result in a redistribution of traffic on local roadways. Some of the vehicle trips that currently terminate at the Dublin/Pleasanton Station would terminate at the proposed Isabel Station under the Proposed Project.

  As shown in Table 3.J-24, in 2025, under the Proposed Project, the greatest increase in roadway noise would occur along East Airway Boulevard (3.8 dBA) during the AM peak hour. This would represent more than a 1-dBA increase at a receptor where existing noise levels are above 62 L_{eq}, resulting in a significant impact. The geographical extent of this impact would be from approximately 200 feet west of Montecito Circle to approximately 300 feet east of Via Montalvo (along Sun Valley Mobile Estates Mobile Home Park). Noise levels at other residences along East Airway Boulevard that are along Saddleback Circle and to the west, would not exceed thresholds as the residences are set back from East Airway Boulevard by approximately 100 to 200 feet and are separated from the roadway by a berm, which further reduces the noise levels. Noise level increases along all other roadways would be less than 1 dBA and would be less than significant.

- **Conclusion.** As described above, in 2025, the Proposed Project would result in ambient noise level increases that would exceed the applicable thresholds at receptors south of East Airway Boulevard (from approximately 200 feet west of Montecito Circle to approximately 300 feet east of Via Montalvo), due to increased traffic during the AM peak hour and PM peak hour. Therefore, the Proposed Project would have a significant impact related to increases in ambient noise levels. **Mitigation Measure NOI-5** would require construction of a sound barrier that would reduce noise impacts to a less-than-significant level along East Airway Boulevard. **(LSM)**

DMU Alternative. In 2025, the change in ambient noise levels under the DMU Alternative is described below for highway relocation and traffic redistribution.

- **Noise Levels Associated with Highway Relocation.** Under the DMU Alternative, the BART ROW for the DMU would be extended approximately 7.1 miles within the I-580 median, requiring relocation of the existing median on both the north and south of I-580 by up to 46 feet along the majority of the extension. The total width of the BART ROW for the DMU would be up to 46 feet, similar to the standard BART ROW. At the proposed Isabel Station, the ROW would be 67 feet wide, to accommodate the station platform.

  As shown in Table 3.J-23, the highway noise at the nearest receptors would increase by up to 0.7 dBA during the peak hour. This would represent less than a 1-dBA increase at a receptor where existing noise levels are below 74 L_{eq}, and thus would be less than significant.

- **Noise Levels Associated with Traffic Redistribution on Local Roadways.** Modeled weekday traffic noise level estimates for seven roadway segments are presented in Table 3.J-24. For the DMU Alternative, the greatest increase in roadway noise would occur along East Airway Boulevard (2.7 dBA) during the AM peak hour. This would represent more than a 1-dBA increase at a receptor where existing noise levels are above 62 L_{eq}. The geographical extent of this impact would be from approximately 200 feet west of Montecito Circle to approximately 300 feet east of Via Montalvo (along Sun Valley Mobile Estates Mobile Home Park). Noise levels at other residences along East Airway Boulevard that are along Saddleback Circle and to the west, would not exceed thresholds as the residences are set back from East Airway Boulevard by approximately 100 to 200 feet and are separated from the roadway by a berm, which reduces the noise levels.
- **Conclusion.** As described above, in 2025, under the DMU Alternative, ambient noise levels along I-580 would be below the applicable thresholds, but ambient noise level increases associated with local traffic redistribution would exceed thresholds along East Airway Boulevard (from approximately 200 feet west of Montecito Circle to approximately 300 feet east of Via Montalvo). Therefore, the DMU Alternative would have a significant impact related to ambient noise level increases. However, implementation of **Mitigation Measure NOI-5**, which requires construction of a sound barrier along a portion of the south side of East Airway Boulevard, would reduce ambient noise impacts to less than significant. **(LSM)**

Express Bus/BRT Alternative. In 2025, the change in ambient noise levels under the Express Bus/BRT Alternative is described below for highway relocation and traffic redistribution.

- **Noise Levels Associated with Highway Relocation.** Under the Express Bus/BRT Alternative, the I-580 lanes would be relocated for approximately 2.2 miles to accommodate the widened ROW in the I-580 median. The freeway would be relocated by approximately 88 feet from west of Dougherty Road to the Tassajara Road/Santa Rita Road overcrossing. At the Dublin/Pleasanton Station, the freeway would be relocated up to approximately 100 feet.

  As shown in Table 3.J-24, under the Express Bus/BRT Alternative, highway noise at the nearest receptors would increase by up to 0.8 dBA during the peak hour. This would represent less than a 1-dBA increase at a receptor where existing noise levels are less than 74 L_{eq}, and thus would be less than significant.
- **Noise Levels Associated with Traffic Redistribution on Local Roadways.** Modeled weekday traffic noise level estimates for seven roadway segments are presented in Table 3.J-24. For the Express Bus/BRT Alternative, the greatest increase in roadway noise would occur along Vasco Road during the PM peak hour (0.1 dBA). This would

represent less than a 1-dBA increase at a receptor where existing noise levels are less than 74 L_{eq}, and thus would be less than significant.

- **Conclusion.** As described above, in 2025, ambient noise level increases associated with highway relocation and traffic redistribution under the Express Bus/BRT Alternative would be below the applicable thresholds. Therefore, the Express Bus/BRT Alternative would have less-than-significant impacts related to ambient noise levels. **(LS)**

Enhanced Bus Alternative. Under the Enhanced Bus Alternative, noise levels along I-580 would not change from No Project Conditions, as this alternative does not entail relocation of I-580 lanes. However, there would be minor changes in traffic volumes on local roadways due to increased bus service. As shown in Table 3.J-24, the Enhanced Bus Alternative, the greatest increase in roadway noise would occur along Murrieta Boulevard (0.3 dBA) during the PM peak hour. This would be less than a 1-dBA increase at a receptor where existing noise levels are between 62 and 74 L_{eq}. Therefore, the Enhanced Bus Alternative would have less-than-significant impacts related to ambient noise levels. **(LS)**

Mitigation Measures. In 2025, the Proposed Project and DMU Alternative would result in a significant noise increase at residences south of East Airway Boulevard from approximately 200 feet west of Montecito Circle to approximately 300 feet east of Via Montalvo, as traffic volumes along this segment of East Airway Boulevard would more than double due to westbound traffic approaching the Isabel Station parking facility. Existing fences along the south side of East Airway Boulevard are currently insufficient to appreciably reduce noise levels. However, with implementation of **Mitigation Measure NOI-5**, which requires construction of a sound barrier along a portion of the south side of East Airway Boulevard along affected receptors, impacts would be reduced to a less-than-significant level. **Mitigation Measure NOI-5** provides for a sound wall sufficient to achieve a noise reduction of 4.3 dBA, which is a greater reduction than necessary according to the 2025 analysis. However, a reduction of 4.3 dBA will be necessary later, as shown in the 2040 analysis in **Impact NOI-6** below. Because BART will construct the sound wall as part of project construction starting in 2021, the more protective sound wall is included in **Mitigation Measure NOI-5**.

As described above, the Express Bus/BRT Alternative and Enhanced Bus Alternative would not result in significant impacts related to ambient noise levels in 2025, and no mitigation measures are required.

Mitigation Measure NOI-5: Construct Noise Barrier along East Airway Boulevard (Conventional BART Project and DMU Alternative/EMU Option).

BART shall construct a sound wall along the south side of East Airway Boulevard that has a demonstrated noise reduction of 4.3 dBA at the receptor. The sound wall shall

extend adjacent to Sun Valley Mobile Estates Mobile Home Park from approximately 200 feet west of Montecito Circle to approximately 300 feet east of Via Montalvo. The sound wall will be approximately 6 to 8 feet high, and shall be sufficient to block the line-of-sight from residences to the roadway and be designed such that any gaps in material are no greater than 10 percent of the total area of the barrier.

Impact NOI-6: Result in a substantial permanent increase in ambient noise levels in from roadway relocation and traffic distribution the project vicinity above levels existing without the Proposed Project or Alternative under 2040 Project Conditions.

(No Project Alternative: NI; Conventional BART Project: LSM; DMU Alternative: LSM; Express Bus/BRT Alternative: LS; Enhanced Bus Alternative: LS)

The Proposed Project, DMU Alternative, and Express Bus/BRT Alternative would result in the relocation of portions of the I-580 lanes within the study area, as described in **Impact NOI-5** above. This relocation, along with the increased future traffic volumes on I-580, as described in Section 3.B, Transportation, could result in a noticeable increase in noise levels at sensitive receptors located along I-580. Freeway segments and sensitive receptors are the same as described for 2025 (see **Impact NOI-5** above). Furthermore, noise levels in 2040 were estimated using the same methodology as described above for 2025. Table 3.J-25 shows the predicted noise levels at sensitive receptors along the I-580 freeway segments and reflects the peak hour conditions with the greatest predicted freeway volumes (AM peak hour conditions for the segment from Dougherty Road/Hopyard Road to Hacienda Drive, and PM peak hour conditions for Tassajara Road/Santa Rita Road to Fallon Road/El Charro Road and Isabel Avenue to North Livermore Avenue).

In addition, new parking facilities at Isabel Avenue and the operation of the Isabel Station (under the Proposed Project and DMU Alternative) and new parking facilities at the Dublin/Pleasanton Station and Laughlin Road (under the Express Bus/BRT Alternative) would result in increased vehicle volumes on local roadways, which could result in a noticeable increase in noise levels at sensitive receptors located along these roadways. Additionally, increased bus service under the Proposed Project and Build Alternatives would also increase roadside noise levels that could impact sensitive receptors located along the bus routes. Modeled weekday traffic noise level estimates for seven roadway segments are presented in Table 3.J-26, for a distance of 50 feet from the roadway center. Roadway segments and sensitive receptors are the same as described for 2025 (see **Impact NOI-5** above).

For this analysis, an increase in noise levels in excess of the allowable increase presented in Table 3.J-9 would be significant. These criteria are based on the existing noise exposure levels at the sensitive receptors.

TABLE 3.J-25 MODELED I-580 NOISE LEVELS IN 2040

	Noise Levels (dBA)								
	No Project Alternative	Conventional BART Project		DMU Alternative		Express Bus/BRT Alternative		Enhanced Bus Alternative	
Roadway Segment	Noise Level	Noise Level	Change	Noise Level	Change	Noise Level	Change	Noise Level	Change
Dougherty Road/Hopyard Road to Hacienda Drive (LT-1)	61.1	61.4	0.3	62.0	0.9	62.0	0.9	61.1	0.0
Tassajara Road/Santa Rita Road to Fallon Road/El Charro Road (LT-2)	61.0	61.5	0.5	61.5	0.5	61.0	0.0	61.0	0.0
Isabel Avenue to North Livermore Avenue (LT-5)	65.6	65.9	0.3	65.9	0.3	65.6	0.0	65.6	0.0

Notes: dBA = A-weighted decibels; L_{eq} = hourly equivalent (average) noise level; LT = long-term noise measurement location; I- = Interstate Highway.
The change in noise levels is the difference between the No Project Conditions and the Project Conditions. Positive values represent an increase in noise levels and negative values represent a decrease in noise levels.
Noise levels under the Enhanced Bus Alternative would not change from No Project Conditions, as this alternative does not entail relocation of I-580 lanes.

TABLE 3.J-26 MODELED PEAK HOUR NOISE LEVELS ON LOCAL ROADWAYS IN 2040

	No Project Alternative	Conventional BART Project		DMU Alternative		Express Bus/BRT Alternative		Enhanced Bus Alternative	
Roadway Segment	No Project Alternative	Noise Level	Change	Noise Level	Change	Noise Level	Change	Noise Level	Change
AM Peak Hour L_{eq} (dBA)									
Owens Drive from Willow Road to Hacienda Drive	69.3	69.1	-0.2	69.1	-0.2	69.3	0.0	69.3	0.0
Martinelli Way from Hacienda Drive to the BART Parking Structure	66.3	66.3	0.0	66.3	0.0	66.3	0.0	66.3	0.0
Dublin Boulevard from Hacienda Drive to the Iron Horse Parkway	72.1	72.0	-0.1	72.0	-0.1	72.0	-0.1	72.0	-0.1
Campus Hill Drive from Portola Avenue to Storage and Maintenance Facility Access Road	66.2	66.3	+0.1	66.2	0.0	66.1	-0.2	66.1	-0.2
Murietta Boulevard from Jack London Boulevard to Stanley Boulevard	68.5	69.1	+0.6	68.9	+0.3	68.4	-0.1	68.4	-0.1
Vasco Road from Patterson Pass Road to East Avenue	70.4	70.3	-0.1	70.4	0.0	70.3	-0.1	70.4	0.0
East Airway Boulevard from Portola Avenue to Sutter Street	62.5	66.8	**+4.3**	65.0	**+2.5**	62.6	0.1	62.5	0.0
PM Peak Hour L_{eq} (dBA)									
Owens Drive From Willow Road to Hacienda Drive	71.5	71.7	+0.2	71.6	+0.1	71.5	0.0	71.5	0.0

TABLE 3.J-26 MODELED PEAK HOUR NOISE LEVELS ON LOCAL ROADWAYS IN 2040

	No Project Alternative	Conventional BART Project		DMU Alternative		Express Bus/BRT Alternative		Enhanced Bus Alternative	
Roadway Segment	**No Project Alternative**	**Noise Level**	**Change**	**Noise Level**	**Change**	**Noise Level**	**Change**	**Noise Level**	**Change**
Martinelli Way from Hacienda Drive to the BART Parking Structure	69.6	68.4	-1.2	69.0	-0.6	69.6	0.0	69.5	-0.1
Dublin Boulevard from Hacienda Drive to the Iron Horse Parkway	73.7	73.7	0.0	73.7	0.0	73.7	0.0	73.8	+0.1
Campus Hill Drive from Portola Avenue to Storage and Maintenance Facility Access Road	67.1	67.1	0.0	67.2	+0.1	67.1	0.0	67.1	0.0
Murietta Boulevard from Jack London Boulevard to Stanley Boulevard	70.0	70.3	+0.3	70.2	+0.2	69.8	-0.2	69.9	-0.1
Vasco Road from Patterson Pass Road to East Avenue	72.4	72.5	+0.1	72.4	0.0	72.4	0.0	72.4	0.0
East Airway Boulevard from Portola Avenue to Sutter Street	66.3	68.2	**+1.9**	67.4	**+1.1**	66.2	-0.1	66.3	0.0

Notes: dBA = A-weighted decibels; L_{eq} = hourly equivalent (average) noise level. **Bold**/gray text indicates noise levels exceeding threshold.
The change in noise levels is the difference between the No Project Conditions and the Project Conditions. Positive values represent an increase in noise levels and negative values represent a decrease in noise levels.

No Project Alternative. Under the 2040 No Project Alternative, the BART to Livermore Extension Project would not be implemented, highway relocation would not occur, and noise increases experienced at sensitive land uses near the freeway would solely be the result of growth-induced traffic volumes. Traffic data indicate a worst-case I-580 volume increase of 16 percent over existing conditions between Dougherty/Hopyard Road and Hacienda Drive near long-term noise measurement location LT-1. Applying the most recent verified truck percentage (5 percent) and conservatively assuming travel at the posted speed limit, modeled noise levels during the morning peak hour at LT-1 would increase by 0.7 dBA (60.4 to 61.1 dBA). This modest increase would not be considered significant. Furthermore, the effects of the other projects associated with the No Project Alternative have been or will be addressed in environmental documents prepared for those projects before they are implemented, and the No Project Alternative would not result in new impacts as a consequence of the BART Board of Directors' decision not to adopt a project. Therefore, the 2040 No Project Alternative is considered to have no impact on noise levels. **(NI)**

Conventional BART Project. The change in ambient noise levels under the Proposed Project in 2040 is described below for highway relocation and traffic redistribution**.**

- **Noise Levels Associated with Highway Relocation.** As shown in Table 3.J-25, under the Proposed Project, highway noise at the nearest receptors would increase by up to 0.5 dBA during the peak hour. This would represent less than a 1-dBA increase at a receptor where existing noise levels are less than 74 L_{eq}, and thus would be less than significant.
- **Noise Levels Associated with Traffic Redistribution on Local Roadways.** Table 3.J-26 indicates that the greatest increase in roadway noise would occur along East Airway Boulevard (4.3 dBA) during the AM peak hour. This would represent more than a 1-dBA increase at a receptor where existing noise levels are above 62 L_{eq}, and thus would be a significant impact. A lesser but still significant impact would also occur during the PM peak hour. Noise level increases along all other roadways would be less than 1 dBA and would be less than significant.
- **Conclusion.** As described above, in 2040, ambient noise level increases associated with highway relocation and traffic redistribution under the Proposed Project would exceed the applicable thresholds at receptors south of East Airway Boulevard, due to vehicles accessing the Isabel Station parking facility (see **Impact NOI-5** above regarding the location of impacted receptors). Therefore, the Proposed Project would have a significant impact related to increases in ambient noise levels. Impacts would be reduced to less than significant with implementation of **Mitigation Measure NOI-5**, described above, which requires construction of a sound barrier along the south side of East Airway Boulevard from approximately 200 feet west of Montecito Circle to approximately 300 feet east of Via Montalvo. **(LSM)**

DMU Alternative. The change in ambient noise levels in 2040 under the DMU Alternative is described below for highway relocation and traffic redistribution.

- **Noise Levels Associated with Highway Relocation.** As shown in Table 3.J-25, under the DMU Alternative, highway noise at the nearest receptors would increase by up to 0.9 dBA during the peak hour. This would represent less than a 1-dBA increase at a receptor where existing noise levels are below 74 L_{eq}, and thus would be less than significant.
- **Noise Levels Associated with Traffic Redistribution on Local Roadways.** As shown in Table 3.J-26, the greatest increase in roadway noise would occur along East Airway Boulevard (2.5 dBA) during the AM peak hour. This would represent more than a 1-dBA increase at a receptor where existing noise levels are above 62 L_{eq}, and thus would be a significant impact. Noise level increases along all other roadways would be less than 1 dBA and less than significant.
- **Conclusion.** As described above, in 2040, ambient noise level increases associated with highway relocation and traffic redistribution under the DMU Alternative would exceed the applicable thresholds at receptors south of East Airway Boulevard, due to vehicles accessing the Isabel Station parking facility (see **Impact NOI-5** above regarding the location of impacted receptors). Therefore, the DMU Alternative would have a significant impact related to increases in ambient noise levels. Impacts would be reduced to less than significant with implementation of **Mitigation Measure NOI-5**, which requires construction of a sound barrier along the south side of East Airway Boulevard from approximately 200 feet west of Montecito Circle to approximately 300 feet east of Via Montalvo. **(LSM)**

Express Bus/BRT Alternative. The change in ambient noise levels in 2040 under the Express Bus/BRT Alternative is described below for highway relocation and traffic redistribution.

- **Noise Levels Associated with Highway Relocation.** As shown in Table 3.J-25, under the Express Bus/BRT Alternative in 2040, highway noise at the nearest receptors would increase by up to 0.9 dBA during the peak hour. This would represent less than a 1-dBA increase at a receptor where existing noise levels are below 74 L_{eq}, and thus would be less than significant.
- **Noise Levels Associated with Traffic Redistribution on Local Roadways.** As shown in Table 3.J-26, the Express Bus/BRT Alternative would have the greatest increase in roadway noise along East Airway Boulevard (0.1 dBA) during the AM peak hour. This would represent less than a 1-dBA increase at a receptor where existing noise levels are below 74 L_{eq}, and thus would be less than significant.
- **Conclusion.** As described above, in 2040, ambient noise level increases associated with highway relocation and traffic redistribution under the Express Bus/BRT

Alternative would be below the applicable thresholds. Therefore, the Express Bus/BRT Alternative would have less-than-significant impacts related to ambient noise levels. **(LS)**

Enhanced Bus Alternative. Under the Express Bus/BRT Alternative, noise levels along I-580 would not change from No Project Conditions, as this alternative does not entail relocation of I-580 lanes. However, there would be minor changes in traffic volumes on local roadways due to increased bus service. Table 3.J-26 indicates that the greatest increase in roadway noise would occur along Dublin Boulevard (0.1 dBA) during the PM peak hour. This would represent less than a 1-dBA increase at a receptor where existing noise levels are below 74 L_{eq}, and thus would be less than significant. Therefore, the Express Bus/BRT Alternative would have less-than-significant roadway noise impacts to adjacent sensitive receptors. **(LS)**

Mitigation Measures. As described above, in 2040, under the Proposed Project and the DMU Alternative (including EMU Option), a significant noise increase would occur at residences south of East Airway Boulevard (from approximately 200 feet west of Montecito Circle to approximately 300 feet east of Via Montalvo) due to increases in vehicles approaching the parking facility from the westbound direction. Existing fences along the south side of East Airway Boulevard are currently insufficient to appreciably reduce noise levels. However, with implementation of **Mitigation Measure NOI-5** above, which requires construction of a sound barrier along a portion of the south side of East Airway Boulevard to achieve a noise reduction of 4.3 dBA, impacts would be reduced to a less-than-significant level.

As described above, the Express Bus/BRT Alternative and Enhanced Bus Alternative would not result in significant impacts related to ambient noise levels in 2040, and no mitigation measures are required for these alternatives.

Impact NOI-7: Expose persons to or generate excessive groundborne vibration or groundborne noise levels under 2025 and 2040 Project Conditions.

(No Project Alternative: NI; Conventional BART Project: LS; DMU Alternative: LSM; EMU Option: LS; Express Bus/BRT Alternative: LS; Enhanced Bus Alternative: LS)

Impacts related to exposing persons to or generating excessive groundborne vibration or groundborne noise levels would remain the same in 2025 and 2040. Thus, they are described jointly below.

No Project Alternative. Under the No Project Alternative, the BART to Livermore Extension Project would not be implemented and there would be no physical changes in the environment associated with construction of the Proposed Project or any of the Build Alternatives. However, planned and programmed transportation improvements for

segments of I-580, local roadways and intersections, and core transit service improvements for BART, ACE, and LAVTA would be constructed. In addition, population and employment increases throughout Alameda County would result in continued land use development, both residential and commercial. Operation of these improvements and development projects could expose persons to or generate excessive groundborne vibration or groundborne noise levels. However, the effects of the other projects associated with the No Project Alternative have been or will be addressed in environmental documents prepared for those projects before they are implemented, and the No Project Alternative would not result in new impacts as a consequence of the BART Board of Directors' decision not to adopt a project. Therefore, the No Project Alternative is considered to have no impacts related to groundborne vibration or groundborne noise levels. **(NI)**

Conventional BART Project. As presented in Table 3.J-10, the FTA has developed screening distances for assessment of potential vibration impacts. Receptors located beyond these distances would be expected to experience less-than-significant impacts from train vibrations. The Proposed Project would generate groundborne vibration and noise that could adversely impact nearby sensitive receptors. In particular, locations where the BART trains cross a railroad switch could result in relatively high vibration levels. Railroad switches allow trains to cross from one track to another, and these switches have gaps that increase vibration levels as a vehicle crosses over the gaps.

As shown in Table 3.J-27 below, receptors less than 90 feet from the tracks without switches or less than 125 feet from railroad tracks with switches could be significantly impacted by groundborne vibration.

As shown in Table 3.J-18, there are no receptors within 600 feet of any proposed switch locations of the Proposed Project. In addition, the nearest residential uses at LT-2 (Pimlico), are approximately 170 feet from the rails. At this distance, groundborne vibration would be less than 70 VdB and below the FTA significance criteria for groundborne vibration of 72 VdB identified in Table 3.J-3. Therefore, vibration and groundborne noise impacts would be less than significant for the Proposed Project. **(LS)**

DMU Alternative. The diesel engines of trains under the DMU Alternative would generate groundborne vibration and noise that could annoy nearby sensitive receptors. In particular, locations where the DMU trains cross a railroad switch could result in relatively high vibration levels.

TABLE 3.J-27 CONVENTIONAL BART PROJECT – PREDICTED VIBRATION LEVELS FROM AT-GRADE RAIL OPERATIONS

Type of Impact	Location	Acceptable Level (VdB)	Distance from Centerline of Track					
			25 feet	50 feet	80 feet	90 feet	100 feet	125 feet
Groundborne Vibration (VdB)	Away from Switches	=<72	**82**	**77**	**74**	**72**	71	70
	At Switches	=<72	**92**	**87**	**80**	**77**	**75**	**72**
Groundborne Noise (VdB)	Away from Switches	=<35	32	27	24	22	21	20
	At Switches	=<35	**42**	**37**	30	27	25	22

Notes: VdB = vibration decibels. **Bold**/gray text indicates noise levels exceeding threshold.
Acceptable levels are conservatively shown for residences and buildings where people normally sleep. Institutional land uses have higher acceptable levels.

Table 3.J-28 shows the distance at which vibration levels caused by DMU trains traveling on surface tracks become less than significant. As shown in the table, receptors less than 100 feet from the tracks alone or less than 200 feet from railroad switches could be significantly impacted by groundborne vibration.

TABLE 3.J-28 DMU ALTERNATIVE – PREDICTED VIBRATION LEVELS FROM AT-GRADE RAIL OPERATIONS

Type of Impact	Location	Acceptable Level (VdB)	Distance from Centerline of Track					
			50 feet	100 feet	125 feet	150 feet	170 feet	200 feet
Groundborne Vibration (VdB)	Away from Switches	=<72	**84**	**78**	**77**	**76**	**76**	**76**
	At Switches	=<72	**94**	**82**	**79**	**76**	**73**	70
Groundborne Noise (VdB)	Away from Switches	=<35	34	28	28	27	26	25
	At Switches	=<35	**44**	32	29	26	23	20

Notes: VdB = vibration decibels. **Bold**/gray text indicates noise levels exceeding threshold.
Acceptable levels are for residences and buildings where people normally sleep. Institutional land uses have higher acceptable levels.

As shown in Table 3.J-20, there are no receptors within 600 feet of any proposed switch locations of the DMU Alternative. However, the nearest residential uses along the Tassajara Road/Santa Rita Road to Fallon Road/El Charro Road segment at LT-2 (Pimlico),

are approximately 170 feet from the rails. At this distance, groundborne vibration is predicted to be 75 VdB, which would exceed the FTA significance criteria for groundborne vibration of 72 VdB identified in Table 3.J-3 for residential (Category 2) uses. Sensitive receptors along all other segments of the DMU alignment are sufficiently distant to ensure vibration levels below the FTA significance criteria.

Due to the distance of LT-2 to the track, the DMU Alternative would have a potentially significant impact related to groundborne vibration. With implementation of **Mitigation Measure NOI-7**, which requires vibration-reducing design elements, this impact would be reduced to a less-than-significant level. **(LSM)**

EMU Option. Under the EMU Option, vibration associated with rail operations would be the same as the Proposed Project. Therefore, vibration impacts associated with the EMU Option would be similar to Proposed Project and would have less-than-significant impacts related to groundborne vibration on adjacent sensitive receptors. **(LS)**

Express Bus/BRT Alternative. Rubber-tire vehicles rarely create groundborne vibration unless there is a discontinuity or bump in the road. Vibration curves developed by the FTA indicate that the vibration level for a typical bus operating on a smooth roadway would have vibration levels below the threshold of 72 VdB at a distance of 20 feet from the roadway center. As no receptors are located within this proximity to I-580 or along the bus routes, operational vibration impacts from the Express Bus/BRT Alternative would be less than significant. **(LS)**

Enhanced Bus Alternative. As with the Express Bus/BRT Alternative, the Enhanced Bus Alternative would only involve increased bus operations of rubber-tire vehicles with independent suspension. Vibration curves developed by the FTA indicate that the vibration level for a typical bus operating on a smooth roadway vibration levels would be below the threshold of 72 VdB at a distance of 20 feet from the roadway center. As no receptors are located within this proximity to I-580 or along the bus routes, operational vibration impacts from the Enhanced Bus Alternative would be less than significant. **(LS)**

Mitigation Measures. As described above, the Proposed Project, EMU Option, Express Bus/BRT Alternative, and Enhanced Bus Alternative would not have significant impacts; therefore, no mitigation measures are required.

However, the DMU Alternative would have potentially significant impacts on groundborne noise and vibration due to the proximity of sensitive receptor LT-2 to the track. With implementation of **Mitigation Measure NOI-7**, which requires vibration-reducing design elements to achieve a performance standard, impacts would be reduced to a less-than-significant level. Given that an estimated 4 VdB of reduction would be sufficient to achieve a less-than-significant impact, FTA estimates of vibration reduction associated with the below menu of measures indicate that the 72-VdB performance standard is

attainable to reduce the impact to less than significant. Alternatively, this mitigation may not be required if BART can demonstrate through more refined analysis that this performance standard could be attained without additional mitigation.

Mitigation Measure NOI-7: Vibration-Reducing Design Elements (DMU Alternative).

The operational vibration analysis indicates that a significant groundborne vibration impact could occur under the DMU Alternative. BART shall include vibration-reducing design elements for an approximately 3,000-foot stretch of the DMU track between Brockton Drive and Streamside Circle in the Pleasanton Meadows/Fairlands neighborhood sufficient to achieve a performance standard of 72 VdB at the northernmost receptors of the neighborhood. Examples of available options to achieve this reduction may include the following:

1. **Resilient Fasteners.** Resilient fasteners are used to fasten the rail to concrete track slabs. Standard resilient fasteners are very stiff in the vertical direction. Special fasteners with vertical stiffness of approximately 30,000 pounds per inch would reduce vibration by as much as 5 to 10 dB at frequencies above 30 to 40 Hz.
2. **Ballast Mats.** A ballast mat consists of a rubber or other type of elastomer pad that is placed under the ballast. The mat generally must be placed on a concrete pad to be effective. Consequently, most ballast mat applications are in subway or elevated structures. Ballast mats can provide 10 to 15 dB attenuation at frequencies above 25 to 30 Hz.
3. **Resiliently Supported Ties.** The resiliently supported tie system consists of concrete ties supported by rubber pads. The rails are fastened directly to the concrete ties using standard rail clips. Existing measurement data indicate that resiliently supported ties may be very effective in reducing low-frequency vibration in the 15 to 40 Hz range.
4. **Floating Slabs.** Floating slabs can be very effective at controlling groundborne vibration and noise. They consist of a concrete slab supported on resilient elements, usually rubber or a similar elastomer. A special floating slab in the BART system uses a very heavy design with a resonance frequency in the 5- to 10-Hz frequency range.[19]

[19] Federal Transit Administration (FTA), 2006. Transit Noise and Vibration Impact Assessment, Final Report FTA-VA-90-1003-06. May.

Impact NOI-8: Expose people residing or working in the project area to excessive noise levels if located within an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport or if located within the vicinity of a private airstrip under 2025 and 2040 Project Conditions.

(No Project Alternative: NI; Conventional BART Project: NI; DMU Alternative: NI; Express Bus/BRT Alternative: NI; Enhanced Bus Alternative: NI)

Impacts related to exposing people to excessive airport noise levels would remain the same in 2025 and 2040; thus, they are described jointly below.

No Project Alternative. Under the No Project Alternative, the BART to Livermore Extension Project would not be implemented and project-related workers would not be introduced to the area. However, planned and programmed transportation improvements would be constructed and continued land use development would occur. The effects of the projects associated with the No Project Alternative have been or will be addressed in environmental documents prepared for those projects before they are implemented, as applicable under CEQA, and the No Project Alternative would not result in new impacts as a consequence of the BART Board of Directors' decision not to adopt a project. Therefore, the No Project Alternative is considered to have no impacts related to public or private airport noise. **(NI)**

Conventional BART Project and Build Alternatives. There is one public use airport within 2 miles of the collective footprint. The Livermore Municipal Airport is located immediately south of I-580 between El Charro Road and Isabel Avenue. The nearest runway would be approximately 2,500 feet from the alignments of the Proposed Project and the DMU Alternative and 3,000 feet from the proposed Isabel Station. Noise contours contained in the Airport Land Use Compatibility Plan for the Livermore Municipal Airport indicate that the alignments of the Proposed Project and the DMU Alternative as well as the proposed Isabel Station would be outside of the 60 CNEL noise contour for airport operations.[20] Noise exposures below 60 CNEL are considered normally acceptable for all land use types.[21]

There are no private air strips within a 6-mile radius of the Proposed Project or the alternatives; however, the Camp Parks heliport is located approximately 4,000 feet north of the existing Dublin/Pleasanton Station.[22] While there is no publicly available information with regard to number of daily operations or noise contours for this heliport, long-term noise monitoring conducted at location LT-1, adjacent to the Dublin/Pleasanton Station,

[20] Alameda County Airport Land Use Commission, 2012. Livermore Executive Airport: Airport Land Use Compatibility Plan. August. Figure 3-2.
[21] California Governor's Office of Planning and Research, 2003. General Plan Guidelines.
[22] Federal Aviation Administration (FAA), 2017. Airport Data and Contact Information web tool. Available at: https://www.faa.gov/airports/airport_safety/airportdata_5010/menu/, accessed February 15.

indicate an existing CNEL of 67 and this level of existing noise exposure is considered in the impact analysis using FTA guidance. The Proposed Project and the Build Alternatives would not result in locating new or additional sensitive receptors in the area of the Camp Parks heliport. Therefore, the Proposed Project and Build Alternatives would have no impact related to exposure of people to public or private airport noise. **(NI)**

Mitigation Measures. As described above, the Proposed Project and Alternatives would not result in significant impacts related to public or private airports, and no mitigation measures are required.

Impact NOI-9: Expose persons to or generate noise levels in excess of standards established by the FTA from combined project sources in 2025 under Project Conditions.

(No Project Alternative: NI; Conventional BART: LS; DMU Alternative: LS; EMU Option: LS; Express Bus/BRT Alternative: LS; Enhanced Bus Alternative: LS)

The noise increases from the operation of the various components of the Proposed Project and Build Alternatives, such as rail and bus transit, could impact the same receptors that would be affected by highway noise, resulting in greater noise levels than those of the individual components, described in **Impact NOI-3** and **Impact NOI-5** above. The analysis below considers these potential combined project noise impacts.

No Project Alternative. Under the No Project Alternative, the BART to Livermore Extension Project would not be implemented. However, planned and programmed transportation improvements for segments of I-580, local roadways and intersections, and core transit service improvements for BART, ACE, and LAVTA would be constructed. In addition, population and employment increases throughout Alameda County would result in continued land use development, including residential and commercial construction. These improvements and development projects could result in potential impacts to exposing persons to or generating excessive noise. However, the effects of the other projects associated with the No Project Alternative have been or will be addressed in environmental documents prepared for those projects before they are implemented, and the No Project Alternative would not result in new impacts as a consequence of the BART Board of Directors' decision not to adopt a project. Therefore, the 2025 No Project Alternative is considered to have no impact to exposing persons to or generating excessive noise levels. **(NI)**

Conventional BART Project. As indicated in Table 3.J-19, noise from BART operations would primarily increase noise levels at receptors LT-2 and LT-3. As indicated in Table 3.J-23, highway relocation would primarily increase noise levels at receptors LT-1, LT-2, and LT-5. Consequently, a potential impact could occur at receptor LT-2 from both BART operations and roadway relocation/traffic distribution.

The existing monitored noise level at LT-2 is 63.9 dBA L_{dn}, which would be inclusive of aircraft overflights. Highway relocation would increase noise levels at LT-2 by 0.4 dBA, resulting in a new noise exposure of 64.3 dBA. At this noise level, the FTA-identified acceptable L_{dn} contribution from BART trains is less than 61 dBA (the same as existing noise levels). Operations of BART would result in a contribution of 54 dBA, which would be a less-than-significant impact. Consequently, the combined impacts of BART operations and roadway relocation/traffic distribution in 2025 would be less than significant. **(LS)**

DMU Alternative. As indicated in Table 3.J-21, noise from DMU operations would primarily increase noise levels at receptors LT-2, LT-3, and LT-1. As indicated in Table 3.J-23, highway relocation would primarily increase noise levels at receptors LT-2, LT-5, and LT-1. Consequently, a potential impact could occur at receptors LT-1 and LT-2 from both DMU operations and roadway relocation/traffic distribution.

The existing monitored noise level at LT-2 is 63.9 dBA L_{dn}, which would be inclusive of aircraft overflights. Highway relocation would increase noise levels at LT-2 by 0.4 dBA, resulting in a new noise exposure of 64.3 dBA. At this noise level, the FTA-identified acceptable L_{dn} contribution from transit is less than 61 dBA (the same as for the existing noise level). Operations of DMU trains would result in a contribution of 56 dBA, which would be a less-than-significant impact. Consequently, the combined impacts of DMU operations and roadway relocation/traffic distribution in 2025 would be less than significant.

The existing monitored noise level at LT-1 is 66.3 dBA L_{dn}, which would be inclusive of existing BART operations at the Dublin/Pleasanton Station and any aircraft overflights. Highway relocation would increase noise levels at LT-1 by 0.7 dBA, conservatively[23] resulting in a new noise exposure of 67.0 dBA. At this noise level, the FTA-identified acceptable L_{dn} contribution from transit is less than 63 dBA (the same as existing noise levels). Operations of DMU trains would result in a contribution of 58 dBA, which would be a less-than-significant impact. Consequently, the combined impacts of DMU operations and roadway relocation/traffic distribution in 2025 would be significant.

EMU Option. The EMU Option (electronically powered) would be quieter than the DMU Alternative (powered by a diesel engine). Consequently, with respect to noise from train operations along the alignment, the noise impacts of the EMU Option would be less than the DMU Alternative and would be similar to the Proposed Project, discussed above. Consequently, the combined impacts of EMU operations and roadway relocation/traffic distribution in 2025 would be significant. **(LS)**

[23] This is conservative because existing BART operations to and from the Dublin/Pleasanton Station are a significant contributor to the monitored noise levels at LT-7. Thus, assuming the full contribution of highway noise increase likely overstates this resultant noise level.

Express Bus/BRT Alternative. As indicated in Table 3.J-22, noise from express bus operations would primarily increase noise levels at receptors LT-5, LT-4, and LT-1. As indicated in Table 3.J-23, roadway relocation/traffic distribution would primarily increase noise levels at receptor LT-1. Consequently, a potential combined project impact could occur at receptor LT-1 from both express bus operations and roadway relocation/traffic distribution.

The existing monitored noise level at LT-1 is 66.3 dBA L_{dn}, which would be inclusive of any aircraft overflights. Highway relocation would increase noise levels at LT-1 by 0.7 dBA, resulting in a new noise exposure of 67.0 dBA. At this noise level, the FTA-identified acceptable L_{dn} contribution from transit is less than 63 dBA (1 dBA less than existing noise levels). Operations of express buses would result in a contribution of 48 dBA, which would be a less-than-significant impact. Consequently, the combined project impacts of the Express Bus/BRT Alternative at receptor LT-1 in 2025 would be less than significant. **(LS)**

Enhanced Bus Alternative. There would be no roadway relocation under the Enhanced Bus Alternative. Consequently, project impacts in 2025 would be the same as those resulting from increased bus service discussed above in **Impact NOI-3** for this alternative, which was determined to be less than significant. **(LS)**

Mitigation Measures. As described above, in 2025, the Proposed Project and Alternatives in combination with roadway relocation and traffic distribution would not result in significant cumulative impacts related to exposing persons to or generating noise levels in excess of standards established by the FTA, and no additional mitigation measures are required.

Impact NOI-10: Expose persons to or generate noise levels in excess of standards established by the FTA from combined project sources in 2040 under Project Conditions.

(No Project Alternative: NI; Conventional BART: LS; DMU Alternative: LS; EMU Option: LS; Express Bus/BRT Alternative: LS; Enhanced Bus Alternative: LS)

The noise increases from the operation of the various components of the Proposed Project and Build Alternatives, such as rail and bus transit, could impact the same receptors that would be affected by highway noise, resulting in greater noise levels than those of the individual components, described in **Impact NOI-4** and **Impact NOI-6** above. The analysis below considers these potential combined project noise impacts.

No Project Alternative. Under the 2040 No Project Alternative, the BART to Livermore Extension Project would not be implemented and there would be no physical changes to the environment associated with operation of the Proposed Project or any of the Build Alternatives. However, planned and programmed transportation improvements for

segments of I-580, local roadways and intersections, and core transit service improvements for BART, ACE, and LAVTA would be constructed. In addition, population and employment increases throughout Alameda County would result in continued land use development, both residential and commercial. These improvements and development projects could result in potential impacts to exposing persons to or generating excessive noise. However, the effects of the other projects associated with the No Project Alternative have been or will be addressed in environmental documents prepared for those projects before they are implemented, and the No Project Alternative would not result in new impacts as a consequence of the BART Board of Directors' decision not to adopt a project. Therefore, the 2040 No Project Alternative is considered to have no impact to exposing persons to or generating excessive noise levels. **(NI)**

Conventional BART Project. As discussed in **Impact NOI-4** predicted noise levels from BART operations in 2040 would be the same as those presented in Table 3.J-19 for 2025. Consequently, the combined impact of BART operations and highway relocation in 2040 would be the same as those described above for 2025. Operations of BART would result in a contribution of 59 dBA, which would be a less-than-significant impact with consideration of both the transit noise and increased noise from highway relocation. Consequently, the combined impacts of BART operations and roadway relocation/traffic distribution in 2040 would be less than significant. **(LS)**

DMU Alternative. As discussed in **Impact NOI-4**, predicted noise levels from the DMU Alternative in 2040 would be the same as those presented in Table 3.J-21 for 2025. As indicated in Table 3.J-14, noise from DMU operations would primarily increase noise levels at receptors LT-1, LT-2 and LT-3. As indicated in Table 3.J-25, highway relocation would primarily increase noise levels at receptors LT-1, LT-2 and LT-5. Consequently, a potential impact could occur at receptors LT-1 and LT-2 from both DMU operations and roadway relocation/traffic distribution.

The existing monitored noise level at LT-2 is 63.9 dBA L_{dn}, which would be inclusive of aircraft overflights. Highway relocation would increase noise levels at LT-2 by 0.4 dBA, resulting in a new noise exposure of 64.3 dBA. At this noise level, the FTA-identified acceptable L_{dn} contribution from transit is less than 61 dBA (the same as for the existing noise level). Operations of DMU trains would result in a contribution of 58 dBA, which would be a less-than-significant level.

The existing monitored noise level at LT-1 is 66.3 dBA L_{dn}, which would be inclusive of existing BART operations at the Dublin/Pleasanton Station and any aircraft overflights.

Highway relocation would increase noise levels at LT-1 by 0.7 dBA, conservatively[24] resulting in a new noise exposure of 67.0 dBA. At this noise level, the FTA-identified acceptable L_{dn} contribution from transit is less than 63 dBA (the same as existing noise levels). Operations of DMU trains would result in a contribution of 55 dBA, which would be a less-than-significant impact with consideration of both the transit noise and increased noise from highway relocation. Consequently, the combined impacts of DMU operations and roadway relocation/traffic distribution in 2040 would be less than significant. **(LS)**

EMU Option. The EMU Option (electronically powered) would be quieter than the DMU Alternative (powered by a diesel engine). Consequently, with respect to noise from train operations along the alignment, the noise impacts of the EMU Option would be less than the DMU Alternative and would be similar to the Proposed Project, discussed above. Consequently, the combined impacts of EMU operations and roadway relocation/traffic distribution in 2040 would be significant. **(LS)**

Express Bus/BRT Alternative. As indicated in Table 3.J-22, noise from express bus operations would primarily increase noise levels at receptors LT-1, LT-4 and LT-5. As indicated in Table 3.J-25, highway relocation would primarily increase noise levels at receptor LT-1. Consequently, a potential combined impact could occur at receptor LT-1 from both express bus operations and roadway relocation/traffic distribution.

The existing monitored noise level at LT-1 is 66.3 dBA L_{dn}, which would be inclusive of any aircraft overflights. Highway relocation would increase noise levels at LT-1 by 0.7 dBA, resulting in a new noise exposure of 67.0 dBA. At this noise level, the FTA-identified acceptable L_{dn} contribution from transit is less than 63 dBA (1 dBA less than existing noise levels). Operations of express buses would result in a contribution of 51 dBA, which would be a less-than-significant impact with consideration of both the transit noise and increased noise from highway relocation. Consequently, the combined impacts of Express Bus/BRT Alternative and roadway relocation/traffic distribution in 2040 would be less than significant. **(LS)**

Enhanced Bus Alternative. There would be no roadway relocation under the Enhanced Bus Alternative. Consequently, impacts in 2040 would be the same as the project level impacts discussed above for this alternative. **(LS)**

Mitigation Measures. As described above, in 2040, new transit operation of the Proposed Project and Alternatives in combination with roadway relocation and traffic distribution would not result in significant cumulative impacts related to exposing persons to or

[24] This is conservative because existing BART operations to and from the Dublin/Pleasanton Station are a significant contributor to the monitored noise levels at LT-7. Thus, assuming the full contribution of highway noise increase likely overstates this resultant noise level.

generating noise levels in excess of standards established by the FTA, and no additional mitigation measures are required.

(b) Operations – Cumulative Analysis

The geographic study area for cumulative impacts is the similar to that of the study area described in the Introduction subsection above. In addition, the cumulative projects considered extend beyond the study area.

Consistent with CEQA requirements, this Draft EIR considers the direct and indirect impacts on noise of the Proposed Project and Build Alternatives together with the effects of past, present, and probable future projects that cause or contribute to a cumulative noise effect. As described in Section 3.A, Introduction to Environmental Analysis and Appendix E, cumulative projects that could cause impacts in combination with the impacts of the Proposed Project or Build Alternatives include growth envisioned in Plan Bay Area as well as the Dublin/Pleasanton Station Parking Expansion.[25] In addition, the cumulative projects under the Proposed Project and the DMU Alternative include the INP.

As described in **Impact NOI-8** above, the Proposed Project and Build Alternatives would have no impacts related to exposing people to excessive noise due to private or public airports and airstrips. Therefore, the Proposed Project and Build Alternatives would not contribute to these cumulative impacts during operations.

Impact NOI-11(CU): Result in a substantial permanent increase in ambient noise levels in the vicinity above levels existing without the Proposed Project or Alternative under 2025 Cumulative Conditions.

(No Project Alternative: NI; Conventional BART Project: LS; DMU Alternative: LS; Express Bus/BRT Alternative: LS; Enhanced Bus Alternative: LS)

Project parking facilities and the operation of the Isabel Station under the Proposed Project, the DMU Alternative, and the Express Bus/BRT Alternative would result in increased vehicle volumes on local roadways, which, together with cumulative development of the INP, the Dublin/Pleasanton Station Parking Expansion, and development growth throughout the area as envisioned in Plan Bay Area, could result in a noticeable increase in noise levels at sensitive receptors located along these roadways.[26] Additionally, increased bus service under the Proposed Project and Build Alternatives would increase roadside noise levels that could impact sensitive receptors located along the bus routes with substantially increased volumes. For this analysis, an increase in noise exceeding those presented in Table 3.J-7 would be significant.

[25] Association of Bay Area Governments (ABAG), 2013. Plan Bay Area Projections 2013.
[26] Ibid.

For this analysis, consistent with Table 3.J-9, an increase of 1 dBA or higher would be significant in an area where existing noise levels are below 74 dBA L_{dn}, and an increase of 2 dBA or higher would be significant in an area where existing noise levels are above below 62 dBA L_{dn}.

No Project Alternative. Under the 2025 No Project Alternative in the Cumulative Condition, the BART to Livermore Extension Project would not be implemented, highway relocation would not occur, and noise increases experienced at sensitive land uses near the freeway would solely be the result of growth-induced traffic volumes. Traffic data indicate a worst-case I-580 volume increase of 14 percent over existing conditions between Dougherty/Hopyard Road and Hacienda Drive near long-term noise measurement location LT-1. Applying the most recent verified truck percentage (5 percent) and conservatively assuming travel at the posted speed limit, modeled noise levels during the morning peak hour at LT-1 would increase by 0.6 dBA (60.4 to 61.0 dBA). This modest increase would not be considered significant. Furthermore, the effects of the other projects associated with the No Project Alternative have been or will be addressed in environmental documents prepared for those projects before they are implemented, and the No Project Alternative would not result in new impacts as a consequence of the BART Board of Directors' decision not to adopt a project. Therefore, the 2025 No Project Alternative under Cumulative Conditions is considered to have no impact on noise levels. **(NI)**

Conventional BART Project. The change in ambient noise levels resulting from Proposed Project when combined with past, present, and probable future projects is described below for highway relocation and traffic redistribution.

- **Noise Levels Associated with Highway Relocation and Future Cumulative Development.** Cumulative noise levels from highway relocation, in combination with regional traffic growth, were estimated for this analysis using the FHWA Traffic Noise Prediction Model, as the FTA has not developed its own model for highway and roadway noise analysis. Cumulative noise levels were based on cumulative traffic projections developed as part of the transportation analysis, which included development under the INP and the Dublin/Pleasanton Station Parking Expansion. Modeled weekday traffic noise level estimates for the nearest receptors along three segments of I-580 are as follows:
  - Dougherty Road/Hopyard Road to Hacienda Drive (residences near LT-1)
  - Tassajara Road/Santa Rita Road to Fallon Road/El Charro Road (residences near LT-2)
  - Isabel Avenue to North Livermore Avenue (residences near LT52)

  None of the other segments of I-580 proposed for relocation have receptors within 500 feet, which is more than five times the proposed increase in width; thus, they

would experience marginal if any increase in noise. Predicted cumulative noise levels at these receptors under 2025 No Project Conditions and 2025 Cumulative Conditions are presented in Table 3.J-29.

TABLE 3.J-29 MODELED I-580 NOISE LEVELS UNDER 2025 CUMULATIVE CONDITIONS

	Noise Levels (dBA)								
	No Project Alternative	Conventional BART Project		DMU Alternative		Express Bus/BRT Alternative		Enhanced Bus Alternative	
Roadway Segment	Noise Level	Noise Level	Change	Noise Level	Change	Noise Level	Change	Noise Level	Change
Dougherty Road/Hopyard Road to Hacienda Drive at LT-1	61.0	61.1	0.1	61.7	0.7	61.7	0.7	60.8	-0.2
Tassajara Road/Santa Rita Road to Fallon Road/El Charro Road at LT-2	60.6	61.0	0.4	61.1	0.5	60.6	0.0	60.6	0.0
Isabel Avenue to North Livermore Avenue at LT-5	65.2	65.3	0.1	65.4	0.2	65.2	0.0	65.1	-0.1

Notes: dBA = A-weighted decibels; I- = Interstate Highway; LT = Long-term noise measurement location.
The change in noise levels is the difference between the No Project Conditions and the Project Conditions. Positive values represent an increase in noise levels and negative values represent a decrease in noise levels.

Under the Proposed Project, cumulative highway noise at the nearest receptors would increase by up to 0.4 dBA during the peak hour. This would represent less than a 1-dBA increase at a receptor where existing noise levels are between 58 and 61 L_{eq}. Per Table 3.J-9, the allowable noise exposure increase is 2 dBA in areas that have existing noise levels between 58 and 61 L_{eq}, so impacts would be less than significant.

- **Noise Levels Associated with Traffic Redistribution on Local Roadways in the 2025 Cumulative Conditions.** The Proposed Project would result in a redistribution of traffic on local roadways, and cumulative development would further add vehicle traffic to local roadways.

  No sensitive receptors are located along the roadways that would be used to access the parking facilities at the new Isabel Station from the west, such as Isabel Avenue

south of I-580, Kitty Hawk Road, and East Airway Boulevard to Rutan Drive, and traffic increases along these roadways would not substantially contribute to cumulative noise impacts. However, sensitive receptors are located south of East Airway Boulevard, which would be used by vehicles accessing proposed parking facilities from the east.

Cumulative noise level increases along roadways were estimated using the FHWA Traffic Noise Prediction Model. Modeled weekday traffic noise level estimates for seven roadway segments are presented in Table 3.J-30. Noise levels in Table 3.J-30 represent cumulative conditions with and without the project (Proposed Project and all of the Alternatives) for 2025 at a distance of 50 feet from the roadway center. For the Proposed Project, Table 3.J-30 indicates that greatest increase in roadway noise would occur along East Airway Boulevard (3.4 dBA) during the AM peak hour. This would represent more than a 1-dBA increase at a receptor where existing noise levels are above 62 L_{eq} (refer to Table 3.J-9), a significant increase. As described in **Impact NOI-5**, this impact would be reduced to a less-than significant level with implementation of **Mitigation Measure NOI-5**, which would require construction of a sound barrier that would reduce noise impacts along East Airway Boulevard. Noise level increases along all other roadways would be less than 1 dBA and less than significant.

- **Conclusion.** As described above, the cumulative noise level increases associated with highway relocation and traffic redistribution under the Proposed Project would exceed the applicable thresholds at receptors south of East Airway Boulevard. However, as described in **Impact NOI-5**, the Proposed Project would be required to implement **Mitigation Measure NOI-5**, which would require construction of a sound barrier that would reduce noise impacts to a less-than-significant level along East Airway Boulevard. Similarly, other cumulative projects would also be required to assess and mitigate significant ambient noise level increases associated with traffic redistribution on local roadways. Therefore, the Proposed Project, in combination with past, present, and probable future projects, would have a less-than-significant impact related to ambient noise level increases under 2025 conditions.**(LS)**

DMU Alternative. The change in ambient noise levels resulting from the DMU Alternative when combined with past, present, and probable future projects is described below for highway relocation and traffic redistribution.

- **Noise Levels Associated with Highway Relocation and Future Cumulative Development.** Modeled weekday traffic noise level estimates for the nearest receptors along three segments of I-580 are as follows:
  - Dougherty Road/Hopyard Road to Hacienda Drive at LT-1
  - Tassajara Road/Santa Rita Road to Fallon Road/El Charro Road at LT-2
  - Isabel Avenue to North Livermore Avenue at LT-5

  Predicted noise levels at these receptors under 2025 No Project Conditions and 2025 Cumulative with DMU Alternative are presented in Table 3.J-29 and reflect the peak

hour conditions with the greatest predicted freeway volumes (AM peak hour conditions for the segment from Dougherty Road/Hopyard Road to Hacienda Drive, and PM peak hour conditions for the other two segments).

Under the DMU Alternative, cumulative highway noise at the nearest receptors would increase by up to 0.7 dBA during the peak hour. Consistent with Table 3.J-9, this would represent less than a 1-dBA increase at a receptor where existing noise levels are below 74 L_{eq}, a less-than-significant impact.

Noise Levels Associated with Traffic Redistribution on Local Roadways in the 2025 Cumulative Conditions. Modeled weekday traffic noise level estimates for seven roadway segments are presented in Table 3.J-30. These noise levels represent conditions with and without the Proposed Project or any of the Alternatives for 2025 at a distance of 50 feet from the roadway center. For the DMU Alternative, Table 3.J-30 indicates that greatest increase in roadway noise would occur along East Airway Boulevard (0.9 dBA) during the AM peak hour. This would represent less than a 1-dBA increase at a receptor where existing noise levels are above 62 L_{eq}, a less-than-significant impact (refer to Table 3.J-9). Noise level increases along all other roadways would also be less than 1 dBA and less than significant.

- **Conclusion.** As described above, cumulative noise level increases associated with highway relocation and traffic redistribution under the DMU Alternative would not exceed the applicable thresholds at any receptor. Therefore, the DMU Alternative, in combination with past, present, and probable future projects, would have a less-than-significant impact related to ambient noise level increases under 2025 conditions. **(LS)**

TABLE 3.J-30 MODELED NOISE LEVELS ON LOCAL ROADWAYS UNDER 2025 CUMULATIVE CONDITIONS

	No Project Alternative	Conventional BART Project		DMU Alternative		Express Bus/BRT Alternative		Enhanced Bus Alternative	
Roadway Segment	Noise Level	Noise Level	Change	Noise Level	Change	Noise Level	Change	Noise Level	Change
AM Peak Hour L_{eq} (dBA)									
Owens Drive From Willow Road to Hacienda Drive	68.9	68.6	-0.3	68.6	-0.3	69.0	+0.1	69.0	+0.1
Martinelli Way from Hacienda Drive to the BART Parking Structure	65.7	65.6	-0.1	65.7	0.0	65.6	-0.1	65.7	0.0
Dublin Boulevard from Hacienda Drive to the Iron Horse Parkway	71.6	71.6	0.0	71.6	0.0	71.6	0.0	71.6	0.0
Campus Hill Drive from Portola Avenue to Storage and Maintenance Facility Access Road	65.7	66.3	+0.6	66.2	+0.5	65.7	0.0	65.7	0.0
Murietta Boulevard from Jack London Boulevard to Stanley Boulevard	67.6	67.6	0.0	67.6	0.0	67.6	0.0	67.6	0.0
Vasco Road from Patterson Pass Road to East Avenue	70.1	70.1	0.0	70.0	-0.1	70.1	0.0	70.1	0.0
East Airway Boulevard from Portola Avenue to Sutter Street	62.6	66.0	**+3.4**	63.5	+0.9	62.6	0.0	62.6	0.0
PM Peak Hour L_{eq} (dBA)									
Owens Drive From Willow Road to Hacienda Drive	70.8	70.7	-0.1	70.7	-0.1	70.7	-0.1	70.7	-0.1
Martinelli Way from Hacienda Drive to the BART Parking Structure	68.7	68.2	-0.5	68.5	-0.2	68.7	0.0	68.8	+0.1

TABLE 3.J-30 MODELED NOISE LEVELS ON LOCAL ROADWAYS UNDER 2025 CUMULATIVE CONDITIONS

	No Project Alternative	Conventional BART Project		DMU Alternative		Express Bus/BRT Alternative		Enhanced Bus Alternative	
Roadway Segment	Noise Level	Noise Level	Change	Noise Level	Change	Noise Level	Change	Noise Level	Change
Dublin Boulevard from Hacienda Drive to the Iron Horse Parkway	72.9	72.9	0.0	72.9	0.0	72.9	0.0	72.9	0.0
Campus Hill Drive from Portola Avenue to Storage and Maintenance Facility Access Road	67.0	68.0	+1.0	67.9	+0.9	66.9	-0.1	66.9	-0.1
Murietta Boulevard from Jack London Boulevard to Stanley Boulevard	68.7	69.0	+0.3	68.9	+0.2	68.6	-0.1	68.8	+0.1
Vasco Road from Patterson Pass Road to East Avenue	71.3	71.3	0.0	71.3	0.0	71.3	0.0	71.3	0.0
East Airway Boulevard from Portola Avenue to Sutter Street	66.0	67.9	**+1.9**	66.4	+0.4	66.0	0.0	66.0	0.0

Notes: dBA = A-weighted decibels; L_{eq} = peak hour equivalent (average) noise level. **Bold**/gray text indicates noise levels exceeding threshold.
Negative values reflect reductions in traffic on these roadways due to availability of closer stations or facilities.
Change in noise levels are the change between the No Project Conditions and the Project Conditions. Positive values represent an increase in noise levels and negative values represent a decrease in noise levels.

Express Bus/BRT Alternative. The change in ambient noise levels resulting from the Express Bus/BRT Alternative when combined with past, present, and probable future project is described below for highway relocation and traffic redistribution.

- **Noise Levels Associated with Highway Relocation and Future Cumulative Development.** Weekday traffic noise level estimates were modeled for the nearest receptors along three segments of I-580, as follows:
  - Dougherty Road/Hopyard Road to Hacienda Drive at LT-1
  - Tassajara Road/Santa Rita Road to Fallon Road/El Charro Road at LT-2
  - Isabel Avenue to North Livermore Avenue at LT-5

  Predicted noise levels at these receptors under 2025 No Project Conditions and 2025 Cumulative with Express Bus/BRT Alternative are presented in Table 3.J-29 and reflect the peak hour conditions with the greatest predicted freeway volumes (AM peak hour conditions for the segment from Dougherty Road/Hopyard Road to Hacienda Drive, and PM peak hour conditions for the other two segments).

  Under the Express Bus/BRT Alternative, cumulative highway noise at the nearest receptors would increase by up to 0.7 dBA during the peak hour. This would represent less than a 1-dBA increase at a receptor where existing noise levels are below 74 L_{eq}, a less-than-significant impact.
- **Noise Levels Associated with Traffic Redistribution on Local Roadways in the 2025 Cumulative Conditions.** Cumulative noise level increases along roadways were estimated for the Express Bus/BRT Alternative using the FHWA Traffic Noise Prediction Model based on 2025 No Project Conditions and future project traffic projections developed as part of the transportation analysis (see Section 3.B, Transportation). Modeled weekday traffic noise level estimates for seven roadway segments are presented in Table 3.J-30. These noise levels represent conditions with and without the Proposed Project or any of the Alternatives for 2025 at a distance of 50 feet from the roadway center. For the Express Bus/BRT Alternative, Table 3.J-30 indicates that greatest increase in roadway noise would occur along Owens Drive (0.1 dBA) during the AM peak hour. This would represent less than a 1-dBA increase at a receptor where existing noise levels are below 74 L_{eq}, a less-than-significant impact.
- **Conclusion.** As described above, cumulative noise level increases associated with highway relocation and traffic redistribution under the Express Bus/BRT Alternative would be below the relevant thresholds. Therefore, the Express Bus/BRT Alternative would have a less-than-significant cumulative impact related to ambient noise levels in the 2025 Cumulative Conditions. **(LS)**

Enhanced Bus Alternative. Cumulative noise level increases along roadways were estimated for the Enhanced Bus Alternative using the FHWA Traffic Noise Prediction Model

based on 2025 No Project Conditions and future traffic projections developed as part of the transportation analysis (see Section 3.B, Transportation). Modeled weekday traffic noise level estimates for seven roadway segments are presented in Table 3.J-30. Noise levels in Table 3.J-30 represent conditions with and without the Proposed Project or any of the Alternatives for 2025 at a distance of 50 feet from the roadway center. For the Enhanced Bus Alternative, Table 3.J-30 indicates that greatest increase in roadway noise would occur along Owens Drive (0.1 dBA) during the AM peak hour and along Martinelli Way and Murietta Boulevard during the PM peak hour. Because this would be less than a 1-dBA increase at a receptor where existing noise levels are below 74 L_{eq}, there would be a less-than-significant cumulative roadway noise impact in 2025. **(LS)**

Mitigation Measures. As described above, in 2025, the operation of the Proposed Project and Alternatives in combination with past, present, or probable future projects would not result in significant cumulative impacts related to ambient noise increases, and no additional mitigation measures, beyond those identified for the project impacts are required.

Impact NOI-12(CU): Result in a substantial permanent increase in ambient noise levels in the vicinity above levels existing without the Proposed Project or Alternative under 2040 Cumulative Conditions.

(No Project Alternative: LS; Conventional BART Project: LS; DMU Alternative: LS; Express Bus/BRT Alternative: LS; Enhanced Bus Alternative: LS)

Cumulative projects throughout the region would also add vehicle trips to the roadway network surrounding the proposed facilities under each alternative. Specifically, cumulative projects analyzed in the transportation analysis include the INP and the Dublin/Pleasanton Station Parking Expansion. Cumulative impacts are described for operations in the horizon year (2040) below.

No Project Alternative. Under the 2040 No Project Alternative in the Cumulative Condition, the BART to Livermore Extension Project would not be implemented, highway relocation would not occur, and noise increases experienced at sensitive land uses near the freeway would solely be the result of growth-induced traffic volumes. Traffic data indicate a worst-case I-580 volume increase of 16 percent over existing conditions between Dougherty/Hopyard Road and Hacienda Drive near long-term noise measurement location LT-1. Applying the most recent verified truck percentage (5 percent) and conservatively assuming travel at the posted speed limit, modeled noise levels during the morning peak hour at LT-1 would increase by 0.7 dBA (60.4 to 61.1 dBA). This modest increase would not be considered significant. Furthermore, the effects of the other projects associated with the No Project Alternative have been or will be addressed in environmental documents prepared for those projects before they are implemented, and

the No Project Alternative would not result in new impacts as a consequence of the BART Board of Directors' decision not to adopt a project. Therefore, the 2040 No Project Alternative under Cumulative Conditions is considered to have no impact on noise levels. **(NI)**

Conventional BART Project. The change in ambient noise levels resulting from the Proposed Project when combined with past, present, and probable future projects is described below for highway relocation and traffic redistribution.

- **Noise Levels Associated with Highway Relocation and Future Cumulative Development.** Increased noise levels from highway relocation in the Cumulative Conditions were analyzed with the same methodology as for the 2025 analysis above. Predicted cumulative noise levels at these receptors under 2040 No Project Conditions and 2040 Cumulative Conditions are presented in Table 3.J-31.
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TABLE 3.J-31 MODELED I-580 NOISE LEVELS UNDER 2040 CUMULATIVE CONDITIONS

	Noise Levels (dBA)								
	No Project Alternative	Conventional BART Project		DMU Alternative		Express Bus/BRT Alternative		Enhanced Bus Alternative	
Roadway Segment	Noise Level	Noise Level	Change	Noise Level	Change	Noise Level	Change	Noise Level	Change
Dougherty Road/Hopyard Road to Hacienda Drive at LT-1	61.1	61.4	0.3	62.0	0.9	62.0	0.9	61.1	0.0
Tassajara Road/Santa Rita Road to Fallon Road/El Charro Road at LT-2	61.0	61.5	0.5	61.5	0.5	61.0	0.0	61.0	0.0
Isabel Avenue to North Livermore Avenue at LT-5	65.6	65.9	0.3	65.9	0.3	65.6	0.0	65.6	0.0

Notes: LT = long-term noise measurement location; dBA = A-weighted decibels; I- = Interstate Highway.
Change in noise levels are the change between the No Project Conditions and the Project Conditions. Positive values represent an increase in noise levels and negative values represent a decrease in noise levels.

Under the Proposed Project, cumulative highway noise at the nearest receptors would increase by up to 0.5 dBA during the peak hour. This would represent less than a 1-dBA increase at a receptor where existing noise levels are below 74 L_{eq}.

- **Noise Levels Associated with Traffic Redistribution on Local Roadways in the 2040 Cumulative Conditions.** The Proposed Project would result in a redistribution of traffic on local roadways, and cumulative development would add further vehicle traffic to local roadways.

  No sensitive receptors are located along the roadways that would be used to access the parking facilities at the new Isabel Station, such as Isabel Avenue south of I-580, Kitty Hawk Road, and East Airway Boulevard to Rutan Drive; consequently, traffic increases along these roadways would not substantially contribute to cumulative noise impacts. However, sensitive receptors are located south of East Airway Boulevard, a road segment that would be used by vehicles accessing proposed parking facilities from the east.

  Modeled weekday traffic noise level estimates for seven roadway segments are presented in Table 3.J-32. These noise levels represent cumulative conditions with and without the Proposed Project or any of the Alternatives for cumulative 2040 conditions at a distance of 50 feet from the roadway center. For the Proposed Project, Table 3.J-32 indicates that greatest increase in roadway noise would occur along East Airway Boulevard (4.4 dBA) during the AM peak hour. This would represent more than a 1-dBA increase at a receptor where existing noise levels are above 62 L_{eq}, a significant impact (refer to Table 3.J-9). Noise level increases along all other roadways would be less than 1 dBA and less than significant.

- **Conclusion.** As described above, cumulative noise level increases associated with highway relocation and traffic redistribution under the Proposed Project would exceed the applicable thresholds at receptors south of East Airway Boulevard. However, as described in **Impact NOI-6**, the Proposed Project would be required to implement **Mitigation Measure NOI-5**, which would require construction of a sound barrier that would reduce noise impacts to a less-than-significant level along East Airway Boulevard. Similarly, other cumulative projects would also be required to mitigate significant ambient noise level increases associated with traffic redistribution on local roadways. Therefore, with mitigation, the Proposed Project, in combination with past, present, and probable future projects, would have a less-than-significant impact related to ambient noise level increases under 2040 conditions. **(LS)**

TABLE 3.J-32 MODELED NOISE LEVELS ON LOCAL ROADWAYS UNDER 2040 CUMULATIVE CONDITIONS

	No Project Alternative	Conventional BART Project		DMU Alternative		Express Bus/BRT Alternative		Enhanced Bus Alternative	
Roadway Segment	**Noise Level**	**Noise Level**	**Change**	**Noise Level**	**Change**	**Noise Level**	**Change**	**Noise Level**	**Change**
AM Peak Hour L_{eq} (dBA)									
Owens Drive From Willow Road to Hacienda Drive	69.3	69.4	+0.1	69.2	-0.1	69.4	+0.1	69.4	+0.1
Martinelli Way from Hacienda Drive to the BART Parking Structure	66.3	66.3	0.0	66.3	0.0	66.3	0.0	66.3	0.0
Dublin Boulevard from Hacienda Drive to the Iron Horse Parkway	72.1	72.0	-0.1	72.0	-0.1	72.1	0.0	72.3	+0.2
Campus Hill Drive from Portola Avenue to Storage and Maintenance Facility Access Road	66.2	66.3	+0.1	66.3	+0.1	66.1	-0.1	66.1	-0.1
Murietta Boulevard from Jack London Boulevard to Stanley Boulevard	68.5	69.3	+0.8	69.2	+0.7	68.4	-0.1	68.5	0.0
Vasco Road from Patterson Pass Road to East Avenue	70.4	70.3	-0.1	70.5	+0.1	70.4	0.0	70.4	0.0
East Airway Boulevard from Portola Avenue to Sutter Street	62.5	66.9	**+4.4**	66.3	**+3.8**	62.5	0.0	62.5	0.0
PM Peak Hour L_{eq} (dBA)									
Owens Drive From Willow Road to Hacienda Drive	71.5	71.6	+0.1	71.6	+0.1	71.5	0.0	71.5	0.0
Martinelli Way from Hacienda Drive to the BART Parking Structure	69.6	69.2	-0.4	69.0	-0.6	69.7	+0.1	69.8	+0.2
Dublin Boulevard from Hacienda Drive to the Iron Horse Parkway	73.7	73.7	0.0	73.7	0.0	73.8	+0.1	73.9	+0.2
Campus Hill Drive from Portola Avenue to Storage and Maintenance Facility Access Road	67.1	67.0	-0.1	67.0	-0.1	67.1	0.0	67.1	0.0

TABLE 3.J-32 MODELED NOISE LEVELS ON LOCAL ROADWAYS UNDER 2040 CUMULATIVE CONDITIONS

	No Project Alternative	Conventional BART Project		DMU Alternative		Express Bus/BRT Alternative		Enhanced Bus Alternative	
Roadway Segment	**Noise Level**	**Noise Level**	**Change**	**Noise Level**	**Change**	**Noise Level**	**Change**	**Noise Level**	**Change**
Murietta Boulevard from Jack London Boulevard to Stanley Boulevard	70.0	70.5	+0.5	70.5	+0.5	69.9	-0.1	70.0	0.0
Vasco Road from Patterson Pass Road to East Avenue	72.4	72.7	+0.3	72.6	+0.2	72.5	+0.1	72.4	0.0
East Airway Boulevard from Portola Avenue to Sutter Street	66.3	68.9	**+2.6**	68.1	**+1.8**	66.3	0.0	66.3	0.0

Notes: dBA = A-weighted decibels; L_{eq} = peak hour equivalent (average) noise level. **Bold**/gray text indicates noise levels exceeding threshold.
Change in noise levels are the change between the No Project Conditions and the Project Conditions. Positive values represent an increase in noise levels and negative values represent a decrease in noise levels.

DMU Alternative. The change in ambient noise levels resulting from the DMU Alternative when combined with past, present, and probable future project is described below for highway relocation and traffic redistribution.

- **Noise Levels Associated with Highway Relocation and Future Cumulative Development.** Weekday traffic noise level estimates were modeled for the nearest receptors along the same three segments of I-580 as for the Proposed Project. Predicted noise levels at these receptors under 2040 No Project Conditions and 2040 Cumulative With DMU Alternative are presented in Table 3.J-31 and reflect the peak hour conditions with the greatest predicted freeway volumes (AM peak hour conditions for the segment from Dougherty Road/Hopyard Road to Hacienda Drive, and PM peak hour conditions for the other two segments).

  Under the DMU Alternative, cumulative highway noise at the nearest receptors would increase by up to 0.9 dBA during the peak hour. This would represent less than a 1-dBA increase at a receptor where existing noise levels are below 74 L_{eq}.

- **Noise Levels Associated with Traffic Redistribution on Local Roadways in the 2040 Cumulative Conditions**. Modeled weekday traffic noise level estimates for seven roadway segments are presented in Table 3.J-32. These noise levels represent conditions with and without the Proposed Project and Build Alternatives for 2040 at a distance of 50 feet from the roadway center. For the DMU Alternative, Table 3.J-32 indicates that greatest increase in roadway noise would occur along East Airway Boulevard (3.8 dBA) during the AM peak hour. This would represent more than a 1-dBA increase at a receptor where existing noise levels are above 62 L_{eq}, a significant impact (refer to Table 3.J-9). Implementation of **Mitigation Measure NOI-5** would reduce this impact to a less-than-significant level.

- **Conclusion.** As described above, cumulative noise level increases associated with highway relocation and traffic redistribution under the DMU Alternative would exceed the applicable thresholds at receptors south of East Airway Boulevard. However, as described in **Impact NOI-6**, the DMU Alternative would be required to implement **Mitigation Measure NOI-5**, which would require construction of a sound barrier that would reduce noise impacts to a less-than-significant level along East Airway Boulevard. Similarly, other cumulative projects would also be required to mitigate significant ambient noise level increases associated with traffic redistribution on local roadways. Therefore, with mitigation, the Proposed Project, in combination with past, present, and probable future projects, would have a less-than-significant impact related to ambient noise level increases under 2040 conditions. **(LS)**

- **Express Bus/BRT Alternative.** The change in ambient noise levels resulting from the Express Bus/BRT Alternative when combined with past, present, and probable future projects is described below for highway relocation and traffic redistribution.

- **Noise Levels Associated with Highway Relocation and Future Cumulative Development.** Modeled weekday traffic noise level estimates for the nearest receptors along the same three segments of I-580 as for the Proposed Project under 2040 No Project Conditions and 2040 Cumulative With Express Bus/BRT Alternative are presented in Table 3.J-31, and reflect the peak hour conditions with the greatest predicted freeway volumes (AM peak hour conditions for the segment from Dougherty Road/Hopyard Road to Hacienda Drive, and PM peak hour conditions for the other two segments).

  Under the Express Bus/BRT Alternative, cumulative highway noise at the nearest receptors would increase by up to 0.9 dBA during the peak hour. This would represent less than a 1-dBA increase at a receptor where existing noise levels are below 74 L_{eq}.

- **Noise Levels Associated with Traffic Redistribution on Local Roadways in the 2040 Cumulative Conditions.** Modeled weekday traffic noise level estimates for seven roadway segments are presented in Table 3.J-32. These noise levels represent cumulative conditions with and without the Proposed Project and Build Alternatives for 2040 at a distance of 50 feet from the roadway center. For the Express Bus/BRT Alternative, Table 3.J-32 indicates that greatest increases in roadway noise would occur along Owens Drive (0.1 dBA) during the AM peak hour and Martinelli Way, Dublin Boulevard, and Vasco Road (0.1 dBA) during the PM peak hour. These would be less than a 1-dBA increases at receptors where existing noise levels are below 74 L_{eq}.

- **Conclusion.** As described above, cumulative noise level increases associated with highway relocation and traffic redistribution under the Express Bus/BRT Alternative would be below the relevant thresholds. Therefore, the Express Bus/BRT Alternative would have a less-than-significant cumulative impact related to ambient noise levels in the 2040 Cumulative Conditions. **(LS)**

Enhanced Bus Alternative. Cumulative noise level increases along roadways were estimated for the Enhanced Bus Alternative using the FHWA Traffic Noise Prediction Model based on 2040 No Project Conditions and future with project traffic projections developed as part of the transportation analysis (see Section 3.B, Transportation). Modeled weekday traffic noise level estimates for seven roadway segments are presented in Table 3.J-32. These noise levels represent conditions with and without the Proposed Project or any of the Alternatives for 2040 at a distance of 50 feet from the roadway center. For the Enhanced Bus Alternative, Table 3.J-32 indicates that the greatest increase in roadway noise would occur along Dublin Boulevard and Martinelli Way (0.2 dBA) during the PM peak hour. Therefore, the Enhanced Bus Alternative would have less-than-significant cumulative roadway noise impacts to adjacent sensitive receptors. **(LS)**

Mitigation Measures. As described above, in 2040, the operation of the Proposed Project and Alternatives in combination with past, present, or probable future projects would not result in significant cumulative impacts related to ambient noise increases, and no

additional mitigation measures, beyond those identified for the project impacts are required.

Impact NOI-13(CU): Expose persons to or generate noise levels in excess of standards established by the FTA with cumulative development under 2025 and 2040 Cumulative Conditions.

(No Project Alternative: NI; Conventional BART: LS; DMU Alternative: LS; Express Bus/BRT Alternative: LS; Enhanced Bus Alternative: LS)

Cumulative projects throughout the region would locate sensitive land uses to proposed transit improvements under each alternative. Specifically, cumulative projects include the INP and the Dublin/Pleasanton Station Parking Expansion. Cumulative impacts are the same for transit operations in both 2025 and 2040.

No Project Alternative. Under the No Project Alternative, the BART to Livermore Extension Project would not be implemented. However, planned and programmed transportation improvements for segments of I-580, local roadways and intersections, and core transit service improvements for BART, ACE, and LAVTA would be constructed. In addition, population and employment increases throughout Alameda County would result in continued land use development, including residential and commercial construction. Operation of these improvements and development projects could adversely noise environment. However, the effects of the other projects associated with the No Project Alternative have been or will be addressed in environmental documents prepared for those projects before they are implemented, and the No Project Alternative would not result in new impacts as a consequence of the BART Board of Directors' decision not to adopt a project. Therefore, the 2025 and 2040 No Project Alternative under Cumulative Conditions is considered to have no impact on noise levels. **(NI)**

Conventional BART Project. The noise generated from operation of the Proposed Project could impact future residential and other noise sensitive receptors of the INP. The Dublin/Pleasanton Station Parking Expansion would not be considered a noise sensitive land use that would be impacted by noise generated by the proposed transit improvements of the Proposed Project. Consequently, the following analysis only examines potential impact to locations zoned as potential noise-sensitive receptors under the INP. Because the Shea Homes – Sage Project has many units already constructed, this part of the INP was analyzed previously in the project-level analysis.

- **Noise Generated by BART Train Operations.** The closest residentially zoned area of the INP to BART rail operations would be the area south of East Airway Boulevard, between what would be the extension of Stealth Street and Sutter Street. This future development would be approximately 370 feet south of alignment of tail tracks to the maintenance and storage facility. The noise impacts to these cumulative receptors

would be the similar to that for receptor LT-5 as presented in Table 3.J-19. At this location, the existing L_{dn} is 66 dBA, which would mean an acceptable L_{dn} contribution from BART trains of less than 62 dBA. The L_{dn} contribution from BART trains at this receptor would be 55 dBA, which would be below the applicable threshold and a less-than-significant impact.

- **Noise Generated by the Proposed Isabel Station**. Noise could be generated near the Isabel Station as BART trains travel over switches and/or sound their horns as they enter the station. The switch near the Isabel Station would be approximately 600 feet west of the I-580/Isabel Avenue interchange overcrossing center and over 800 feet from the nearest receptor of the INP (west of Collier Canyon Road), which is beyond the FTA screening distance for any type of rail project or ancillary facilities. These facilities would have a less-than-significant noise impact.

  The noise from the BART trains near Isabel Station would be from tracks and horns. The nearest INP residential zone, south of East Airway Boulevard, represented by monitoring location LT-5 would be about 700 feet from the station. At this existing noise level, the acceptable L_{dn} contribution from BART trains is less than 62 dBA (exclusive of existing noise levels). The L_{dn} contribution from BART trains with horns at this receptor would be 55 dBA. The L_{dn} contribution from BART trains inclusive of noise from horns as trains enter the station would not exceed the FTA threshold of 62 dBA at this closest receptor. No INP sensitive receptors would be located within the FTA-recommended screening distance of 250 feet from the power substations, and the noise impacts from these sources would be less than significant. The standby generator would be operated for 2 hours per month during daytime hours for maintenance purposes and would not be a significant noise source.

- **Noise Generated by Bus Operations in the Proposed Isabel Station Bus Transfer Facility**. Impacts from operation of the proposed bus transfer facility would be the same as analyzed for the Shea Homes – Sage Project under for the proposed Project as this would be the closet residentially zoned land use in the INP to the bus transfer station. As described in **Impact NOI-3** and **Impact NOI-4**, this would be a less-than-significant impact.

- **Noise Generated by the Isabel Station South Parking Facility.** Parking facilities would be provided south of the Isabel Station, along East Airway Boulevard, just east of Isabel Avenue. Approximately 3,412 parking spaces would be provided as follows: a seven-level parking structure would provide approximately 2,835 parking spaces and two surface parking lots would provide 577 parking spaces.

  FTA guidance identifies a screening distance of 125 feet from proposed parking facilities, beyond which noise impacts would be less than significant. The nearest INP receptor to the proposed garage would be south of East Airway Boulevard, approximately 300 feet east of the proposed taxi waiting area. Because all INP receptors would be beyond the FTA screening distance for parking facilities, operation

of the proposed parking structure would have a less-than-significant operational noise impact

- **Noise Generated by the Storage and Maintenance Facility.** All residentially zoned land uses in the INP would be beyond the 1,000-foot FTA screening distance for yards and shops. The noise impacts from operations of the storage and maintenance facility would be less than significant.
- **Noise Generated by Wayside System Facilities.** The nearest INP receptor to the Kitty Hawk Road wayside facility would be residentially zoned parcels 600 feet to the north, west of Collier Canyon Road. All receptors would be beyond the 250-foot FTA screening distance for substations.
- **Conclusion.** As described above, noise from BART train operations, the Isabel Station, the Isabel Station bus transfer facility, the Isabel Station parking facility, the storage and maintenance facility, and wayside system facilities under the Proposed Project would be below the established FTA standards for sensitive receptors in the INP; therefore, impacts would be less than significant. **(LS)**

DMU Alternative. Noise generated by the DMU Alternative in combination with cumulative projects is described below.

- **Noise Generated by DMU Train Operations.** The closest residentially zoned area of the INP to DMU rail operations would be the area south of East Airway Boulevard, between what would be the extension of Stealth Street and Sutter Street. This future development would be approximately 370 feet south of alignment of tail tracks to the maintenance and storage facility. The noise impacts to these cumulative receptors would be the similar to that for receptor LT-5 as presented in Table 3.J-21. At this location, the existing L_{dn} is 66 dBA, which would mean an acceptable L_{dn} contribution from DMU trains of less than 62 dBA. The L_{dn} contribution from DMU trains at this receptor would be 57 dBA, which would be below the applicable threshold and a less-than-significant impact.
- **Noise Generated by the Isabel Station.** Noise could be generated near the Isabel Station as DMU trains travel over switches and/or sound their horns as they enter the station. The switch near the Isabel Station would be approximately 600 feet west of the I-580/Isabel Avenue interchange overcrossing center and over 800 feet from the nearest receptor of the INP (west of Collier Canyon Road), which is beyond the FTA screening distance for any type of rail project or ancillary facilities. These facilities would have a less-than-significant noise impact.

  The noise from the DMU trains near Isabel Station would be from tracks and horns. The nearest INP residential zone, south of East Airway Boulevard, represented by monitoring location LT-5 would be about 700 feet from the station. At this existing noise level, the acceptable L_{dn} contribution from BART trains is less than 62 dBA

(exclusive of existing noise levels). The L_{dn} contribution from DMU trains with horns at this receptor would be 57 dBA. The L_{dn} contribution from DMU trains inclusive of noise from horns as trains enter the station would not exceed the FTA threshold of 62 dBA at this closest receptor. No INP sensitive receptors would be located within the FTA-recommended screening distance of 250 feet from the power substations, and the noise impacts from these sources would be less than significant. The standby generator would be operated for 2 hours per month during daytime hours for maintenance purposes and would not be a significant noise source.

- **Noise Generated by Bus Operations at the Proposed Isabel Station Bus Transfer Facility.** Impacts from operation of the proposed bus transfer facility would be the same as analyzed for the Shea Homes – Sage Project under for the proposed Project as this would be the closet residentially zoned land use in the INP to the bus transfer station. As described in **Impact NOI-3** and **Impact NOI-4**, this would be a less-than-significant impact.
- **Noise Generated by the Proposed Isabel Station Parking Facility.** Parking facilities would be provided south of the Isabel Station, along East Airway Boulevard, just east of Isabel Avenue. Approximately 3,412 parking spaces would be provided as follows: a seven-level parking structure would provide approximately 2,835 parking spaces and two surface parking lots would provide 577 parking spaces.
- **Noise Generated by the Storage and Maintenance Facility.** All residentially zoned land uses in the INP would be beyond the 1,000-foot FTA screening distance for yards and shops. The noise impacts from operations of the storage and maintenance facility would be less than significant.
- **Noise Generated by Wayside System Facilities.** The nearest INP receptor to the Kitty Hawk Road wayside facility would be residentially zoned parcels 600 feet to the north, west of Collier Canyon Road. All receptors would be beyond the 250-foot FTA screening distance for substations.
- **Conclusion.** As described above, noise from DMU train operations, the Isabel Station, the Isabel Station bus transfer facility, the Isabel Station parking facility, the storage and maintenance facility, and wayside system facilities under the DMU Alternative would be below the established FTA standards for sensitive receptors in the INP; therefore, impacts would be less than significant. **(LS)**

EMU Option. The EMU Option (electrically powered) would be quieter than the DMU Alternative (powered by a diesel engine). Consequently, with respect to noise from train operations along the alignment, the cumulative noise impacts of the EMU Option would be less than the DMU Alternative and similar to the Proposed Project as discussed above. Therefore, noise from the EMU Option operations would be less than significant for cumulative development of the INP. **(LS)**

Express Bus/BRT Alternative. Noise generated by the Express Bus/BRT Alternative in combination with cumulative projects is described below.

- **Noise Generated by Express Bus Operations.** Noise associated with operation of express buses along the proposed alignment would result from engine noise and wheel friction of additional buses traveling in the express lanes of I-580. While there would be a marginal increase in headways to the operational characteristics of the express buses in 2040 compared to 2025, the noise levels presented in Table 3.J-22 represent a worst case analysis at a receptor distance of 100 along Campus Hill Drive, which reflects impacts to the existing Montage neighborhood as well as to other residentially zoned parcels of the INP. As indicated in Table 3.J-22 noise-related impacts would be less than significant.
- **Noise Generated by the Dublin/Pleasanton Station Replacement Parking Lot (or Garage).** The Dublin/Pleasanton Station replacement parking proposed under this alternative would be over 3 miles from potential residentially zoned parcels of the INP All receptors would be beyond the FTA screening distance for parking facilities.
- **Noise Generated by the Laughlin Parking Lot.** The Laughlin Parking Lot proposed under this alternative would be over 3 miles from potential residentially zoned parcels of the INP. All receptors would be beyond the FTA screening distance for parking facilities.
- **Conclusion.** As described above, the noise from express bus operations under the Express Bus/BRT Alternative would not exceed the established FTA standards for any cumulative residentially zoned parcels of the INP and noise-related impacts would be less than significant. **(LS)**

Enhanced Bus Alternative. The proposed bus operations plan for this alternative would include an additional rapid route (R-B) and one express route (X-A). The existing local Route 12 would be modified, and the existing rapid route and 20X route would be eliminated to avoid redundancy and ensure an efficient spread of transit service to all key areas. Thus, the Enhanced Bus Alternative would not establish a new rail line or dedicated busway or BRT exclusive roadway, and it would have less-than-significant impacts related to transit noise from structural improvements. **(LS)**

Mitigation Measures. As described above, in 2025 and 2040, the Proposed Project and Alternatives in combination with past, present, or probable future projects would not result in significant cumulative impacts related to exposing persons to or generating vibration levels in excess of FTA standards, and no mitigation measures are required.

Impact NOI-14(CU): Expose persons to or generate groundborne vibration levels in excess of standards established by the FTA under 2025 and 2040 Cumulative Conditions.

(No Project Alternative: NI; Conventional BART: LS; DMU Alternative: LS; Express Bus/BRT Alternative: LS; Enhanced Bus Alternative: LS)

No Project Alternative. As described in **Impact NOI-7** above, the No Project Alternative would have no impacts associated with the exposing persons to or generating cumulative vibration levels in excess of standards established by the FTA under 2025 or 2040 Cumulative Conditions. Therefore, the No Project Alternative would not contribute to cumulative impacts. **(NI)**

Conventional BART Project and Build Alternatives. Operational vibration levels associated with cumulative projects in combination with the Proposed Project and Build Alternatives would not expose persons to or generate cumulative vibration levels in excess FTA standards under 2025 or 2040 Cumulative Conditions. No projects on the cumulative projects list would propose or involve operational vibration sources such as rail transit operations, blasting activities for quarrying, or operation of large-scale industrial equipment, and because vibration tends to dissipate quickly with distance, effects from one project would not typically combine to result in cumulative impacts. As described in **Impact NOI-7** above, the Proposed Project, the EMU Option, Express Bus/BRT Alternative, and the Enhanced Bus Alternative would all have less-than-significant vibration impacts under 2025 and 2040 Project Conditions.

The DMU Alternative would have significant vibration impacts at one receptor and would be required to implement **Mitigation Measure NOI-7**, which requires vibration-reducing design elements to achieve a 72-VdB performance standard. With implementation of this measure, impacts would be reduced to a less-than-significant level, and the DMU Alternative would not combine with cumulative projects to create a cumulatively significant impact. Therefore, the Proposed Project and Build Alternatives, in combination with past, present, and probable future projects, would have a less-than-significant impact related to exposing persons to or generating cumulative vibration levels exceeding FTA standards under 2025 or 2040 Cumulative Conditions. **(LS)**

Mitigation Measures. As described above, in 2025 and 2040, the operation of the Proposed Project and Alternatives in combination with past, present, or probable future projects would not result in significant cumulative impacts related to exposing persons to or generating vibration levels in excess of FTA standards, and no additional mitigation measures beyond those identified for the project impacts are required.